G05B CONTROLLING; REGULATING

G05B CONTROL OR REGULATING SYSTEMS IN GENERAL; FUNCTIONAL ELEMENTS OF SUCH SYSTEMS; MONITORING OR TESTING ARRANGEMENTS FOR SUCH SYSTEMS OR ELEMENTS (fluid-pressure actuators or systems acting by means of fluids in general F15B; valves per se F16K; characterised by mechanical features only G05G; sensitive elements, see the appropriate subclass, e.g. G12B, subclass of G01, H01; correcting units, see the appropriate subclass, e.g. H02K)

NOTES
1. This subclass covers features of control systems or elements for regulating specific variables, which are clearly more generally applicable.
2. This subclass does not cover:
   a. systems for controlling or regulating non-electric variables in general, which are covered by subclass G05D;
   b. systems for regulating electric or magnetic variables in general, which are covered by subclass G05F;
   c. systems specially adapted for the control of particular machines or apparatus provided for in a single other subclass, which are classified in the relevant subclass for such machines or apparatus, provided that there is specific provision for control or regulation relevant to the special adaptation. Otherwise, classification is made in the most appropriate place in this subclass.
3. In this subclass, the following terms or expressions are used with the meanings indicated:
   - "automatic controller" means a system, circuit, or device in which a signal from the detecting element is compared with a signal representing the desired value and which operates in such a way as to reduce the deviation. The automatic controller generally does not include the sensitive element, i.e. that element which measures the value of the condition to be corrected, or the correcting element, i.e. that element which adjusts the condition to be corrected;
   - "electric" includes "electromechanical", "electrohydraulic" or "electropneumatic".
4. In this subclass, details or specific control systems are classified in the group relevant to that system, if not otherwise provided for.

WARNING
In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

1/00 Comparing elements, i.e. elements for effecting comparison directly or indirectly between a desired value and existing or anticipated values
(comparing phase or frequency of two electric signals H03D 13/00)
1/01 . electric
1/02 . for comparing analogue signals
1/022 . { using discharge tubes }
1/025 . { using inductance means }
1/027 . { using impedance bridges }
1/03 . for comparing digital signals
1/04 . with sensing of the position of the pointer of a measuring instrument
1/06 . . continuous sensing
1/08 . . stepwise sensing
1/11 . fluidic
5/00 Anti-hunting arrangements
5/01 . electric
5/04 . fluidic
6/00 Internal feedback arrangements for obtaining particular characteristics, e.g. proportional, integral, differential (in automatic controllers G05B 11/00)
6/02 . electric
6/05 . fluidic
7/00 Arrangements for obtaining smooth engagement or disengagement of automatic control
7/02 . electric
7/04 . fluidic
9/00 Safety arrangements (G05B 7/00 takes precedence; safety arrangements in programme-control systems G05B 19/048, G05B 19/406; safety valves F16K 17/00; emergency protective circuit arrangements in general H02H)
9/02 . electric
Automatic controllers (G05B 13/00 takes precedence)

11/00

11/01 . . . electric
11/011 . . . [details of the correcting means]
11/012 . . . [details of the transmission means]
11/013 . . . [using discharge tubes]
11/015 . . . [using rotating amplifiers]
11/016 . . . [using inductance means]
11/017 . . . [using photo-electric means]
11/018 . . . [using thermal amplifiers]
11/06 . . . in which the output signal represents a continuous function of the deviation from the desired value, i.e. continuous controllers (G05B 11/26 takes precedence)

11/10 . . . the signal transmitted being dc
11/12 . . . the signal transmitted being modulated on an ac carrier
11/14 . . . in which the output signal represents a discontinuous function of the deviation from the desired value, i.e. discontinuous controllers (G05B 11/26 takes precedence)
11/16 . . . Two-step controllers, e.g. with on-off action
11/18 . . . Multi-step controllers
11/26 . . . in which the output signal is a pulse-train
11/28 . . . using pulse-height modulation; using pulse-width modulation
11/30 . . . using pulse-frequency modulation
11/32 . . . with inputs from more than one sensing element; with outputs to more than one correcting element
11/36 . . . with provision for obtaining particular characteristics, e.g. proportional, integral, differential
11/38 . . . for obtaining a proportional characteristic
11/40 . . . for obtaining an integral characteristic
11/42 . . . for obtaining a characteristic which is both proportional and time-dependent, e.g. P.I., P.I.D.
11/44 . . . pneumatic only
11/46 . . . without auxiliary power
11/48 . . . with auxiliary power
11/50 . . . in which the output signal represents a continuous function of the deviation from the desired value, i.e. continuous controllers
11/52 . . . in which the output signal represents a discontinuous function of the deviation from the desired value, i.e. discontinuous controllers
11/54 . . . Two-step controllers, e.g. with on-off action
11/56 . . . Multi-step controllers
11/58 . . . with inputs from more than one sensing element; with outputs to more than one correcting element
11/60 . . . hydraulic only

Adaptive control systems, i.e. systems automatically adjusting themselves to have a performance which is optimum according to some preassigned criterion (G05B 19/00 takes precedence; machine learning G06N 20/00)

13/00

13/01 . . . electric
13/02 . . . [not using a model or a simulator of the controlled system]
G05B

19/0405 ... [Programme-control specially adapted for machine tool control and not otherwise provided for (B23Q takes precedence; G05B 19/06 - G05B 19/16 take precedence)]
19/041 ... [Function-oriented details]
19/0415 ... [adapting phase duration according to measured parameters]
19/042 ... using digital processors (G05B 19/05 takes precedence)
19/0421 ... [Multiprocessor system]
19/0423 ... [Input/output]
19/0425 ... {Safety, monitoring}
19/0426 ... [Programming the control sequence]
19/0428 ... {Safety, monitoring (G05B 19/0423 takes precedence)}
19/045 ... using logic state machines, consisting only of a memory or a programmable logic device containing the logic for the controlled machine and in which the state of its outputs is dependent on the state of its inputs or part of its own output states, e.g. binary decision controllers, finite state controllers
19/048 ... Monitoring; Safety
19/05 ... Programmable logic controllers, e.g. simulating logic interconnections of signals according to ladder diagrams or function charts
19/052 ... {Linking several PLC’s}
19/054 ... {Input/output}
19/056 ... {Programming the PLC}
19/058 ... {Safety, monitoring}
19/06 ... using cams, discs, rods, drums, or the like (mechanical programme-control apparatus G05G 21/00)
19/063 ... {for sequential programme-control without delivering a reference value}
19/066 ... {for delivering “step function”, a slope function or a continuous function}
19/07 ... where the programme is defined in the fixed connection of electrical elements, e.g. potentiometers, counters, transistors
19/075 ... {for delivering a step function, a slope or a continuous function (G05B 19/06 takes precedence; function generators per se H03K, G06G)}
19/08 ... using plugboards, cross-bar distributors, matrix switches, or the like
19/10 ... using selector switches
19/102 ... {for input of programme steps, i.e. setting up sequence}
19/104 ... {characterised by physical layout of switches; switches co-operating with display; use of switches in a special way}
19/106 ... {for selecting a programme, variable or parameter}
19/108 ... {characterised by physical layout of switches; switches co-operating with display; use of switches in a special way}
19/12 ... using record carriers
19/122 ... {using cards, tapes or discs having conductive paths (G05B 19/128 takes precedence)}
19/124 ... {using tapes, cards or discs with optically sensed marks or codes (G05B 19/128, G05B 19/14 take precedence)}
19/126 ... {using cards, tapes or discs having protuberances (G05B 19/128 takes precedence)}
19/128 ... {the workpiece itself serves as a record carrier, e.g. by its form, by marks or codes on it}
19/14 ... using punched cards or tapes ((G05B 19/128 takes precedence)}
19/16 ... using magnetic record carriers ((G05B 19/128 takes precedence)}
19/18 ... Numerical control [NC], i.e. automatically operating machines, in particular machine tools, e.g. in a manufacturing environment, so as to execute positioning, movement or co-ordinated operations by means of programme data in numerical form (G05B 19/1418 takes precedence)
19/182 ... {characterised by the machine tool function, e.g. thread cutting, cam making, tool direction control (G05B 19/21 - G05B 19/40 take precedence)}
19/184 ... {Generation of cam-like surfaces}
19/186 ... {Generation of screw- or gearlike surfaces}
19/188 ... {characterised by special applications and not provided for in the relevant subclasses, (e.g. making dies, filament windings)}
19/19 ... characterised by positioning or contouring control systems, e.g. to control position from one programmed point to another or to control movement along a programmed continuous path

NOTE

In this group, the measuring system for an axis is used to measure the displacement along that axis. This measurement is used as position-feedback in the servo-control system.

19/195 ... {Controlling the position of several slides on one axis}
19/21 ... using an incremental digital measuring device
19/23 ... for point-to-point control
19/231 ... {the positional error is used to control continuously the servomotor according to its magnitude}
19/232 ... {with speed feedback only}
19/234 ... {with current or torque feedback only}
19/235 ... {with force or acceleration feedback only}
19/237 ... {with a combination of feedback covered by G05B 19/232 - G05B 19/235}
19/238 ... {the positional error is only used to control speed in steps according to distance left, or to give a stop signal when error reaches zero}
19/25 ... for continuous-path control
19/251 ... {the positional error is used to control continuously the servomotor according to its magnitude}
19/253 ... {with speed feedback only}
19/255 ... {with current or torque feedback only}
G05B

19/256 . . . . . . [with force or acceleration feedback only]
19/258 . . . . . . [with a combination of feedback covered by G05B 19/253 - G05B 19/256]
19/27 . . . . using an absolute digital measuring device
19/29 . . . . for point-to-point control
19/291 . . . . [the positional error is used to control continuously the servomotor according to its magnitude]
19/293 . . . . [with speed feedback only]
19/295 . . . . [with current or torque feedback only]
19/296 . . . . [with force or acceleration feedback only]
19/298 . . . . [with a combination of feedback covered by G05B 19/293 - G05B 19/296]
19/31 . . . . for continuous-path control
19/311 . . . . [the positional error is used to control continuously the servomotor according to its magnitude]
19/313 . . . . [with speed feedback only]
19/315 . . . . [with current or torque feedback only]
19/316 . . . . [with force or acceleration feedback only]
19/318 . . . . [with a combination of feedback covered by G05B 19/313 - G05B 19/316]
19/33 . . . . using an analogue measuring device
19/35 . . . . . . for point-to-point control
19/351 . . . . [the positional error is used to control continuously the servomotor according to its magnitude]
19/353 . . . . [with speed feedback only]
19/355 . . . . [with current or torque feedback only]
19/356 . . . . [with force or acceleration feedback only]
19/358 . . . . [with a combination of feedback covered by G05B 19/353 - G05B 19/356]
19/37 . . . . for continuous-path control
19/371 . . . . [the positional error is used to control continuously the servomotor according to its magnitude]
19/373 . . . . [with speed feedback only]
19/375 . . . . [with current or torque feedback only]
19/376 . . . . [with force or acceleration feedback only]
19/378 . . . . [with a combination of feedback covered by G05B 19/373 - G05B 19/376]
19/39 . . . . using a combination of the means covered by at least two of the preceding sub-groups G05B 19/21, G05B 19/27, and G05B 19/33
19/40 . . . . Open loop systems, e.g. using stepping motor
19/401 . . . . characterised by control arrangements for measuring, e.g. calibration and initialisation, measuring workpiece for machining purposes (G05B 19/19 takes precedence)

19/4015 . . . . [going to a reference at the beginning of machine cycle, e.g. for calibration]
19/402 . . . . characterised by control arrangements for positioning, e.g. centring a tool relative to a hole in the workpiece, additional detection means to correct position (G05B 19/19 takes precedence)
19/404 . . . . characterised by control arrangements for compensation, e.g. for backlash, overshoot, tool offset, tool wear, temperature, machine construction errors, load, inertia (G05B 19/19, G05B 19/41 take precedence)
19/406 . . . . characterised by monitoring or safety (G05B 19/19 takes precedence)
19/4061 . . . . Avoiding collision or forbidden zones
19/4062 . . . . Monitoring servoloop, e.g. overload of servomotor, loss of feedback or reference
19/4063 . . . . Monitoring general control system (G05B 19/4062 takes precedence)
19/4065 . . . . Monitoring tool breakage, life or condition
19/4067 . . . . Restoring data or position after power failure or other interruption
19/4068 . . . . Verifying part programme on screen, by drawing or other means
19/4069 . . . . Simulating machining process on screen (G05B 19/4068 takes precedence)
19/408 . . . . characterised by data handling or data format, e.g. reading, buffering or conversion of data
19/4083 . . . . [Adapting programme, configuration]
19/4086 . . . . [Coordinate conversions; Other special calculations]
19/409 . . . . characterised by using manual input [MDI] or by using control panel, e.g. controlling functions with the panel; characterised by control panel details, by setting parameters (G05B 19/408, G05B 19/4093 take precedence)
19/4093 . . . . characterised by part programming, e.g. entry of geometrical information as taken from a technical drawing, combining this with machining and material information to obtain control information, named part programme, for the NC machine
19/40931 . . . . [concerning programming of geometry]
19/40932 . . . . [Shape input]
19/40933 . . . . . . [Selecting figure elements from a menu table]
19/40935 . . . . [Selection of predetermined shapes and defining the dimensions with parameter input]
19/40936 . . . . [Defining geometry with a high level language]
19/40937 . . . . [concerning programming of machining or material parameters, pocket machining]
19/40938 . . . . [Tool management]
19/4097 . . . . characterised by using design data to control NC machines, e.g. CAD/CAM (G05B 19/4093 takes precedence; CAD in general G06F 17/50)
19/4099 . . . . Surface or curve machining, making 3D objects, e.g. desktop manufacturing
19/41 . . . . characterised by interpolation, e.g. the computation of intermediate points between programmed end points to define the path to be followed and the rate of travel along that path (G05B 19/25, G05B 19/31, G05B 19/37, G05B 19/39, G05B 19/40 take precedence)
Digital interpolation
Analog interpolation
Structure of the control system, e.g. common controller or multiprocessor systems, interface to servo, programmable interface controller

(characterised by a controller or microprocessor per axis)

(characterised by the use of a microprocessor (G05B 19/4141 takes precedence))

(characterised by using multiplexing for control system)

(characterised by using same processor to execute programmable controller and numerical controller function [CNC] and PC controlled NC [PCNC])

(characterised by using a programmable interface controller [PIC])

(characterised by using several processors for different functions, distributed (real-time) systems (G05B 19/4141 takes precedence))

(characterised by programme execution, i.e. part programme or machine function execution, e.g. selection of a programme)

(characterised by control of velocity, acceleration or deceleration (G05B 19/19 takes precedence))

(Adaptive control of feed or cutting velocity (without NC B23Q 15/12))

(Controlling feed or in-feed (G05B 19/4163 takes precedence))

Total factory control, i.e. centrally controlling a plurality of machines, e.g. direct or distributed numerical control [DNC], flexible manufacturing systems [FMS], computer integrated manufacturing [CIM]

(characterised by assembly)

(characterised by direct numerical control [DNC])

(characterised by the cooperation between machine tools, manipulators and conveyor or other workpiece supply system, workcell)

(manipulators and conveyor only)

(machine tools and manipulators only, machining centre)

(characterised by data acquisition, e.g. workpiece identification)

(characterised by programme execution)

(characterised by fault tolerance, reliability of production system)

(characterised by system universality, reconfigurability, modularity)

(characterised by the network communication)

(by local area network [LAN], network structure)

(by protocol, e.g. MAP, TOP)

(characterised by job scheduling, process planning, material flow)

(by tool management)

(characterised by quality surveillance of production)

(characterised by CIM planning or realisation)

(characterised by modeling, simulation of the manufacturing system)

(characterised by the transport system)

[using automatic guided vehicles [AGV] (control of position or course of AGV's G05D 1/00)]

Recording and playback systems, i.e. in which the programme is recorded from a cycle of operations, e.g. the cycle of operations being manually controlled, after which this record is played back on the same machine

[preparation of the programme medium using a drawing, a model]

[in which a drawing is traced or scanned and corresponding data recorded]

[in which a model is traced or scanned and corresponding data recorded]

Teaching successive positions by mechanical means, e.g. by mechanically-coupled handwheels to position tool head or end effector (G05B 19/423 takes precedence)

Teaching successive positions by walk-through, i.e. the tool head or end effector being grasped and guided directly, with or without servo-assistance, to follow a path

Teaching successive positions by numerical control, i.e. commands being entered to control the positioning servo of the tool head or end effector

Teaching successive positions by tracking the position of a joystick or handle to control the positioning servo of the tool head, master-slave control (G05B 19/423 takes precedence)

Fluidic
Pneumatic
Hydraulic

Systems involving sampling of the variable controlled (G05B 13/00 - G05B 19/00 take precedence; transmission systems for measured values G08C; electronic switching or gating H03K 17/00)

Electric

Testing or monitoring of control systems or parts thereof (monitoring of programme-control systems G05B 19/048, G05B 19/406)

Electric testing or monitoring

[in which a transfer function of a process is calculated]

WARNING

Group G05B 23/0202 is no longer used for the classification of documents as of August 1, 2018. The content of this group is being reclassified into groups G05B 23/0205 - G05B 23/0297.

Groups G05B 23/0205 - G05B 23/0297 are incomplete pending reclassification from group G05B 23/0202.

Groups G05B 23/0202 and G05B 23/0205 - G05B 23/0297 should be considered in order to perform a complete search.
should be considered in order to perform a complete search.

Groups G05B 23/0202 and G05B 23/0205 - G05B 23/0297 should be considered in order to

[characterized by the configuration of the monitoring system]  

[adopting a different treatment of each operating region or a different mode of the monitored system, e.g. transient modes; different operating configurations of monitored system]  

[Modular or universal configuration of the monitoring system, e.g. monitoring system having modules that may be combined to build monitoring program; monitoring system that can be applied to legacy systems; adaptable monitoring system; using different communication protocols]  

[characterized by the fault detection method dealing with either existing or incipient faults]  

[Preprocessing measurements, e.g. data collection rate adjustment; Standardization of measurements; Time series or signal analysis, e.g. frequency analysis or wavelets; Trustworthiness of measurements; Indexes therefor; Measurements using easily measured parameters to estimate parameters difficult to measure; Virtual sensor creation; De-noising; Sensor fusion; Unconventional preprocessing inherently present in specific fault detection methods like PCA-based methods]  

[Process history based detection method, e.g. whereby history implies the availability of large amounts of data]  

[Qualitative history assessment, whereby the type of data acted upon, e.g. waveforms, images or patterns, is not relevant, e.g. rule based assessment; if-then decisions]  

[knowledge based, e.g. expert systems; genetic algorithms]  

[based on qualitative trend analysis, e.g. system evolution]  

[Based on a comparison with predetermined threshold or range, e.g. "classical methods", carried out during normal operation; threshold adaptation or choice; when or how to compare with the threshold]  

[based on parallel systems, e.g. comparing signals produced at the same time by same type systems and detect faulty ones by noticing differences among their responses]
Program-control systems

**Plc systems**

- 2219/10 Plc I-O input output
- 2219/11 Plc I-O input output
- 2219/1101 Remote I-O
- 2219/1102 Speed up I-O manipulation
- 2219/1103 Special, intelligent I-O processor, also plc can only access via processor
- 2219/1104 Display state of connection of I-O
- 2219/1105 I-O
- 2219/1106 Pneumatic, hydraulic output module connected to plc module
- 2219/1107 Hardware expansion of function of plc, programmable, connected in output line
- 2219/1108 Relay module
- 2219/1109 Expansion, extension of I-O
- 2219/1110 Verifying ram data correct, validity, reload faulty data with correct data
- 2219/1111 I-O grouped on one board
- 2219/1112 Bit addressing, handling
- 2219/1113 Address setting
- 2219/1114 Address by module name
- 2219/1115 Avoid to give two different addresses to same I-O, no duplicate
- 2219/1116 Position of module in loop, ring determines address of module
- 2219/1117 Parallel input addressed as memory
- 2219/1118 Peripherals have a key to determine kind of peripheral
- 2219/1119 Key is 8-resistors connected to either 0-or-1 to form a byte key
- 2219/1120 Read key multiplexed, 16-bit wide, connect some resistors to reversed potential
- 2219/1121 Program address module after installation, connect programmer into module
- 2219/1122 Poll and detect connected I-O addresses, not connected means high address
- 2219/1123 Transfer address to module, decrement, send this as address for next module
- 2219/1124 I-O addressing
- 2219/1125 Conversion table between original defined module address and actual physical address
- 2219/1126 Selector for I-O, multiplex for I-O
- 2219/1127 Program address module after installation, connect programmer into module
- 2219/1128 Several networks linked to host computer
- 2219/1129 Serial addressed modules on bus
- 2219/1130 I-O connected to a bus
- 2219/1131 High speed bus between plc and plc or programming device
- 2219/1132 Sensor actuator, asi, bus, network
- 2219/1133 Fieldbus
- 2219/1134 Profibus
- 2219/1135 Canbus
- 2219/1136 Peer to peer communication
- 2219/1137 Configuration of I-O
- 2219/1138 By using software configurable circuit, integrated, pga between cpu and I-O
- 2219/1139 Modify manually, using keyboard configuration of module
- 2219/1140 Load in replacement I-O stored configuration
- 2219/1141 Base configuration contains all I-O modules, deselect not present modules
- 2219/1142 Program, program I-O module
- 2219/1143 Normal scan of I-O and direct acces of some I-O independent from normal scan
- 2219/1144 Scanning sequence as function of previous logic expression
- 2219/1145 Variable rate of scan
- 2219/1146 If I-O module cannot be scanned in time, report to controller
- 2219/1147 I-O in groups, serviced according to critical inputs, tasks matched to I-O
- 2219/1148 Fast scanning of I-O to put I-O status in image table
- 2219/1149 I-O module delivers interrupts on event, store port and 10ms timestamp in buffer
- 2219/1150 Scan only some I-O registers, use flags
- 2219/1151 Reading repeatedly input state, try again
- 2219/1152 Switching over from one input to another one
- 2219/1153 Special latches release all simultaneously
- 2219/1154 I-O used either as input or as output
- 2219/1155 Control of output current
- 2219/1156 Image table, memory
- 2219/1157 Signal processing, detect or deliver analog signals
- 2219/1158 Forcing I-O
- 2219/1159 Multiplexer for analog signals
- 2219/1160 Latch for output or input
- 2219/1161 Disable I-O card by preventing current flow
- 2219/1162 Create optimum data blocks for transmission
- 2219/1163 Pulse wave output
- 2219/1164 Peak amplitude for input, null amplitude for activating output
- 2219/1165 Activating output if input changes, transition input and output not yet on
- 2219/1166 Detect only input variation, changing, transition state of variable
- 2219/1167 Direct negation, inversion of input signal
- 2219/1168 Activating output only if powersupply is sufficient
- 2219/1169 Input activates directly output and vice versa
- 2219/1170 Activating output repeatedly for guaranteed turning on of output
- 2219/1171 I-O signal processing, adaption, conditioning, conversion of signal levels
- 2219/1172 Insertion mistake
- 2219/1173 Display states of I-O in time

Subject matter not provided for in other groups of this subclass
2219/1179 . . . Safety, on error, fault, block, inhibit output
2219/1181 . . . Detection of I-O faults, shut down of I-O
2219/1182 . . . I-O isolation, optical
2219/1183 . . . On error shut off output by independent system, not normal I-O
2219/1184 . . . Test ability of input for on, off capability
2219/1185 . . . Feedback of output status to input module and compare with command
2219/1186 . . . Redundant inputs parallel, outputs series, load safe switch off, AND condition
2219/1187 . . . Test input value with stored limits, permissible range, plausibility
2219/1188 . . . Detection of inserted boards, inserting extra memory, availability of boards
2219/1189 . . . Duplicated I-O also triple
2219/1191 . . . I-O voter
2219/1192 . . . Output of interfaces parallel, for safe load switch on, OR condition
2219/1193 . . . I-O ram as buffer for signals and self test for I-O bus
2219/1194 . . . Send dummy, check data to I-O to check correct I-O connection
2219/1195 . . . Critical I-O monitored by safety module connected to plc, other I-Os by plc self
2219/1196 . . . Intelligent, smart I-O can function independently, monitoring limit values
2219/1197 . . . Each interface, module has simulation module which takes over control
2219/1198 . . . Activate output only if power of the output signal is sufficient
2219/1199 . . . Inserting or taking out of boards during power on, hot plug in
2219/12 . . . Plc mp multi processor system
2219/1201 . . . Each plc can act as master, flying master
2219/1202 . . . Modules with same hardware and software
2219/1203 . . . Expand logical expression over multiple controllers
2219/1204 . . . Multiprocessing, several plc's, distributed logic control
2219/1205 . . . Memory access for different processors, memory arbitration, mailbox
2219/1206 . . . All processors are loaded with same program, only part of program is loaded
2219/1207 . . . Download program code to node, I-O and execute program code
2219/1208 . . . Communication, exchange of control, I-O data between different plc
2219/1209 . . . Exchange control, I-O data to other plc, individually, without host
2219/1211 . . . Exchange control, I-O data to other plc, using separate synchronizing
2219/1212 . . . Exchange control data between plc's only when other plc's are inactive
2219/1213 . . . All plc send their input to a common image memory, output directly send out
2219/1214 . . . Real-time communication between plc, Ethernet for configuration, monitor
2219/1215 . . . Master slave system
2219/1216 . . . Interlock problem, avoid sending data to slave when slave processes data
2219/12 . . . Plc programming
2219/13001 . . . Interrupt handling
2219/13002 . . . Transfer ram content to ram, load ram from non volatile memory
2219/13003 . . . Initial program load, host to controller
2219/13004 . . . Programming the plc
2219/13005 . . . Subroutine
2219/13006 . . . Prom burning
2219/13007 . . . Program hardwired logic, pld, fpga when out of machine, or inactive
2219/13008 . . . Quicker execution of jumps when repeating same kind of operation
2219/13009 . . . State machine instructions
2219/13011 . . . Batch control
2219/13012 . . . Using other programs, adapting program to machine, exchanging or rom
2219/13013 . . . Transferring ram to eprom see also prom burning
2219/13014 . . . Expanding functions of display by modular hardware
2219/13015 . . . Semi automatic, manual automatic
2219/13016 . . . Jump while output is disabled, or disabling output when running test instruction
2219/13017 . . . Macro instructions
2219/13018 . . . Conversion ladder diagram to decision system, machine code, language
2219/13019 . . . Translate program in order to be used on different plc
2219/13021 . . . Convert Petri net to ladder diagram
2219/13022 . . . Convert source program to intermediate program
2219/13023 . . . Convert natural language, graphic to coded states, input
2219/13024 . . . Convert digital logic of hardware circuit into plc software
2219/13025 . . . Convert batch recipe into plc program
2219/13026 . . . Convert ladder to event chaining, internal state for fpga or similar
2219/13027 . . . Convert time chart to relation vector to calculate plc I-O state as function of time
2219/13028 . . . Convert plc type program in pc type program for running in pc environment
2219/13029 . . . Enter values with incremental keys
2219/13031 . . . Use of touch screen
2219/13032 . . . Different menus on screen, softkeys
2219/13033 . . . Code wheel to enter data, push button to accept
2219/13034 . . . Operator interface derived from comment label in program
2219/13035 . . . Name, address duplication detection for program components, symbols
2219/13036 . . . Tracing, use of dummy ladder to collect signals together in one
2219/13037 . . . Tracing
2219/13038 . . . Comment, message data displayed with program instructions
2219/13039 . . . Print out of program, printer for program
2219/13041 . . . Display ladder or logic diagram, mnemonics, switch between two display
2219/13042 . . . Display logic diagram, LOP
2219/13043 . . . Display statement, instruction list, IL, BL, AWL
2219/13044 . . . Display as flow chart, SFC, FUP
2219/13045 . . . Additional data to restore ladder diagram from machine instructions
Display status of edited program segments: inserted, deleted, replaced

Display data on chart with comment, message about type of data

Display of ladder, RLD, RLL, KOP

Display progress of program, state, highlight, colour

Display status of I-O in intelligible, easy to understand language

Display of ladder diagram

Edit by use of a ladder mask, raster, enter a symbol and select place in mask

Enter a symbol and number of times symbol to be used in ladder diagram

Place cursor, enter symbol, move cursor

Edit conversion, jump table interactively

Automatic search for unused, available address; assign to symbol

One instruction of plc generates a whole independent sequence, relay

If not able to execute instruction block, skip and execute next

Selection between sequential and conditional program

Booting

Synchronization between modules

Execute reverse sequence

Tasks for executing several programs asynchronously

Execute next step if state, control zone changes

Use of variables, symbols in instructions, to indicate mechanisms, interfaces

Program divided in operation blocks, groups, tasks each executed

Execute bit operation during instruction fetch cycle for word operation

Non time critical program by processor, time critical program by hardware

Super scalar computing

Several interacting programs, each for a separate machine, exchange of start, stop

Result of bit operation can modify or stop instruction execution

User program, then interlock program to override certain conditions

Interprete in pc a ladder diagram, use of sequence engine

Interlock conditions stored in tables

Sequence operation and interlock set programs are separated

Solving stored logic function if value is equal target value

Select between initialisation and normal control instructions sequence plc

Parallel execution of bit operations

Jumps

Rom or eprom with conditional instructions

Plc controls several machines in sequence

Priority interrupt

Separate interrupt controller for modules

Analyzing only relevant rows of ladder diagram

Skip part of expression evaluation if no influence on end result

Use of precalculated and stored values to speed up calculations

Speed up, evaluation of expressions between brackets

Using functions like arithmetic timers in program

Using a-d converter as function

Pid regulator

Fuzzy control function

Function is true macro program, not subroutine, conversion to machine

Nc function to control axis, written in C or not

Function block, OOP, various functions grouped, called by name as servo

Function block instance, only one function block exists, several instances

Function is a user written program, separate from rest

Adaptive selftuning regulator

Assembly, machine code, instruction list, AWL, IL, BL

Two or more languages, ladder diagram or progression, basic program

Natural language, use simple words like move, rotate,

Logic symbols, plan LOP, functional block symbols FBS, functional programming FUP

Flow diagram, sequential function chart with transitions and states SFC Grafset

Ptd programmable logic device software for plc

Expert system

Petri net

Read image of sequence ladder diagram, flow chart drawing, translate into code

Use of relative addresses for program

Optimize ladder diagram block by rearrangement of serial and parallel

Machine code, instruction for processor

Two languages, ladder diagram and machine code for processor

Decompiler, translate machine code to hll, reverse processing, easy modification

Compiler

DDE direct data exchange, DLL dynamic library linking

Flow chart program activates several ladder diagrams, each controls one machine

C language

Step language

Use of virtual, logical connections

Csl computer simulation language

Hybrid sfc for description of sequence, ladder diagram for conditions, interlock

Relay ladder diagram, RLL RLD KOP

Automatic documentation of program

Select out several languages: FBD, SFC, RLL or RLD

Select out several languages: FBD and SFC

Select control languages out of FB RLL or RLD, SFC, ST
Two or more languages mixed, RLD, SFC, FBD, IL, ST, relay ladder, function block, sequential function, instruction list, structured text mixed to form logic control program

Using audio and/or video playback

Translate spreadsheet into code

Interpreter considers hierarchy of plc in system structure for programming it

High level language HLL, structured text ST, resembles pascal

CAD, design plc system by inputting desired failure, fault behaviour

Derive sequence program from design, cad data of machine

Debugging, tracing

Manual testing

GUI graphical user interface, icon, function bloc editor, OI operator interface

Graphical input of network of symbols, simulation on screen, translate to machine

Process image blocks have a relation to software function blocks

Program using time charts

Object oriented programming

Encapsulated actuator model with standardized interface: state, action, interlock

Correction of program using grammatical error detection

Modification of program

Modification, change of program in real time

Patching rom to correct program

Inserting instructions in program

IC-memory card

Tape

Non volatile memory, no battery

Cassette

Easily exchangeable rom, eprom cassette, earom

Core memory

Light pen

Remote and local programming unit, control panel

Program plc by independent build in processor

Program intelligent I-O separate from main plc

Personal computer pc

With contact pins

Voice, oral, vocal, speech announcement

Portable, detachable programming unit

Remote programming from computer

Selection out of all possible programs with switch

Pc, computer connected to plc to simulate machine

For each input corresponding delay time for output response

Functionality of a complex controlled systems, composed of sub-systems

Select next stimuli as function of input state of previous step, so useless stimuli skipped

Reritate simulation till minimum delay stimuli, original contact state

Reritate simulation for different conditions or subsystems

Selection of limited stimuli, inputs for simulation

With petrinet

Connect simulation card with overlay into control system, to learn programming

Pc, computer connected to plc to simulate only part of machine

Software function module for simulation

Simulation, also of test inputs

Checking validity of data

Checking program data, parity, key

On error, look in table for alternative allowed next instruction

Inhibit next step if signature fails, response different from stored response

Eeprom and software interlock, user cannot change ram data

Examine needed I-O, detect connected I-O, execute program only if proper I-O

Build in measurement processing time and input time, input time must be smaller

Protected programs, running these programs

Check if instruction for special module is valid for that module

Host and remote version of ladder program, avoid different versions

Safety, forbid dangerous instruction, instruction order while programming

On error choose another program

Pc safety

Detect direction, sign of change of signal

Independent processor, coprocessor monitors plc

Pc, personal computer monitors contact data of several plc's

On error I-O control state is substituted by actual state to continue

Alarm

Safety, monitoring in general

Pc as standalone for safety control of machine

Pc monitors plc

Manual override control, digital or analog, between plc and machine

Explosion free control, intrinsically safe

Safety integrity level, safety integrated systems, SIL, SIS

IN, dual plc worker coworker, switch, OUT persistency

Redundant processors and I-O

Dual plc's, processors and dual I-O

Triple plc's, processors and dual I-O, triple modular redundant

IN, plc and comparator, error detector, backup, standby plc, switch, update OUT

Dual IN, crosscoupled relay, dual AND, dual OUT

IN, direct link parallel to plc, AND, OUT

Dual IN, dual plc with dual OUT comparator, dual AND, dual OUT

IN, three plc and 2-out-of-3 processor voter, 2-out-of-3 output voter, OUT
Diagnostic, troubleshooting
module reinserted
Reintegration, after correction of fault, failed
Repair on or off-line
Reconfiguration of components or graceful
sequence again
Fault masking, redundant module is selected,
ocurrence to fault recognition
Detection on or off-line, latency from failure
Indication of status in a ready, off, running of
What kind of fault, first fault latch indication
Displaying instructions for monitoring state of
Display of error messages
Voice, vocal, speech alarm
Display of error messages
Displaying instructions for monitoring state of
machine
What kind of fault, first fault latch indication
Indication of status in a ready, off, running of
fault state
Fault stages, confinement, logical segregation
of I-O, separate modules
Detection on or off-line, latency from failure
occurrence to fault recognition
Fault masking, redundant module is selected,
fault will not propagate
Retry, reacquire redundant module is selected,
sequence again
Reconfiguration of components or graceful
degradation, degrade
Recovery, after detection or reconfiguration,
effect an error eliminati
Restart of processing
Repair on or off-line
Reintegration, after correction of fault, failed
module reinserted
Diagostic, troubleshooting
Fault tolerant objectives for equipment,
controller
Integrity, error detector, switch off controller,
fail safe

G05B

CPC - 2019.08
Rapid recovery after fault detection
Safe, emergency shutdown, esd of system
Emergency shut down of control processor, power down
Interlock of control switches
Inhibit remote control
Dual hand control
Prevent conflicting writing of data; use lock flags
Majority voting, dynamic redundant, persistency and integrity
Redundant network, client server nodes
Redundant I-O racks, interfaces to points
Redundant I-O points, two sensors, actuators for same point
Redundant communication between processor and I-O
Redundant I-O rack has spare slots, hot repair feature, spare blocks f
Primary, worker and backup, coworker plc for testing I-O
Workby plc, all plc function in parallel, synchronous data exchange
Dual plc, each monitors other
Each plc is different from others
Each plc is programmed by different person
Single plc, load between two I-O to plus and two I-O to ground
Redundancy, masking redundancy, avoid failure but no fault detection
Restart, power up of processor, outputs are off, disabled or hold last state
Each independent operation block, group has own restart, home position
On the fly software replacement in case of error
Restart
Low impedance bus
Structure, low pass filter, debouncing input, output driver with ramp
Galvanic isolation
Serial feedback of several states of output
Plc structure of the system
Local remote switch control
Image table in I-O expansion module
Interbus-s
Identity kind of module, control unit connected
Set switches defining control function
Set configuration from master control station
On reinser tion, board, power up, program setting, configuration automatically set
Identify connected I-O and store in address table
Object oriented configuring, graphical display of plant
Configuration of operating system
Configuration software for networks
Set configuration, address of connected module from fixed non volatile
Configure priorities of different tasks
Assign functions to group of complete or partial cells, modules
Initialize amount of memory space needed in module
Optical fiber
Communication, serial data transmission, modem
RS232 serial
Convertor between plc and pc built into serial communication line
Synchronous serial datatransmission
Data packet, each module reads input stream and replaces with output
RS422, balanced lines, xor, only one transmitter, receiver, RS485
Before starting communication between modules, initialize modules
Detection of data transmission faults
RS485, MPI multipoint interface, multiple transmitters, receivers connected
Controller and device have several formats and protocols, select common one
I-O communicates with local bus at one end and with fieldbus at other end
RS485 for service connection to module
Exchange objects having I-O, configuration, status, parameters, functions attributes
Exchange objects between cpu and intelligent I-O, stored in their memory
Serial transmission using one line for data and one line for clock
Select between simplex, only reading I-O data or duplex, also writing to interface
Control words for interface itself and for connected I-O
Fail safe communication
Internet, tcp-ip, web server see under
Display of reference, set value, of measured, feedback value
Sense area of screen, compare if corresponds with correct area
Synoptic display of process, mimic diagram
Lcd, 7-segment displays ten different states
Multiple lcd, alphanumerical display
Portable display unit
Low-high intensity display, flashing
Colour display
Microprocessor
Timer, counter, clock-calendar, flip-flop as peripheral
Dual port memory
Communication processor, link interface
Microcontroller
LIFO for storing intermediate results
FIFO
DMA
FPGA field programmable gate array
Tristate interface
Floating point coprocessor
RISC processor for plc
Battery backup
Real time clock
MMU, memory management unit
Optimize program memory space
Use of external memory
Using a mixture of memories
Intelligent interface behaves like a plc, by PLC
Intelligent interface is much faster than main interface
Intelligent I-O is a plc itself, with limited function
Intelligent interface is much faster than main plc
Intelligent interface behaves like a plc, by special communication pro
Two cpu control plc, select cpu, video switch, with special key

G05B

Pc systems
Pc I-O input output
Analog input
Neural classifier for inputs, groups inputs into classes
Proximity switch as input
Microprocessor plus electromechanical, cam control for output
Several slave modules connected to same I-O of master, multiplexed by master
Detect position switches, connect resistances, analog value gives position
A processor to evaluate signals of detector, only, I-O processor
Read in analog values by microprocessor, potentiometer, resistor tps
Display states of I-O
Forcing I-O
Configurable I-O
Microcontroller and power output switches integrated on same chip
Interface, module with relays
Easy expansion, extension of I-O
I-O has own power supply
Use of stack memory between processor and machine
Connect sensors to a concentrator, concentrators to bus
Split, separate urgent from non urgent, interrupt from status inputs, store in two register
Intelligent I-O, executes tasks independently from main cpu
2219/21022 . . . Telephone ring interface, detect ring sequence to control devices
2219/21023 . . . Midi interface
2219/21024 . . . Analog output
2219/21025 . . . To address single module, assign a group with only that single module
2219/21026 . . . Indirect addressing of I-O through a control register
2219/21027 . . . Address extension, module with several I-O, command has subaddress for each I-O
2219/21028 . . . Address of module determined by position
2219/21029 . . . Address of module determined by function of module
2219/21031 . . . Address of module determined by signature: type, value of measured, controlled data of module
2219/21032 . . . Controlled module in a ring, each module detects its own address
2219/21033 . . . Serial transfer address to each module, decrement, if zero module found
2219/21034 . . . Address I-O
2219/21035 . . . Identification with serial header
2219/21036 . . . Each connected module has own address and address of originator of message
2219/21037 . . . Serial time multiplex bus, programming each module with one delayed line TDM
2219/21038 . . . Special clock line, module counts clock until equal to its address
2219/21039 . . . Slaves, modules in daisy chain, each handles control data, transmits to next
2219/21041 . . . Detect length of packet of pulses to recognise address
2219/21042 . . . Address a group, a zone
2219/21043 . . . Device address and subdevice address and function address
2219/21044 . . . Modules with same address are each selected by different transmission speed
2219/21045 . . . Modules with same address are each selected by different modulation
2219/21046 . . . Address a single module out of a group
2219/21047 . . . Select module if address of module equals required address, compare addresses
2219/21048 . . . Compare fixed address of module to required address
2219/21049 . . . Poll and detect connected I-O modules, address terminator, address line high
2219/21051 . . . Modules able to communicate to other modules are connected to arbitration
2219/21052 . . . Modules having a common function are allocated ascending number to address
2219/21053 . . . Each unit, module has unique identification code, set during manufacturing, IMAC address
2219/21054 . . . Connector on bus has two rows of contacts, if one contact is connected, other not
2219/21055 . . . Number of halfwaves equals number of I-O, send block of halfwaves, synchro gap
2219/21056 . . . Decoding on module, module can be inserted anywhere, fixed address in bus connector
2219/21057 . . . Buslines connecting modules are offset by one line from module to module
2219/21058 . . . Find address by activating power and detect which address gives feedback
2219/21059 . . . I-O in address space
2219/21061 . . . Adapter bus connected to centronics
2219/21062 . . . Pc and I-O bus manager and network nodes linked to I-O clusters
2219/21063 . . . Bus, I-O connected to a bus
2219/21064 . . . Calibration: automatic of a-d convertor, store null and maximum in eeprom
2219/21065 . . . Module calibrates connected sensor
2219/21066 . . . Disconnect data line from module before, reconnect after configuration
2219/21067 . . . Set group of module by hardware for each module, no program protocol
2219/21068 . . . Configure input signals either as interrupt or status signals
2219/21069 . . . At start up check I-O and store addresses in secure device
2219/21071 . . . Configuration, each module has a settable address, code wheel, encoder
2219/21072 . . . Write, modify address into module by optical means, laser
2219/21073 . . . Each module has push button, trigger circuit to initialise address setting
2219/21074 . . . Master has keyboard to enter address of called slave
2219/21075 . . . Initialise each module random, count down, if zero master sets address
2219/21076 . . . Plug, connector with build in decoding, encoding for module
2219/21077 . . . Module address fixed, defined by fixed identification lines on motherboard
2219/21078 . . . Fixed address of slot on motherboard changed, using address convertor, decoder
2219/21079 . . . Allocate at start up also to each controlled device a code for the master
2219/21081 . . . At start up, check I-O configuration and store addresses in ram
2219/21082 . . . At start, send first address to all modules, manually trigger first module and so on
2219/21083 . . . At start up detect if connected devices are input or output devices
2219/21084 . . . Actuate module, seek response by counting up address, store address on response
2219/21085 . . . Define type of I-O, analog, digital, pulse
2219/21086 . . . Configuration menu program for I-O
2219/21087 . . . Define sensor type, resistance, thermocouple, thermistor, voltage, current
2219/21088 . . . Define name and address of I-O
2219/21089 . . . Detect configuration of I-O regular
2219/21091 . . . First module initializes its address, then signals next to do same, serial
2219/21092 . . . At start up, autoconfigure module for proper I-O execution, bootstrap
2219/21093 . . . Module has a configuration part for own logic and one for application logic
2219/21094 . . . Different connectors for serial transmission as function of machine or connected sensor
2219/21095 . . . Screen, display connected directed to control system via optical fibre
2219/21096 . . . Connection of machine to pc via centronics, parallel port
2219/21097 . . . DMA
2219/21098 . . . Connect pc to machine, controller, module via serial port
2219/21099 . . . Two independent interfaces, one for pc, other for remote monitoring
2219/21101 . . . Connect I-O interface to joystick port
Pc control of device over normal remote control connected between them

Connect pc to machine, controller, module via PCMCIA

Wire pc connector to output of controlled module, for printer, modem, other module

Read in data only if value changes, transition to save processor time

If specific I-O not updated in memory, priority access of I-O, data directly to microprocessor

Change sensitivity of detection if input value is very low

Module, I-O module consisting of counters and comparators

Field programmable gate array, fpga as I-O module

Each module has a push button to bypass control and switch module on

Each module has push button to turn module off

Bus interface has multiplexer, control register, data shift register

Universal input, AC or DC

Same connector can represent either input or output

Universal cabling: control interface between processor and devices

Universal I-O, same pin is input or output, bidirectional

Two sensors on same line, superpose pulsed digital on analog signal

Circuit for signal adaption, voltage level shift, filter noise

Output only enabled during a short period of positive going power supply

Programmable signal discrimination, input can be used for several functions

Impedance matching

A-d conversion if input signal is analog, no a-d conversion if input signal is digital

Digital value of analog signals depends on range between signal and threshold

Signal processing, filter input

Signal adaption I-O

Change control signal, first max or min signal, then normal desired signal

Low pass filter for input

Sample two input values, one in positive wave, other in negative wave, average

Window for signal

Module to adapt connection of signals to general connector

Signal adaption circuit build into connector

On closing contact, clean contact with large current, then normal signal current

Detection of zero crossing for command and maximum for reading value

Analog to digital conversion, ADC, DAC

Variable filtering as function of kind of sensor signal

Input activates directly output and vice versa

Latched I-O

Read input signal when switching power supply is not switched

Sample analog signal between superposed digital signal

Link between input and output, output only activated if corresponding input on

Fuse in case of overcurrent

If real status is different from controlled status stop motor

Time critical I-O shut off by I-O module, otherwise by processor

Over current protection on clock line

If read write error, keep last I-O status for next cycle

Activate output only if power sufficient

If output defect, switch it off

In order to follow higher data input rate, shut off non essential peripherals

Over current protection

Over voltage protection

Over temperature protection

Broken, open line, cable, circuit, faulty connection

Activate I-O only after system stabilises from start up

If I-O defect, warning light, operator pushes button. cpu disconnects I-O

Send dummy, check data to I-O to check correct I-O connection

Detect short circuit of cable

Test I-O if functional or safe value

Resistors between transmitter and receiver, against disturbances

Zener diodes for protection of output of transmitter, input of receiver

Output state, over resistance, coupled back to input to monitor output

Intelligent I-O monitors also local load, controlled object

Couple, feedback each output to corresponding input to verify output

Low voltage protection

Pc multi processor system

Controller calculates a control parameter from values sent by other controllers

Grid, array of controllers

Use default values if communication with other controllers not available

Multi core

Microprocessor for display and parameter input, link to control microprocessor

Microcontroller combined with state sequencer

Each processor controls a different function of the machine

Only one processor is permitted to execute a common function at a time

Active controllers are allocated more time if request rate is low

All processors are loaded with same program, only part of program is used

Local processor uses data from own local store and data from other stations

Multicontrollers, multimicrocomputers, multiprocessing
Process directly process signals without interrupt or polling

Define module independent and module specific element, interconnection, capability

First cluster runs normal program, second cluster runs different program

Join two clusters of processors together

Processor starts application program only if it receives predetermined data

Only common memory in host, master, no local memory in slave, local controller

Use of priority levels for gaining access to resources

Use a different frequency to address each processor

Processor sends data to next, downstream processor

Communication, CPU accesses own I-O and next CPU over dual port memory

Processor accesses own I-O and I-O of all processors connected on his right

Common memory as well as local memory

Master detects and configures slaves

Multiprocessing, change over from master slave to peer to peer, no master

Master slave

Master executes modified program on slave demand

Each slave can control several other slaves

Each slave can function in stand alone if master fails

Each slave has library of states during which operation is permitted to start

Master determines critical time when each of slaves must be controlled

Selection of master or slave

Several masters at same time

Reallocate, reschedule execution of controlled functions if one processor fails

Real time database, each processor stores in local memory used variables

Program references to variable by absolute address, update of absolute address

Detect incompatibilities between control devices

Pc programming

Expansion of control words, code of standard language to increase functionality

Petrinet

Bumpless control transfer, map corresponding operation states to operation tables

Build up program so that safety conditions are met, select most stable states

Expert design system, uses modeling, simulation, to control design process

Finite state modeling

CAD to develop sequential control system, use data also to test

Computer aided software engineering, program generation, case tools, CASE

Automatic documentation of program

Sequence control design using pc, cad of control system CADCS

Derive sequence program from design, cad data of machine CADCS

Build up program by selecting function modules as function of amount paid for it, charging, payment

Conversion of ASCII scripting language to machine code

Convert input signals to universal machine control signals represented by music

Accelerate input, exponent as function of pressure, time, turning speed, keys for 10-to-1

Page, scroll key

Enter parameters by combinations of keys and duration of actuation of keys

Joystick delivers reference function as function of speed of its movement, except about null

Gesture programming, camera sees hand, displays it on screen, grasp buttons

Production design metaphor, tool, operation like input system

Control knobs, levers integrated into display, display parameters near knobs

Delivers reference when in neutral position, otherwise delivers desired value

Overlay, template for keys with different meaning

Recognise user input pattern and present possible intended program

Database with information on how to control or test different appliances

Switch function of panel, detect this and execute other orders

Up down, increment decrement keys, jog, sequentially show functions or values

Simulate control panel to give remote instructions

Input of data from second control unit if first fails

Variable pressure on key gives input value

Press once on key to raise signal, twice to lower signal

Same knob, different functions, turn for pulses, push to enter value

Same knob, different function, normal for parameter, value, pushed to enter value

Touch key integrated in display

Select function by amplitude of analog value, potentiometer, resistor taps

Remote programmer

Enter analog value

Only increment key

Remote and local control panel, programming unit, switch

Transparent overlay with touch sensors, put over display panel, select function

Function key changes function as function of program, associated pictogram

Selection out of menu by function keys

Operating, repair manual stored in memory

Knob to select program serves also as indicator for progress of program

Control panel serial, RS232 connected to controller
Remote control, enter program remote, detachable programmer
Matrix, plugboard like control panel with modules for display, switches
Knob with tactile feedback, representing clicks, detents programmed
Simulate response on entered parameters and display, quicker response
Cursor keys to select cells of a spreadsheet with control parameter, enter value
Foot pedal, control, operated
Position of knob, pedal detected by encoder, addresses memory for functions
Knob, pedal selects ranges, functions and controls in each range as function of position
Configuration of pedal, knob with code card, adapt pedal to person
Variable range of knob, pedal for each function, adapt to person
Double, two foot pedal
Entry of function or parameter during manipulation of tool, operation
Manual override of program
Same knob starts two different functions
Control, human or man interface, interactive, HMI, MMI
Give instructions, messages to operator
Illuminated, lighting up keys, build in led, display, show sequence data entry
If up, down key is selected, linear display of values appears, pops up
Telephone, dial as control panel
Keyboard decoding by microprocessor
Each control unit can control own associated load or as central control
Control unit can switch load on off or can also go into program mode
Pushbuttons to manually up or down control of motor also for entry of program
Reconfigurable remote programmer, learn control signals for different devices
Input a code representing a sequence of operations
Local programmer can switch to remote to use same capabilities as remote
MMI design, operator workplace design
Enter parameters with two hands, dead man knob, switch, pedal
Joystick with buttons for menu and function selection, scrolling, +sign and -sign
Synoptic display of available, selectable control modules with their functions
Several users can enter data simultaneously to same processor
Menu is sequentially selected and read from cd disk and guides operator
Programmable selector switch, can be programmed by connected apparatus
Same switch to power control and to set references of several devices
Key cap label rewritten, changed to indicate changed or alternate functions
Multiple consoles, panels to issue concurrent commands to different groups I-O
Soft up down keys, simulated on screen
Input a code representing a device function
Debounce key
If knob pushed during power up, knob can be used afterwards as data input
Use single button, knob to enter code number, equals number of pushes
Messages to operator in mother tongue, selection out of different languages
Manual control, via microprocessor instead of direct connection to actuators
Switches on panel, connected to serial port
Enter quality parameters to select control parameters
Quality parameter is low energy consumption of machine
Quality parameter is high production rate of machine
Change display of window to another as function of settable active display time of window
Window, drop down menus
Cockpit metaphore, condensed representation, urgent things better shown
Push on flashing alarm indicator, corresponding window pops up on whole screen
Floorplan, room metaphore, dedicated windows, unchangeable but can be selectable
Configuration of display device, operator panel
Adapt control signal logarithmic
Ramp, slope connection between two reference values
Reread, retransmit several times data for valid data, redundant command
Maintain parameter setting for a while to avoid changes due to noise
Buffer
Input signal can be sent simultaneously to several processors
Lookup table, interpolation between points
Column and line select in memory to access address data in second memory, tree
Display state, variable only when needed, energy saving
Display graphics with corresponding text
Display on off time chart for different events
Production report
Note pad, message from other operator
Switch display to show different things, test or normal state
Display tree structure of whole system or relevant info after function selection
Switch from one kind of display to other, selected by duration discrimination
Switch from one kind of display to other when parameter is changed
Animated display, changes as function of parameters
Select on large display part of pictogram to show on display of used workstation
Multifunction display
2219/23133 . . . Animated, rotating fan indicates speed, flashing bulb for intensity
2219/23134 . . . Display history of used, selected programs, their frequency
2219/23135 . . . Display to console, panel which sends parameters, commands
2219/23136 . . . Display all subsystems, select one and display screen corresponding to subsystem
2219/23137 . . . Display program step, instruction number
2219/23138 . . . Linear, bar display of variables
2219/23139 . . . Segment display
2219/23141 . . . Flat panel, thin film electro luminescent
2219/23142 . . . Colour display
2219/23143 . . . Adjustable display
2219/23144 . . . Kind of display, matrix like display, large surface
2219/23145 . . . Blinking, flickering display
2219/23146 . . . Programmable, reconfigurable via microprocessor or coding switches
2219/23147 . . . LCD liquid crystal display
2219/23148 . . . Helmet display, mounted on head of operator
2219/23149 . . . Dual, two displays
2219/23151 . . . Highlight
2219/23152 . . . Large and several smaller displays for each workstation, each own cursor on large display
2219/23153 . . . Controlled load, lightbulb, roller blind itself acts as display to acknowledge command
2219/23154 . . . Line of light diodes LED
2219/23155 . . . Display on screen reference value and sequence steps
2219/23156 . . . Show upper, lower value, position with upper, lower segment of 7-segment display
2219/23157 . . . Display process, synoptic, legend, pictogram, mimic
2219/23158 . . . Display of evaluated and selectable program
2219/23159 . . . Display plurality of parameters simultaneously
2219/23161 . . . Hand held terminal PDA displays machine control program when user is near that machine
2219/23162 . . . Display real time or time already elapsed or rest time for program
2219/23163 . . . Display enlarged, zoomed detail and small overall schematic, plan
2219/23164 . . . Display data on a scrolling line, ticker display
2219/23165 . . . Display of parameter plus permissible, allowable range
2219/23166 . . . Display program in fast, quick, speed mode
2219/23167 . . . Display of selected sequence, permissible sequence
2219/23168 . . . Display progress of program
2219/23169 . . . Operation field together with control parameters
2219/23171 . . . Display dynamic change of process, animation
2219/23172 . . . Different states with one LED, blinking, on and off or different colours
2219/23173 . . . Display modified program together with original program to see differences
2219/23174 . . . Display of parameter and several suggested values for that parameter
2219/23175 . . . What to display: program channels, running of program
2219/23176 . . . Display entered data for each controlled station
2219/23177 . . . Indicate all selected devices operating currently
2219/23178 . . . Display status of currently selected controlled devices
2219/23179 . . . Warning display if heavy energy consuming programsteps are selected
2219/23181 . . . Use of sound, acoustic, voice
2219/23182 . . . 3D display of controlled system
2219/23183 . . . Display effects of high level commands
2219/23184 . . . Display different states by using two leds, first blinks, then second, then both
2219/23185 . . . Setting of internal dipswitches, jumpers
2219/23186 . . . Visual display of workpiece with actions to execute on
2219/23187 . . . Display number of each program
2219/23188 . . . Software independent and dependent of hardware
2219/23189 . . . Information is code
2219/23191 . . . Command to control simultaneously several machines
2219/23192 . . . A limited number of programs to be used by plurality of machines, multiplex
2219/23193 . . . Memory stores lifetime, different settings, configurations of controlled device
2219/23194 . . . Check validity data by writing in sector control data and check data
2219/23195 . . . Memory stores available, allowable, possible options, variations, alternatives of program or modules
2219/23196 . . . From lookup table and real time clock, select actual daylight period
2219/23197 . . . Curve entered with pen on touchscreen
2219/23198 . . . Disk with segments connected to separate input of microprocessor, represents different values
2219/23199 . . . Reference value, setpoint for regulator
2219/23201 . . . Value is analog signal
2219/23202 . . . Curve, surface represents analog value, line, surface follower
2219/23203 . . . Curve represents analog value, tv scan
2219/23204 . . . Reference in coded form
2219/23205 . . . Reference together with sequence commands
2219/23206 . . . Set reference as function of position, for compensations
2219/23207 . . . Capacitive detection of line
2219/23208 . . . Potentiometer
2219/23209 . . . Linear potentiometers with multiple sliders
2219/23211 . . . Limit value to tolerances, ranges, plausibility
2219/23212 . . . Store entered data, program status, reread regularly, against data loss
2219/23213 . . . Check validity of entered data
2219/23214 . . . Checksum CRC
2219/23215 . . . Check data validity in ram, keep correct validity, compare rom ram
2219/23216 . . . Extend processing time by extending enable signal with special output signal
2219/23217 . . . Parallel processing
2219/23218 . . . Interrupt queued requests only at the end of each segment of each of requests
2219/23219 . . . Different tasks in different memory, called as function of priority of tasks
2219/23221 . . . Each event can have two sub events, device can be activated twice in cycle
2219/23222 . . . On off time tables, as function of angle, each linked to groups for device selection, pointer
During each cycle, different on-off sequences can be used.

Offset on-off signals for different sections.

Program system from more than one source.

Table with data on how to execute the same function in different modules.

Environment conditions affect the execution of the program.

Program execution, if external programs exist, execute them instead of internal.

Execute first current program, then select new program.

Mark objects, execute sequence according to mark.

Execute program from added, expansion rom, memory.

Input state executes immediately corresponding block program.

In real-time loop do one of the control modules and a safety module program.

Set address code in register to switch between program in RAM and in EPROM, flash.

Table lookup driven system.

Program execution by message passing.

TV microprocessor executes also home control, monitoring of appliances.

Execute other program during idle time of main program, or between interrupts.

Idle, during idle time of main program, a game can be played.

Synthesize time logic circuits.

Specification language.

Ascii script: one line is read each time, each letter controls a device.

Block, buffer the inputs when executing critical process, read them when finished, for a finite state machine.

Create control program by demonstrating behaviours using widget and inferencing them.

Widget have states, properties, events associated, demonstrate control behaviour.

Integrate function blocks from different machines: CORBA, RMI protocols.

Using audio and or video playback.

Use two or more different programming languages in the same program.

High-level language HLL, basic, control language.

Expert system.

Interactive programming, sentence on screen filled in by operator.

Object oriented programming, OOP.

Hybrid programming, part sequence, part continuous.

Grafcet.

GUI graphical user interface, icon, function bloc editor, labview.

Synchronous language.

Use control template library.

DDE direct data exchange, DLL dynamic library linking.

C++.

Assembly language, pass parameters by registers instead of stack.

Select device driver for actuator, sensor.

Compiler.

Program derived from sequence time diagram and stored in table.

Forth.

Program provides for communication protocol with device, equipment.

Decompiler, translate machine code to HLL, reverse processing, easy modification.

Natural language, use simple words like move, rotate.

Select, associate the real hardware to be used in the program.

Link graphical data for display automatically into program.

Use of parser.

Use of virtual, logical connections.

Use of separate interface software, main program calls functions from it.

Program by data flow.

Enter simple words: start motor, pc translates boolean equations into orders.

PEARL process experimental automation real time language.

Detect erroneous instructions in ASIC systems.

Debugging, breakpoint.

Eliminate redundant states in finite state machine.

Enable, disable hardware logic to implement finite state machines.

Graphical representation of finite machine states to help operator.

Executing sequential program concurrently with state machine instructions.

Adaptive states; learning transitions.

State logic control, finite state, tasks, machine, FSM.

Process, graphic programming of a process, text and images.

Use of model of process, divided in part models with IN, OUT and actuator.

Automated assembly of machine control software, reusable software components.

Whole program to first processor, transfer to next processor if not for 1st.

Load program and data for multiple processors.

Load, update new program without test program, save memory space.

Remote load of program with cellular, wireless, satellite connection.

Remote load of program, through internet.

Remote load of program, through fieldbus.

Load program from file system of a controller.

Load program in data blocks.

Load program, optical connection between programmer and eprom.

Download program from host.

Transfer program into prom with passwords.

Load program from host, remote load, non volatile card to volatile, RAM.

Initial program loader, IPL, bootstrap loader.
Endless tape, loop

Extraordinary memory, record, after erasing can be used again

Modification of program in real time

Switch between manual, automatic, inching or step by step mode, select mode

Transfer modified data from ram to eprom, flash after system have run several cycles

Clone, duplicate hardware functions of another device

Overide stored parameters

Use of table with addresses for different modules, write new table if modified

History, log of program modifications

Identification of program, application, device to be controlled

Modify if history of program coincides with history of modifying data

Update modified program from ram to eprom, flash

Only new module in high level language, combine with existing modules

Pluggable rom, smart card

Earom, alterable eprom, erasable

Changeable memory, program

Memory is eprom

Permeability of pin sets frequency of oscillator, record carrier

Eprom

Programmed parameter values in memory, rom, function selection and entry, no cpu

Pluggable pin module, fits in corresponding female receptacle, coded plug

Film

Ram rom memory

Endless tape, loop

Hard disk

Magnetic card

Programmable, pluggable module, logic set up on front of module

Grammophone record, disk

Program card with integrated control panel, flexible circuit

Screw like form of record carrier

Ram card with write protection switch

Floppy diskette

Barcode

Bubble memory

Ferrite memory

Temperature induced on tape, sensors read temperature as program data

Card with picture of work to be done, together with selectable codes

VRAM videoram

Memory in controlled device is ram, rom

Fixed and variable memory for parameters or user program

XY matrix, switching controlled by pc

Interactive guidance by voice message

Set potentiometer automatically

Function switch, knob with piezo, strain gauge

Template for program, set values to template

Touch screen, with representation of buttons, machine on screen

Touch sensitive key

Knob, delivering pulses, digipot, electronic potentiometer

Balls with different properties circulate and form the sequence

Knobs with build in illumination, legend

Lightpen

Tape, card with magnetic, luminescent, iron particles for sequence

Programming pencil, touch probe

Voice, vocal command or message

Trackball

Mixture of different means, joystick, keys, pedals, fader, potentiometer

Modular program, each process has corresponding program module

Each module can transfer data to I-O or other module and has parameter memory

Change execution time ratio of several programs

Set finish, end time and total program time to calculate, derive begin, start time

Set time constant

Set value of limit switches, high low value

Enter start and end of selected program

Set day, week

Set time constant

Set start time and duration

Adapt set parameter as function of measured conditions

Programmer has connection with pc to enter parameters into system directly by pc

Edit reference value on screen by lightpen

Store edited program also in detachable programmer, can be used elsewhere
2219/23404 . . . If data error detected, switch automatically to program mode
2219/23405 . . . Change settings of events for a whole group of related events
2219/23406 . . . Programmer device, portable, handheld detachable programmer
2219/23407 . . . Program machine during execution of other program in real time
2219/23408 . . . Handheld programmer has cover to protect operator from environment
2219/23409 . . . Portable, detachable programmer has emulation for fixed control panel
2219/23411 . . . Voltage supply or allow, not inhibit signal to memory on connection of programmer
2219/23412 . . . Discriminate with id code the module to be programmed
2219/23413 . . . Remote programmer can only program a device if nearby, narrow beam communication
2219/23414 . . . Pc as detachable program, debug, monitor device for control system
2219/23415 . . . Program each station with specific data, all, global with general, common data
2219/23416 . . . Enter application program into I-O module, like motion program, servo program
2219/23417 . . . Read program from pluggable memory card
2219/23418 . . . Read tape, card forward, backward, in two directions
2219/23419 . . . Automatic passage of tape to reader
2219/23421 . . . Record program on tape, disk, memory
2219/23422 . . . Learn parameters by producing a small number of objects
2219/23423 . . . Record playback
2219/23424 . . . Select construction element from function library
2219/23425 . . . Selection of program, adaptive to process
2219/23426 . . . Layout of program choice around knob according to used intensity
2219/23427 . . . Selection out of several programs, parameters
2219/23428 . . . Select program from look up tables as function of detector states, pointer, index to program
2219/23429 . . . Selection as function of connected machine
2219/23431 . . . Change program on detection of deviations
2219/23432 . . . Select as function of different connected tools, each tool has its parameters
2219/23433 . . . Selection of program as function of connected keyboard, panel
2219/23434 . . . Select automatically preferred program data, ordered to most used program
2219/23435 . . . Select a program per zone to be controlled
2219/23436 . . . Select by dipswitchs on power on
2219/23437 . . . Each operator can select his own program, data entry
2219/23438 . . . Select application program as well as connected control device
2219/23439 . . . Select additional programfunctions by pushing two different keys
2219/23441 . . . Select between user program selection or service program selection
2219/23442 . . . As function of colour or number code on object to be treated
2219/23443 . . . Upon detected function changes of remote device, activate proper local program
2219/23444 . . . Select as function of surface property, characteristic of object handled by machine

2219/23445 . . . Real time simulation
2219/23446 . . . HIL hardware in the loop, simulates equipment to which a control module is fixed
2219/23447 . . . Uses process simulator to develop, simulate faults, fault tree
2219/23448 . . . Find optimum solution by simulating process with constraints on inputs
2219/23449 . . . Use of an additional dedicated processor for emulating sensor output
2219/23451 . . . Software in the loop, bypass function, execute new program parts on external device
2219/23452 . . . Simulate sequence on display to control program, test functions
2219/23453 . . . Pc simulates equipment and is connected to sequencer to test program
2219/23454 . . . Execute program in fast mode, real system has no time to respond
2219/23455 . . . Determine capability of machine by simulating model of capability of its parts
2219/23456 . . . Model machine for simulation
2219/23457 . . . Programmer magnetically attachable to machine
2219/23458 . . . Remote controller pluggable, attachable to pc
2219/23459 . . . Keyboard attachable, pluggable into household apparatus
2219/23461 . . . Module has coded cams darkling optical detectors
2219/23462 . . . No local entry panel, only central remote programmer for all appliances
2219/23463 . . . Before controlling module execute monitoring of module and its resources
2219/23464 . . . Use signatures to know module is not corrupt, cfc, control flow checking
2219/23465 . . . Master processor blocks input of data to slaves
2219/23466 . . . Block, latch entry keys once program launched
2219/23467 . . . Code and program on two objects to be assembled, compared for compatibility
2219/23468 . . . Before switch to execution of second, non failsafe program, inhibit I-O for it
2219/23469 . . . Execute alternatively a failsafe, proven program and a non failsafe program
2219/23471 . . . Interrupt after set time non failsafe program, switch to failsafe program
2219/23472 . . . Confirmation of user for the selection of a program setting
2219/23473 . . . Program stopped if consumed current to high
2219/24 . . . Pc safety
2219/24001 . . . Maintenance, repair
2219/24002 . . . Clock failing, adaptive to clock
2219/24003 . . . Emergency stop
2219/24004 . . . If control lever, joystick, handle is released, spring return to neutral
2219/24005 . . . Inhibit update control program if default values has been changed by program during processing
2219/24006 . . . Code coverage memory:contains data about addressed addresses during program run
2219/24007 . . . Backup data if microprocessor not responding
2219/24008 . . . Safety integrity level, safety integrated systems SIL, SIS
2219/24009 . . . If board, card is retrieved, then disconnect first power, then block machine
2219/24011 . . . Transmit warning, error message to all devices in a list
Set jumper on board to change user mode to diagnostic mode

Remote testing, monitoring independent from normal control by pc

Diagnostic programmed in state logic

Simulator, generates input signals, shows output signals of logic

During simulation, test inhibit output to actuators

Select signals as function of priority, importance for diagnostic

Sample rate variable as function of importance of alarm signals

Real time diagnostics

Monitor only devices essential to current process

Processor stores variables, events and date in eeprom, for external monitor

Find intermittent errors

Diagnostic

Online service documentation

Detect faulty circuit, display on screen and replace it

Avoid propagation of fault

Probability of defect, seriousness or severity of defect, fault

Predict control element state changes, event changes

Markov model for safety analysis

Module detects wear, changes of controlled device, statistical evaluation

Debounce, correct periodicity of command

Detect correct command waveform

Detect valid sequence of commands

Detect if driver, actuation circuit is correct

Detect if actuators are correct, react

Remote and local monitoring, local result to remote, remote takes action

Analyze, trace fault signals according to tree, table

Expert system, guidance operator, locate fault and indicate how to repair

After correct repair, update fault tree

Simulate process graphically using feedback from real, to prevent or repair

Change colour of message after reading message

Display indication out of order, alarm indication

Warning display lights, lamps, leds on module

Display, show place of error, fault

Voice alarm

Show timely order of errors

Show number of error event

Camera monitors controlled machine

Scan and display states of all actuators if controller fails

On error, send error over lightdiode to external pc, display

Stop error message after a certain time

Display status of controller

Graphical display of proces as function of detected alarm signals

Operator can select a graphical screen at his will as help diagnostic
Test for collision of actuated devices, articles, if interference inhibit entry

Configure actuators to be switched off in case of emergency stop

Program entry, inhibit manual control if in automatic mode

Inhibit local control if in remote

Inhibit program entry if an essential sensor of apparatus is missing, broken

Inhibit programming if physical resources are missing, no gas for heating

Normal and emergency program are integrated

System controller can control independent from host

Password with time limited access to system, protect protocol

Load, enter program if device acknowledges received password, security signal

Inhibit program entry, keyboard by entering sequence of certain keys

Block, inhibit certain inputs by entering certain key code

Access only for service, hide, forbidden tamperfree keys, program

Several levels of security, passwords

Use of key, in key is stored access level

Biometric sensor, fingerprint as user access password

Authentication tag in configuration file

Parts of program accessible only during execution, no access with programming tool

Use codes to activate features of controller

Permit from several operators to allow access

Encryption, password, user access privileges

Identify connected programmer to allow control, program entry

Identification of last person who changed program

Supervisor code to change passwords

Use of second password, different from first

One sensor, two I-O channels each for different processor

One channel is used for communication while other is tested, in redundant I-O

Redundant communication channel, if one fails use the other

Central controller may override redundant controller

State machine arbitrates which redundant controller is active

Controlled device decides which redundant controller will be active

Redundant storage of control parameters

Fail silent nodes, replicated nodes grouped into fault tolerant units

Redundant - I-O, software comparison of both channels

After repair, update redundant system during non critical periods

Redundant processors are synchronised

Redundant processors run identical programs

Redundant processors run different programs
2219/24189 . Redundant processors monitor same point, common parameters
2219/24191 . Redundant processors are different in structure
2219/24192 . Configurable redundancy
2219/24193 . Two transducers for same parameter
2219/24194 . One channel monitors correct program code execution, other correct process state
2219/24195 . Compare data in channels at timed intervals, for equality
2219/24196 . Plausibility check in channels for correct sequence or result
2219/24197 . Dual analog output ports, second takes over if first fails
2219/24198 . Restart, reinitialize, boot system after fault detection, hanging up, stalling
2219/24199 . Recover from fault, malfunction, go to safe state, correct and set new sequence
2219/24201 . Inhibit restart program if start switch fails in normal run mode
2219/24202 . After failure and stop of program, special switch to restart
2219/24203 . Restart, recover from error only if detected states equal stored states
2219/24204 . Select restore procedure corresponding to matched abnormal condition, table
2219/24205 . Slow down processor activity if temperature rises above limit
2219/24206 . Identification by portable memory in a key
2219/24207 . If processor overloaded, reduce messages sent by other systems to it
2219/24208 . Go into safety mode if communications are interrupted
2219/24209 . Create film in case of error
2219/24211 . Override normal program, execute urgency program so machine operates safe
2219/24212 . Set off alarm state manually, acknowledge to restart normal control
2219/24213 . No shut down if after emergency detection, all control parameters are safe
2219/24214 . Detect if analog output signal is within range
2219/24215 . Scada supervisory control and data acquisition
2219/24216 . Supervision of system
2219/25 . Pc structure of the system
2219/25001 . CEBUS consumers electronics bus
2219/25002 . Interbus-S, output serial out, input serial in, as one shift register
2219/25003 . M3S bus with six lines, two power, two canbus, one to initialize, one as dead man switch
2219/25004 . Power and data bus
2219/25005 . Fluid bus for communication in process system with several fluidic control modules
2219/25006 . Interface connected to fieldbus
2219/25007 . UMS bus
2219/25008 . Different buses, protocols on same line, also dsl
2219/25009 . Profinet-I-O, producer-consumer mode
2219/25011 . Domotique, I-O bus, home automation, building automation
2219/25012 . Two different bus systems
2219/25013 . G64-bus
2219/25014 . Fieldbus general name of bus connected to machines, detectors, actuators
2219/25015 . Gpib-488, iec-488, hp bus, parallel instrumentation bus
2219/25016 . Eiba bus, european installation bus association, ib installation bus
2219/25017 . ASI actuator sensor interface, bus, network
2219/25018 . Only actuator bus, network
2219/25019 . Parallel processors coupled to bus by configurable interface card
2219/25021 . Profibus
2219/25022 . LAN local area network for controllers
2219/25023 . Sercos serial real time communications system between servo and cpu
2219/25024 . Bitbus from intel
2219/25025 . Only sensor bus
2219/25026 . Lon local operating network, uses neuron chip with three microprocessors
2219/25027 . GSC general serial channel
2219/25028 . Power, data and clock bus
2219/25029 . Additional logic to mirror certain signals, permits node to adapt to bitrate
2219/25031 . TTCAN bus, time triggered can bus
2219/25032 . CAN, canbus, controller area network bus
2219/25033 . structure, control, synchronization, data, alarm, connect I-O line to interface
2219/25034 . Connect module to data, monitor, control lines, extra I-O and power to connector
2219/25035 . Star network
2219/25036 . Two clocks, high frequency for normal and low frequency for battery low, sleep
2219/25037 . Clock line and data line loop in a contrary sense, for data stability, settling
2219/25038 . During negative cycle of power supply, processor is set to active, else inactive
2219/25039 . Clock
2219/25041 . Select between several clock signals
2219/25042 . Clock derived from power supply
2219/25043 . Superposition time and other pulses
2219/25044 . Radio controlled clock
2219/25045 . Electronic cam, encoder for sequence control as function of position, programmable switch pls
2219/25046 . Real time clock to sample I-O states and store them in memory
2219/25047 . Common clock for redundant processors
2219/25048 . Master clock and several frequency dividers, for motion and sequence control
2219/25049 . Master processor gives timing information to slaves
2219/25051 . For serial communication a separate clock and data line
2219/25052 . VCO voltage controlled oscillator
2219/25053 . Frequency pulses as function of speed
2219/25054 . Calibration timer, compare 1st, number of pulses during calibration with second counter
2219/25055 . During calibration adapt vco, counter to deliver wanted frequency, pulses
2219/25056 . Automatic configuration of monitoring, control system as function of operator input, events
2219/25057 . Configuration stored in distributed database for real time use
2219/25058 . Job setup, use also library to select job setup
2219/25059 . Iterative configuration of identical modules, only config first one, copy to other
2219/25061 . Configuration stored in central database
2219/25062 . Detect physical location of field device
2219/25063 . Force node into an inactive state when required
Update component configuration to optimize program execution

Configure attributes of parameters

Configuration stored in each unit

Graphic configuration control system

Check correct configuration of device

Pseudo redundancy, eliminate failing element and reconfigure system

Synoptique display of system configuration, layout, evolution

Initialise each module during start up

Configuration of keys and related display, shown on keys

Check system, change failing element, compare with stored configuration

Select interconnection of a combination of processor links to form network

Configure connected module only if allowed, registered module

Each module can be programmed for number of input and output

Store in ram a second program adapted to local conditions

Function module makes bus termination, creates local bus on ok from central

Clone, copy configuration from first device, in teach mode, to second identical device

Display name of configuration, to recognise how device has been set, programmed

For each subsystem a configuration

Select configuration as function of operator

Several function expansion units for master, main unit, universal system

Assign functions to group of complete or partial cells, modules

Selector switch to set function of each module

Define scale value of analog signal, min and max value

Define state of digital signal, open, closed, maintained, momentary

Of alternative and parallel parts of program into synchronised tasks

Customized control features, configuration

During start, integration into machine, send module functionality to scheduler

At start, I-O modules receive functionality and check with its own functionality

Detect kind of display to configure display routine

Detect addresses of connected I-O, modules

Detect control panel connected, select corresponding program and parameters

Detect connected sensors, set parameters, gain automatically

Detect configuration I-O and select needed program

Detect connected module, load corresponding parameters, variables into module

Detect connected actuator, by code, select compensation non linearity

Detect during start, number of modules, groups, sub groups

Detect transfer of control module, use mean default values instead of normal

By cable integrated in controlled machine, fixed

Pluggable card, magnetic, smart with configuration data, pulled out after loading

Pluggable card, magnetic or smart with configuration data, staying in device

Dipswitches combined with bcd switch instead of multiple dipswitches

Eeprom loaded from external device with configuration data

Using broadcast message

Using firmware stored in processor

Strapping diodes

Jumpers

Card, board with configuration switches

Pluggable, detachable cassette loads configuration

Resistors, value, combination defines a digital value

Matrix to connect sensor to corresponding actuator

Dipswitches dipswitchaler

What, which input or output to be connected to key or display

Stop angle and status of different on off states

Change controller pin configuration

Configure attributes of parameters

Relationship between different functions of a controller

Synchronize communication based on internal clock of microprocessor

Bus for analog and digital communication

Transmission with higher frequency than the processing frequency

Programming a multitasking, virtual sensor network shared by various users

Collect several parameters and transmit in block to control microprocessor

Superposition data signals on power lines for actuators

Serial parallel conversion

All interfaces load their data in shift register, then serial read out

On data line multiplex data and control words

Transmission with variable frequency, set by operator

Optical window for communication

Transmit data from rotating devices

Use of separate buscouple interface

Normal display led used also for communication purposes

Lan between host and main controller, other network between main and sub controllers

Buffer for communication between two cpu

Between microcomputers, processors

I-O communicates with local bus at one end and with fieldbus at other end

Communication between main and expansion unit, only clock and data

Before communication, check if optical fiber is correctly attached

Before communication, check if I-O is powered
Receiver detects communication error and requests emitter to retransmit data
Check appropriate protocol voltage levels
Parity detection
Checking communication
Detect error, repeat transmission on error, retransmit
Encoded transmission against noise
Full echo communication check, echo back
Checksum CRC
Watchdog
Respond to signal if initialisation and address are received within set interval
Only receiving station, read several times message, select correct one or reject
Contention, if several transmitters avoid collision, by separate transmitter code
Transmit twice, redundant, same data on different channels, check each channel
Loopback
Token ring network
USB, firewire, ieee-1394
Receive commands through mobile telephone
Domotique, access through internet protocols
Half duplex, repeater
Serial, RS232
Duplex
SCSI
Ethernet
Modem, codec decoder
RS485, differential data signals, xor
Using fm frequency modulation, fsk, biphase code
Serial communication, data, also repeater
Parallel
Repeater
Serial between host and modules, nodes, parallel in node to microcontroller
Serial AND-OR parallel interface in one circuit
Number of modules interfaces optimized in relation to applications with which to link
Single serial line, virtual second line is earth
Bluetooth
Transmission of signals, medium, ultrasonic, radio
Superposition high frequency data signal on power lines, current carrier
Current mode sensor I-O, current loop, 40-mA loop instead of voltage
Current loop
Infrared
Coaxial cable
Twin core, twisted cable
Multiwire cable, parallel
Radio link, transponder
Optical, glass fiber
Brouter: transfers data from wireless to wired networks, router: wired to wired
Router brouter broadcast configuration data periodically to update control units
Program communication between remote I-O and controller via remote connection program object
Identification module, type connected I-O, device
Identify controlled element, valve, and read characteristics
System identification
Address memory with variable frequency
Expansion of system, memory
Program and data in separate memory
Decode processor status bits to switch, select between memories
Memory subdivided in separate blocks, high, low addressable with same address
MMA, memory management, set ram and eprom part for flash memory, store state also
Modules with hardwired logic
Each module has file with all components in module and the available components
Ecu, standard processor connects to asic connected to specific application
Module in ring for power supply and ring for command signals
Each module near controlled machine
Pneumatic, hydraulic modules, controlled valves
Clamp module on controlled system by magnet
Modular structure, modules
Module, sequence from module to module, structure
Control unit and actuator in one unit, module
Control unit, sensor and actuator in one unit, module
Power supply module in common for all modules
Standard connector between modules
Connection modules by flexible printed circuit, printed cable, multiway, ribbon
Stackthrough modules, modules are stacked, no need for backplane
Intelligent modules
Modules connected to serial bus
Each connected module has own power supply
Module with low maintenance connected to removable module with high maintenance
Single channel module
Module connected to parallel bus
Each module, segment has only either a sensor or an actuator
Module connected to canbus and to controlled device
Module capability concerns allowable I-O and required sequence of operations
Modules on bus and direct connection between them for additional logic functions
Each module contains several channels, each with an input and an output
Each module has connections to actuator, sensor and to a fieldbus for expansion
Cascade modules, one module connects to other, I-O, computing expansion
She single board computer, stand alone
Microprocessor
Supervisory plus control computer
Single chip programmable controller
2219/25342 . . . Real time controller
2219/25343 . . . Real time multitasking
2219/25344 . . . In one cycle, application task is executed, if time is left, communication or user interface task is executed
2219/25345 . . . Linux, preemption, low-latency patches for real time linux
2219/25346 . . . Several operating systems in one device
2219/25347 . . . Multitasking machine control
2219/25348 . . . Windows expansion for real time control under windows
2219/25349 . . . Operating system, Microsoft Windows
2219/25351 . . . MSDOS
2219/25352 . . . Preemptive for critical tasks combined with non preemptive, selected by attribute
2219/25353 . . . Inductive coupling of power, transformer
2219/25354 . . . Power or secondary control signal derived from received signal
2219/25355 . . . Motor winding used as power transformer
2219/25356 . . . Inductive coupling of power and signal
2219/25357 . . . Regulation of energy coupling
2219/25358 . . . During detection of input, switch over to dc power
2219/25359 . . . Special power supply
2219/25361 . . . DC-DC convertor on board
2219/25362 . . . UPS, no break
2219/25363 . . . Dual power supply, for digital circuit and for analog signals
2219/25364 . . . For each module a powersupply
2219/25365 . . . Initialize parameters
2219/25366 . . . Detect code, kind connected machine, device before execution of program
2219/25367 . . . Control of periodic, synchronous and asynchronous, event driven tasks together
2219/25368 . . . Start group of motors, machines in sequence, power up, down sequence
2219/25369 . . . Control of states, real time
2219/25371 . . . Recharge apparatus with material, only when needed or during specific time
2219/25372 . . . Sequence command, next step if reference equals ramp signal level
2219/25373 . . . Detection position of program drum
2219/25374 . . . Home selection
2219/25375 . . . If error, execute subroutine for alternative command, no shut down
2219/25376 . . . Repeat part of program, kind of subroutine
2219/25377 . . . New sequence as function of deviation from predicted result, state
2219/25378 . . . Stop machine after execution of some instructions on tape, marked by code
2219/25379 . . . Operation on rotating table provided with a plurality of cases
2219/25381 . . . Restart program at predetermined position, crash recovery after power loss
2219/25382 . . . Skip sequences
2219/25383 . . . Jump
2219/25384 . . . Analog I-O to microprocessor to set switch moment for next step
2219/25385 . . . Control speed of conveyor as function of missing objects, to speed up
2219/25386 . . . Program execution as function of direction, forward or backward
2219/25387 . . . Control sequences so as to optimize energy use by controlled machine
2219/25388 . . . Race conditions
2219/25389 . . . Macro's, subroutines
2219/25391 . . . Start, stop sequence of different parts of machine, copier, textile, glass
2219/25392 . . . Convert control signal to deliver pulse modified in time and width
2219/25393 . . . Speed, delay, stand still of record carrier controlled, more commands possible
2219/25394 . . . Execute next step on feedback of result of previous step
2219/25395 . . . Clock dependant, select next cyclus, step as function of parameter
2219/25396 . . . Add pulses or stop pulses as function of changing clock, speed to compensate
2219/25397 . . . Compare real date with programmed date, if equal execute next command
2219/25398 . . . Sampling period is a product of integer number and scheduler interrupt period
2219/25399 . . . Variable, settable clock or cycle, phase duration
2219/25401 . . . Compensation of control signals as function of changing supply voltage
2219/25402 . . . Detect occurrence of signal by higher sampling when parameter value within range
2219/25403 . . . Compare real clock time with programmed time, if equal execute next command
2219/25404 . . . Command order is delayed as function of expected and real delay
2219/25405 . . . Command order is delayed, corrected as function of speed
2219/25406 . . . Delay as function of detected characteristics of controlled element
2219/25407 . . . Delay between operations
2219/25408 . . . Given order is latched for a certain delay in order te execute order surely
2219/25409 . . . Feedforward of control signal to compensate for delay in execution
2219/25411 . . . Priority interrupt
2219/25412 . . . Separate interrupt for, from each interface
2219/25413 . . . Interrupt, event, state change triggered
2219/25414 . . . Interrupt without saving register states
2219/25415 . . . Between processors using a single line and a switch
2219/25416 . . . Interrupt
2219/25417 . . . Identify capabilities necessary to produce article
2219/25418 . . . Enter description of capabilities of each module
2219/25419 . . . Scheduling
2219/25421 . . . Using resource data relative to each component, module of control system
2219/25422 . . . Aperiodic scheduling, executed only on certain condition
2219/25423 . . . Verification of controlled value by comparing with recorded value, signature
2219/25424 . . . Mixture of wall connectors, some with fixed address others no address
2219/25425 . . . Personal computer
2219/25426 . . . Microcontroller in smart card directly controls machine, runs control program
2219/25427 . . . Controller inside socket, wall connector, distributor, junction box
Field device

Microprocessor mounted near controlled machine, cheaper line connection

Dual Port memory

Multiplex

Dataflow processor

Microprocessor and control logic integrated on same circuit board

Multiplex for analog signals

Main board connected to bundle of analog input lines

Main board coupled to bundle of digital and analog input lines

Counter controls device, machine directly or via decoder

Use of flexible printed circuit

Piggy back mounting

Europa card

Connect pc card to industrial bus, additional timing and adapting logic

Stick label over opening for card, to seal opening and indicate program status

Electric wiring inside pneumatic, hydraulic path

Serial port has power connected to pin for external device

Detachable program unit can be replaced by supplemental display

Control module is pluggable into wall connector

Constructive details

Connect module to bus using interface with adaptive logic

Bootstrap logic and ram integrated in serial connector

Encoder, control knob connected to same microprocessor pins as keyboard matrix

Retrofitting

Buscouple interface can be integrated in actuator

Piggy back controller, old controller functions as before, new functions by new

Replace old processor by more powerful processor on additional card

Opto isolation, optical separation

Reed relay separation

Transformer separation

Galvanic separation, galvanic isolation

Optical separation for signals, transformer separation for power

MBO motherboard, backplane special layout

Output of one module connected to input next module by lines on motherboard

Motherboard has data, address, power and module identification lines

Detect if expansion board is connected

Deconnect automatically high voltage supply when taking out a module

Inserting or taking out circuit boards during power on

Replace existing control system with new different system in real time

Synchronize controllers, sensors, measurement with data bus

Compensation variable cycle time, synchronized processes

Synchronize microprocessor with process or I-O

Sequence synchronized with machine axis, like knitting machine

Synchronous state change by clock as function of allowed states to skip certain states

Master waits for signal from slave, slave active thereafter, during limited time

Synchronize several controllers using syncline

Synchronize controllers using messages, add transmission time afterwards

Broadcast to each controller an address of part of program to be used

Synchronize several sequential processes, adjust

Synchronize several controllers using messages over data bus

Synchronize microprocessor and connected, controlled state machine

Pc applications

Dispense machine glue, paste, flow

Water processing

Steering car

Test of external equipment

Wastewater treatment

Tape transport, take up, rewind, play

Infusion controller

Hospital bed

Process control

Microprocessor driven caliper, to measure length distances

Data acquisition interface

Household appliance in general

HVAC, heating, ventilation, climate control

Audio, video, tv, consumer electronics device

Earth moving, work machine

Eye, ophthalmic, surgery system

Lubrication, greasing

Wind turbines

Conveyor, transfert line

Press

Combustion motor

Injection molding

Sprinkler, irrigation, watering

Sewing

Grinding machine

Door, window

Assembly line

Blasting, explosion

Hemodialysis

Washing, laundry

Loom, weaving

Glass forming

Reproduction, image copying machine

Vehicle, car, auto, wheelchair

Airconditioning

Energy management, use maximum of cheap power, keep peak load low
Nc systems
monitoring
Each station along transferline is independent
selected and combined at will
acting as a server to a pmc
Architecture, host controls several CNC, each
in specialised machine tools
General NC system executes tasks not present
deliver each proper control data
Host, model group and workstation computer
Synchronization between AGV movement and
before processing first finished
Second AGV with wafers already underway
Optimize number of vehicles
Communication network identical to transport
network
Optimize number of vehicles
Second AGV with wafers already underway
before processing first finished
Synchronization between AGV movement and
workpiece treatment chambers
Host, model group and workstation computer
deliver each proper control data
General NC system executes tasks not present
in specialised machine tools
Architecture, host controls several CNC, each
acting as a server to a pmc
Virtual factory, modules in network, can be
selected and combined at will
Each station along transferline is independent
several subsystems
interconnection
Configuration editor for networking
special orders can be inserted
Display travels with workpiece, package, order,
floppy disk
Data carrier, communication by exchange of
pallet, tool for data exchange
Read write intelligent chip on workpiece,
devices, processors
Communication between sensors, actuators and
plc’s, using server
Network server for communication between
One client handled by several servers
parts of a cell, not over server
Direct communication between cooperating
and cell, machine group
Network communication between supervisor
central control
Transmission device between workcell and
other part proprietary messages
Part of module exchanges high level messages,
other part proprietary messages
Application scripts; in web server, not sent to
client
Communication of carriage, agv data,
workpiece data at each station
Transmission device between workcell and
central control
Network communication between supervisor
and cell, machine group
Direct communication between cooperating
parts of a cell, not over server
One client handled by several servers
Network server for communication between
plc’s, using server
Communication between sensors, actuators and
gateway
Data exchange between modules, cells,
devices, processors
Read write intelligent chip on workpiece,
pallet, tool for data exchange
Data carrier, communication by exchange of
floppy disk
Display travels with workpiece, package, order,
special orders can be inserted
Configuration editor for networking
interconnection
Configuration of transfer control between
several subsystems
Configuration file with format of relevant
messages for different equipment
Program network controller, connected devices
Configure parameters of controlled devices
Remote configuration of parameters of
controlled devices
Remote control of network controller
Auto configuration, each module responsible
for own configuration
Start up of object manager module
Can controller in full can, detects if message is for
controller
Can controller in basic can, microcontroller
detects if message is for controller
Can controller and microcontroller integrated
Interface, SIOMS standard I-O for mechatronic
systems, device drivers
General, vendor independant display and
control interface for sensor actuator
Sensor on off switch level can be set and
displayed by detachable module
Network controller
A-D interface between asi and fieldbus
Each node has several, three channels, for
control, for data, for addressing
Universal interface between asi and fieldbus,
for any fielddevice
Fielddevice comprises also controller and
pneumatic actuator and sensor
Fielddevice, field controller, interface
connected to fieldbus
Bridge between networks
Multi mode network controller, monitor,
control, configuration, maintenance
Interface between communication network and
process control, store, exchange data
Signal, sensor adapted interfaces build into
fielddevice
Transmitter coupled to fieldbus and to sensor,
a-d conversion
Repeater between two networks
No repeater, split into several analog segments
and common digital, can, expansion
Universal interface for different fieldbus
protocols
Field device with gateway functions for
communication with pc and other field devices
FDT interfacing profibus field device drivers
DTM with engineering tool
Contactless connector, identify module
wirelessly, short distance like less than twenty
cm
PCD profinet component description, field
device description module
Fieldbus
Name of bus, canbus, controller area network
Sercos serial real time communications system
between servo and cpu
Profibus process fieldbus
Lon local operating network, using neuron chip
Devicenet, can based net
Sds smart distributed system, can based
Time multiplex for rapid status exchange
Combine CSMA/CD and TDM time multiplexed access collision detection wireless

Csma/CD, csma/CD-W carrier sense multiple access collision detection wireless
Combine csma/CD and TDM time multiplexed for rapid status exchange

TCP-IP internet protocol
TCP/IP

Mapi, message application interface for FIP fieldbus instrumentation protocol

Token ring, address by pulse sequence, control by pulse protocols, select common one
Controller and device have several formats and all slaves, slave answers, interrupt
Master sends message with address of slave to Hdlc high level data link control

Actuator sensor bus, asi, intelligent actuator, motor, sensor
Ringbus

Ringbus, network structure, internet

Star network, hub

Wan wide area network

Intranet

Java programcode or similar active agents, programs, applets
Wireless lan
Neutral bus with intelligent coupler for all kind of fieldbuses
Bus for analog and digital communication
Control handover in wireless automation networks
Access data by name, object, stored in list, database
Object, data object as network variable
Use of node, sensor, actuator and control object
Object manager contains client, control and communication and start and planning server
Each data object has corresponding identification for object manager, associative
All object managers use same algorithm to search server
Start different object manager as function of priority list
Load, use different protocols, formats, emulators for different systems
Message comprises identification of sender, receiver, command and parameter
Universal, same protocol to control all kind of drives, dc, ac, step motor
Protocol, sdlc serial data link control
Hdle high level data link control
Master sends message with address of slave to all slaves, slave answers, interrupt
Controller and device have several formats and protocols, select common one
Address by pulse sequence, control by pulse width, module filters out own control
Token ring

Fip fieldbus instrumentation protocol
Mapi message application interface for windows

TCP-IP internet protocol
CSMA-CD

Combine CSMA-CD and TDM time multiplexed for rapid status exchange

Shorten header, message can be sent with less bytes, short form PDU
Token passing protocol, priority token passing
Midi communication standard
Multimedia integration into fieldbus
WAP wireless application protocol, wireless web application
SOAP, describes available services and how to call them remotely
Near field communication NFC
VPN virtual private networks
UDP-IP
Frequency shift keying modulation, fsk
Semiconductor equipment communication standard SECS

Purpose, identification of messages, programs, variables
Blind node, executes control, data acquisition without having operator interfaces
Remote transmission of measured values from site, local to host
Exchange of parameters, data, programs between two station, station and central or host or remote
Master sends global files to autonomous controllers, feedback of process status
Server node to watch, store message, variable, data between lon, network
Master actuator sensor interface has priority over host, build into host
Communicate diagnostic data from intelligent field device controller to central
Intelligent local node can handle emergency without communication over net
Synchronization of servers in network
Discontinuous communication controlled by server
Upon modification of data in one database, automatic update of mirror databases
Handshake between machine and agv: readiness to load, unload workpiece
Merge, synchronize process data and network data for trend analysis
Scheduling communication on bus
Fixed deadline monotonic scheduling dm, set each message id to unique priority
Non preemptive earliest deadline ed, message id contains deadline
Mixed traffic scheduler, ed for high speed and dm for low speed messages
Main controller with three levels of serial networks
Supervisor, cell controllers in parallel bus, machine controllers in serial bus
System structure, plc's and pc's communicate over lan
Multitasking server connected to general network and to nc machines
External network for proces data, internal network for transport, handling only
Host, gateways and parallel backbone, multiprocessor computer node, fieldbus
Supervisor, master, workstation controller, automation, machine control
2219/31231 . . . Lan and stations and fieldbus, each station controls own I-O
2219/31232 . . . Lan and station, each station has plc controlling own I-O over bus
2219/31233 . . . Map network and server in node and server controlled ethernet with machine nodes
2219/31234 . . . Host, router and backplane bus, communication with host or backplane
2219/31235 . . . St network, each module of first controls second similar network etc., tree
2219/31236 . . . Plc exclusive network connected to map
2219/31237 . . . Host and rs232, rs485 to network controller and rs232 to controlled devices
2219/31238 . . . First network connected by repeater to second, second connected by repeater to third
2219/31239 . . . Cache for server to fast support client
2219/31241 . . . Remote control by a proxy or echo server, internet - intranet
2219/31242 . . . Device priority levels on same bus, net, devices processes data of exactly lower priority device
2219/31243 . . . Add serial number to message from station to check missing messages in host
2219/31244 . . . Safety, reconnect network automatically if broken
2219/31245 . . . Redundant bus, interbus, with two masters
2219/31246 . . . Firewall
2219/31247 . . . Reconnect network if connection was broken
2219/31248 . . . Multiple data link layer masters, if one fails, other takes over
2219/31249 . . . Display name of communication line and number of errors detected and corrected
2219/31251 . . . Redundant access, wireless and hardware access to fielddevices
2219/31252 . . . Watchdog, client sends regulary message to server, server must answer
2219/31253 . . . Redundant object manager
2219/31254 . . . Request from client waits until corresponding server functions again
2219/31255 . . . Verify communication parameters, if wrong, refuse communication
2219/31256 . . . Object managers arranged in logical ring for monitoring purposes
2219/31257 . . . Redundant wireless links
2219/31258 . . . Compensate control in case of missing message
2219/31259 . . . Communication inhibited during certain process steps
2219/31261 . . . Coordination control
2219/31262 . . . Deca dynamic coordinated concurrent activities
2219/31263 . . . Imbedded learning for planner, executor, monitor, controller and evaluator
2219/31264 . . . Control, autonomous self learn knowledge, rearrange task, reallocate resources
2219/31265 . . . Control process by combining history and real time data
2219/31266 . . . Convey, transport tool to workcenter, central tool storage
2219/31267 . . . Central tool storage, convey a whole tool drum, magazine to workcenter
2219/31268 . . . Central workpiece storage, convey workpiece, work pallet, holder to workcell
2219/31269 . . . Convey tool and workpiece to workcenter
2219/31271 . . . Priority workpiece pallet selected instead of routine workpiece pallet
2219/31272 . . . Avoid piling up, queue of workpieces, accommodate surges
2219/31273 . . . Buffer conveyor along main conveyor
2219/31274 . . . Convey products, move equipment according to production plan in memory
2219/31275 . . . Vehicle to convey workpieces is manually operable
2219/31276 . . . Transport a lot to stations, each with different types of manufacturing equipment
2219/31277 . . . Dispatching rules, shortest travel time or bidding based to reduce empty travel
2219/31278 . . . Store optimum number of workpiece, between max min, in bins, compartment, save travel time
2219/31279 . . . Prevent introduction of two pallets in same cell
2219/31280 . . . Calculate optimum path for conveying workpieces
2219/31282 . . . Data acquisition, BDE MDE
2219/31283 . . . Communication memory, storage, ram, eprom on workpiece or pallet
2219/31284 . . . Set begin and end of collection time for concerned machines, parameters
2219/31285 . . . Send required data to computer as function of specified condition
2219/31286 . . . Detect position of articles and equipment by receivers, identify objects by code
2219/31287 . . . Indicate output for data, screen or printer or database
2219/31288 . . . Archive collected data into history file
2219/31289 . . . Read card with operator and another card with process, product, work order info
2219/31291 . . . Store value detected signal and machine name and name of part of machine, mask
2219/31292 . . . Data in categories, each with a priority factor
2219/31293 . . . Enter size measurements, store in data base, analyze and identify in size data group
2219/31294 . . . Compare measurements from sensors to detect defective sensors
2219/31295 . . . Use integrated controller, processor during product, car assembly for ide, display, test
2219/31296 . . . Identification, pallet object data and program code for station
2219/31297 . . . Read only that ide information which is needed for specific operation
2219/31298 . . . Store on actual pallets also id of several other upstream, following pallets
2219/31299 . . . If workpiece rejected, write in id and erase operation code
2219/31301 . . . Restore lost id by using entry number of preceding, following pallet
2219/31302 . . . Verify id data and reread, rewrite or alarm on fault
2219/31303 . . . If workpiece transferred to other pallet, transfer also id
2219/31304 . . . Identification of workpiece and data for control, inspection, safety, calibration
2219/31305 . . . Robot arm identifies object during movement
2219/31306 . . . Read identification only if object is present
2219/31307 . . . Identification structure is partly a copy of operating structure
2219/31308 . . . Capture image asynchronously with processing of analysis, identification
2219/31309 . . . Identification workpiece and time limit for processing of workpiece
Data are id, destination, number of pieces, alternative destination, process data

Identify pallet, bag, box code

Measure weight, dimension and contents of box, tray

Store in workpiece detected defects

Use of data by host, send work order to operator after pallet detection

Output test result report after testing, inspection

Outputs delivery ordersheet, relating to finished products, to packing cell

Data analysis, using different formats like table, chart

Use data as inventory control value, adapt inventory need to new data

Print, output finished product documentation, manual using id of all workpieces assembled, processed

Work still to be done on workpiece

Database for CIM

Distributed real time knowledge, database

Machine selection support, use of database

Database to manage communication networks

Directory service for database

Objects report their location to directory service

Distributed, among several servers, directory service

Select manufacturing information by entering product number

Back order management with back order, part maker delivery, production databases

Database to backup and restore factory controllers

Database with devices, configuration, of plant

Database of address of devices registers in different networks, mapping

Store machines performance; use it to control future machining

Failure information database

Design, flexible manufacturing cell design

From parameters, build processes, select control elements and their connection

Design of factory information system

Design of process control system

Design of factory, manufacturing system control

Element, file server

Map backbone bus

Network manager

Communication adaptors between network and each machine

Gateway

Server node as operator panel, with display for Lon

Expert system to select best suited machining centre

Expert system integrates knowledges to control workshop

Expert system to design cellular manufacturing systems

Hybrid expert, knowledge based system combined with ANN

Fault, if one station defect, stop it, other stations take over

Automatic fault detection and isolation

Observer based fault detection, use model

Markov model

Object oriented model for fault, quality control

Verify if right controllers are connected to carrier, conveyor controller

Verify correct configuration of system

Action, if one station defect, execute special program for other stations

If one station defect, return other stations to original programmed modes

Send message to most appropriate operator as function of kind of error

Operate faulty tool in degraded mode

MMS manufacturing message specification, rs511, iso9506

MAP manufacturing automation protocol

Translation, conversion of protocol between two layers, networks

VMD virtual manufacturing device for robot task control, cell

Mes manufacturing execution system

You virtual operative organisational unit, extension of vmd

FAL fieldbus application layer, application service elements ase and application relations ar

LAS link active scheduler, distribute bandwidth between processing nodes

MFL material flow

From stored machine groups and relation machine workpiece, send workpiece to idle

Queue control

Master monitors controllers, updates production progress, allocates resources

Matrix cluster, machines in cell according to parts, row is part, column is machines

Find shortest way, route

Compare ratio of running work with optimum, decrease number of idle machines

Produce construction sequence, make parts, store, assemble equipment, ship

Determine rate of MFL out of each process within each workstation

Determine size of batch of material for each process to meet mfl rate

If resources, material, pieces under tolerance level, renew them until upper level

Just in time JIT, kanban is box to control flow of workpiece

Pull type, client order decides manufacturing of workpiece

Renew them until upper level

Administration tasks and factory control tasks

Lims laboratory information and management system

Object oriented engineering data management

Field management, low level, instruments and controllers acting in real time

Process management, specification, process and production data, middle level

Business management, production, document, asset, regulatory management, high level
2219/31397 . . . Instrument information management, subset of process management
2219/31398 . . . Simultaneous, concurrent engineering
2219/31399 . . . Station corrects nc program, sends back modified program to program generator
2219/31401 . . . Keep notebook for keeping track of process, can be executed to make product
2219/31402 . . . Keep log book, for activities of a station, equipment
2219/31403 . . . EDI electronic data exchange
2219/31404 . . . Computer assisted complaint management, customer complaint
2219/31405 . . . EDM electronic data management
2219/31406 . . . Data management, shop management, memory management
2219/31407 . . . Machining, work, process finish time estimation, calculation
2219/31408 . . . Cost calculation of use of certain machine types
2219/31409 . . . Calculation approach time
2219/31411 . . . Down time, loss time estimation, calculation
2219/31412 . . . Calculate machining time, update as function of load, speed
2219/31413 . . . Estimate capacity of plant
2219/31414 . . . Calculate amount of production energy, waste and toxic release
2219/31415 . . . Cost calculation in real time for a product manufactured
2219/31416 . . . Calculate effect of different actuators on optimal path sequence
2219/31417 . . . Calculate capacity by back propagating capacity, constraint from last to first module
2219/31418 . . . NC program management, support, storage, distribution, version, update
2219/31419 . . . Select file from a list, directory
2219/31421 . . . File with parameters for station and identification of station
2219/31422 . . . Upload, download programs, parameters from, to station to, from server
2219/31423 . . . After cap, send resulting programs to different nc machines
2219/31424 . . . Print label of finished part, with info, history, attach to part, docket
2219/31425 . . . Plan availability of operator for cell as function of time and operation calendar
2219/31426 . . . Real time database management for production control
2219/31427 . . . Production, CAPM computer aided production management
2219/31428 . . . Production management for lot production and for individual components of lot
2219/31429 . . . Predict end of job execution, schedule new job beforehand
2219/31431 . . . Identify and classify excess raw material; reuse
2219/31432 . . . Keep track of conveyed workpiece, batch, tool, conditions of stations, cells
2219/31433 . . . Diagnostic unit per zone of manufacturing
2219/31434 . . . Zone supervisor, collects error signals from, and diagnoses different zone
2219/31435 . . . Paging support with display board, status monitoring and report compiling
2219/31436 . . . Host monitors plc, control processor without interrupting its program
2219/31437 . . . Monitoring, global and local alarms
2219/31479 . . . Operator select part of process he wants to see, video image is displayed
2219/31481 . . . Safety monitoring system, redundant display, print systems for process data
2219/31482 . . . Verify working state of printers, displays, switch over if defect
2219/31483 . . . Verify monitored data if valid or not by comparing with reference value
2219/31484 . . . Operator confirms data if verified data is correct, otherwise amends data
2219/31485 . . . Verify and update all related data in relational database
2219/32 . . . Operator till task planning
2219/32001 . . . Computer assisted machining, signals guide operator to manual machine object
2219/32002 . . . Operator interface, manual control at cell, if host fails or priority
2219/32003 . . . Manual control at central control to control workcell, select pallet
2219/32004 . . . Graphical, textual instructions, sheet for operator to resume process
2219/32005 . . . Graphical, text operator instructions synchronous with product distribution
2219/32006 . . . Operator addresses machines to give commands or retrieve data
2219/32007 . . . Operator is assisted by expert system for advice and delegation of tasks
2219/32008 . . . Operator changes schedule, workload in allowed range by graphical interface
2219/32009 . . . Optimal task allocation between operator and machine
2219/32011 . . . Operator adapts manufacturing as function of sensed values
2219/32012 . . . Operator must signify his continued attendance at the workstation
2219/32013 . . . Operator marks processes, scheduler detects marks, releases control to operator
2219/32014 . . . Augmented reality assists operator in maintenance, repair, programming, assembly, use of head mounted display with 2-D 3-D display and voice feedback, voice and gesture command
2219/32015 . . . Optimize, process management, optimize production line
2219/32016 . . . Minimize setup time of machines
2219/32017 . . . Adapt real process as function of changing simulation model, changing for better results
2219/32018 . . . Adapt process as function of results of quality measuring until maximum quality
2219/32019 . . . Dynamic reconfiguration to maintain optimal design, fabrication, assembly
2219/32021 . . . Energy management, balance and limit power to tools
2219/32022 . . . Ordering, remote ordering, enter article and operations needed, create jobfile
2219/32023 . . . Print label, instructions for operator and job code for machining parameters
2219/32024 . . . Remote ordering, electronic selection article and fitting to form of client
2219/32025 . . . Automatic marking of article
2219/32026 . . . Order code follows article through all operations
2219/32027 . . . Order, plan, execute, confirm end order, if unfeasible execute exception operation
2219/32028 . . . Electronic catalog, to select material, resources, make lists with prices
2219/32029 . . . Enter also delivery location, transport means, kind of truck
2219/32031 . . . Use item and structure information
2219/32032 . . . Salesman creates order, system answers back with price, estimated date
2219/32033 . . . Send article design, needed material, packaging and shipping info to manufacturer
2219/32034 . . . Electronic market, network broker
2219/32035 . . . Compose, configure article and order
2219/32036 . . . Enter data, values for custom made articles
2219/32037 . . . Order picking
2219/32038 . . . Client can develop programs, parts on remote server located by manufacturer
2219/32039 . . . Send also testing program
2219/32041 . . . Combine orders from different customers
2219/32042 . . . Halting, initiating or resuming production of a product on order
2219/32043 . . . Program, information flow
2219/32044 . . . Shift workpiece and agv, carriage data in memory on advance to next station
2219/32045 . . . Each machine knows sequence of pallets, each pallet knows sequence of operations
2219/32046 . . . On detection workpiece code load program for workpiece from central
2219/32047 . . . Workcell end instruction selects next workpiece with related program
2219/32048 . . . Wait state between two successive machining steps
2219/32049 . . . Store program data, manufacturing history on workpiece, shifts to next
2219/32051 . . . Central control, modify program slave computers as function of production demand from host
2219/32052 . . . Lookup table, identify job to be executed by master or slave
2219/32053 . . . Adjust work parameter as function of other cell
2219/32054 . . . Send request for object carry out to other cell
2219/32055 . . . Identify workpiece, read status centrally, machine, adapt status centrally
2219/32056 . . . Balance load of workstations by grouping tasks
2219/32057 . . . Control cell as function of correlation between stored and detected machine state
2219/32058 . . . Execute program as function of deviation from predicted state, result
2219/32059 . . . Send code, data for workpiece to each workstation to be used, update data
2219/32061 . . . Central controls modules grouped according to function
2219/32062 . . . Set machines to new lot work, send them operation schedule, nc and handling data
2219/32063 . . . Adapt speed of tool as function of deviation from target rate of workpieces
2219/32064 . . . Production change over
2219/32065 . . . Synchronise set points of processes
2219/32066 . . . Central stores operation code in id and in concerned station
2219/32067 . . . Change combinations of operation codes in station, id for flexibility
2219/32068 . . . Execution at station only permitted if operation code of station and id equal
Divide process into machining methods and normal operations

From order, production time divide into special operative process planning

Calculate machining volumes for turning

Calculate machining axis, best feasible data extraction from geometric models for selecting size of tool

Select machine type

Known case

CASE based process planning, using older, planning

Batch programming using oop

Recipe programming for flexible batch control

Batch, recipe configuration for flexible batch programming, phase sequence, parameters

Text, menu driven editor for batch number of workpieces

Dedicated language for batch processing, enter data and tolerance

Search, adaptive, after each iteration some search directions are forbidden

Decentral planning, each plant involved takes part of global

Master production planning, highest level

Action and material and technology combined to manufacture product

Algorithm, genetic algorithm, evolution strategy

Heuristic algorithm, accept feasible solution and attempt to improve it

Search, adaptive, after each iteration some search directions are forbidden

Dedicated language for batch processing, enter number of workpieces

Text, menu driven editor for batch programming, phase sequence, parameters

Batch, recipe configuration for flexible batch control

Recipe programming for flexible batch

Batch programming using oop

CAPP computer aided machining and process planning

CASE based process planning, using older, known case

Select machine type

Select size of tool

Data extraction from geometric models for process planning

Calculate machining axis, best feasible orientation for machining

Calculate machining volumes for turning operations

Operative process planning

From order, production time divide into special and normal operations

Divide process into machining methods
Prepare teach data by selecting data from two tables as function of type of work

Inhibit further editing of entered parameters

Exchange data between user, cad, caq, nc, capp

Object, attribute for geometry, technology, function oop

Editor and library for objects

Each defined object has corresponding set of geometrical macros

Create a new object by combining existing objects

Object groups, for object replication, naming, messaging and retrieving

Each hardware unit together with its software forms one object

Object oriented control, programming

Tasks or control icons are linked to form a job

Indicate synchronisation tags on icons of tasks

Petri net and procedural language combined

Convert petrinet to sequence program for cell and control program for machine

Convert petrinet to ladder diagram

Generation and analysis of synthesis rules for petrinet

Stochastic pn, spn

Transform, convert operator goals and information into petri nets

Control petrinet together with modeling petri net, cascaded

Table, memory table with identification code for all parts to be used

Memory table parts classification and working, manufacturing conditions

Table with correlation between part codes and part classification

Correspondence between manufacturing part list and design part list

Computer assisted quality surveillance, caq

Normal and correction transferline, transfer workpiece if fault

Quality control, monitor production tool with multiple sensors

Monitor production, assembly apparatus with multiple sensors

If state of tool, product deviates from standard, adjust system, feedback

Test cell

Compare time, quality, state of operators with threshold value

Calculate entropy, disorder

Teaching inspection data, pictures and criteria and apply them for inspection

Correlation between controlling parameters for influence on quality parameters

Teaching relation between controlling parameters and quality parameters

Compare between original solid model and measured manufactured object

Real time statistical process monitoring

After inspection create correction table with position, correction data

Ann, neural base quality management

Quality prediction

Feedforward quality control

Store audit, history of inspection, control and workpiece data into database

Inspection at different locations, stages of manufacturing

Feedforward inspection data for calibration, manufacturing next stage

If number of errors grow, augment sampling rate for testing

Build statistical model of past normal process, compare with actual process

Integration and cooperation between processes

Effect of material constituents, components on product manufactured

Performance assurance; assure certain level of non-defective products

Use model error adapted to type of workpiece

Selection from a lot of workpieces to be inspected

Action upon failure value, send warning, caution message to terminal

Rearrange production line

Stop production line

Outputs new workorders to operators

If parameter out of tolerance reject product

If parameter out of tolerance during limited time, accept product on condition

Display on screen what fault and which tool and what order to repair fault

If detected shape not correct, simulate new machine, tool and adapt path

If machining not optimized, simulate new parameters and correct machining

Finish defect surfaces on workpiece

Sort workpieces as function of quality data

Slow down production after failure

Correlation between defect and measured parameters to find origin of defect

Fault, defect detection of origin of fault, defect of product

Fixture failure diagnosis, measure assembly, derive influence of fixture on error

Identify parameters with highest probability of failure

Randomize workpiece treatment order within lot to improve lot-to-lot comparisons

Computer assisted repair, maintenance of system components

On error detected by zone supervisor, maintenance of particular zone

Repair, rework of manufactured article

Repair fault product by replacing fault parts

Inspection and correction, repair station in one unit, correction data in memory

Inspection and correction, repair station are separate, transmit correction data

Scheduling repair

Maintenance planning

Sharing of data between process control and maintenance management computers

Automatic order of parts needed for maintenance schedule
several jobs

Single machine scheduling, one machine, several jobs

Scheduler triggers generation of nc program for actual selected machine

Avoid deadlock, lockup

Resource editor

Reschedule without propagation of interruptions to other cells

Rerouting parts

By using graphical display of array and selecting elements, rearrange them

Reentrant scheduling, workpiece can return to same machine

Virtual reality based interface scheduler

Real time scheduler

Create schedule from elementary operations from database

Repair, rework of defect, out of tolerance parts, reschedule in next station by reconfiguring it

Normal and special order production lines for different types of workpiece

Scheduling production, machining, job shop

As a function of, change of machine operation

Work sequence, alternative sequence

Required time for work temperature control

Due dates, pieces must be ready, priority of dates, deadline

Tool replacement minimization

Resource, machine assignment preferences, actual and anticipated load

Flexibility, polyvalent machine, large buffers, permutation operations, alternative

Rearrange production line as function of operator rating

Work manhours, number of operators and work place

Afo products, their components to be manufactured, lot selective

Setup time

Waiting, queue time, buffer

Priority orders

Dynamic throughput maximization

Available parts, available materials

Decision, of job release, select job to be launched next in shop

Decision of job dispatching, select job to process next on each machine

Decision of next visiting machine selection, where job is to go

Decision of job pulling, select job to put in input buffer of next machine if conflicts

Event is triggered when first unit of first lot enters or last unit leaves processing

Job, recipe cascading: no delay, next job is started immediately when first is finished

For tool feeding schedule

Agv schedule integrated into cell schedule

Schedule of overhead material handlers, robot gantry

Operator scheduling for load, unload, walk and wait in a cell with plural machines

Single machine scheduling, one machine, several jobs

For a quick and slow production line

Machine scheduling, several machines, several jobs

Job shop, two, more operations may not occupy same machine simultaneously

Multi manipulator assembly cell

Monitoring items connected to certain different entities, activities

Medical, chemical, biological laboratory

Create daily or weekly production matrix

Determine number of components, start of their production, allocate processor

Task sequence optimization

Large, medium and fine schedule, with feedback from fine to large

Minimize work in progress, system at maximum productivity

Maximize throughput of cell

Production start time from order and production specification, satisfaction degree

If error search in a repair library, trained by operator, to correct schedule

Adaptive scheduling, feedback of actual process progress to adapt schedule

Designate at least two group of articles, first with priority, reschedule second

Divide job shop into number of workcenters

Simulate production, process stages, determine optimum scheduling rules

Each pallet has working plan, information and optimum scheduling rules

Convert program to fit rescheduled machine

Minimize flow time, tact, shortest processing, machining time

Fastest interrupt time, change jobs dynamically to fastest machine

Rules to make scheduling decisions

Last buffer first serve, lifo

Shortest, narrowest non full queue

Shortest remaining capacity

Shortest queue next

Largest imminent operation time

Shortest remaining processing time

Largest remaining processing time

Machine with least work

First buffer first serve, fifo

Smallest ratio for imminent processing time divided by total processing time

Smallest value of product of imminent processing time with total processing time

Shortest imminent operation time, part of machining time

Largest processing, machining time

Machines with least frequency of errors

Determine lot priority as function of sum of queue and processing time

Quality data determines optimum machine sequence selection, queuing rules

Object oriented scheduling, use machine, part, tool object and coordinator

Local scheduler, each machine own scheduler, independent from defective machines

Structure, fuzzy logic expert system scheduler
2219/32328 Dynamic scheduling, resource allocation, multi agent negotiation
2219/32329 Real time learning scheduler, uses ANN, fuzzy
2219/32331 Network of coordinating planning systems for each cell, factory
2219/32332 Expert scheduler
2219/32333 Use of genetic algorithm
2219/32334 Use of reinforcement learning, agent acts, receives reward
2219/32335 Use of ann, neural network
2219/32336 Normal, special order lines share some common machines, part of production line
2219/32337 Simulation, statechart SC
2219/32338 Use new conditions for model, check, calculate if model meets objectives
2219/32339 Object oriented modeling, design, analysis, implementation, simulation language
2219/32341 Grafcet model, graph based simulation
2219/32342 Real time simulation
2219/32343 Derive control behaviour, decisions from simulation, behaviour modelling
2219/32344 Modular verification of real time systems
2219/32345 Of interconnection of cells, subsystems, distributed simulation
2219/32346 Using acd, activity cycle diagram
2219/32347 Knowledge based simulation engine, use answers from user, database
2219/32348 Process reengineering, rethink manufacturing process, continuous improve
2219/32349 Simulate effect of stoppages of production facilities, operate as function of simulation
2219/32351 Visual, graphical animation of process
2219/32352 Modular modeling, decompose large system in smaller systems to simulate
2219/32353 Use elementary control task, finite state machine and loop, inhibit, synchronisation connections
2219/32354 Divide, analyse process into subprocesses, until elementary unit operations
2219/32355 Simulation control process using virtual bus
2219/32356 For diagnostics
2219/32357 Simulation of material handling, flexible conveyor system fcs
2219/32358 Strain, stress of manual work, operator strain
2219/32359 Modeling, simulating assembly operations
2219/32361 Master production scheduling
2219/32362 Bulk manufacturing, handling dry or fluid products
2219/32363 Batch job routing in operation overlapping
2219/32364 Simulate batch processing
2219/32365 For resource planning
2219/32366 Line performance evaluation
2219/32367 Parallel experimentation machines
2219/32368 Quality control
2219/32369 Cape-mode computer aided plant enterprise modeling environment for plant life cycle modelisation & management
2219/32371 Predict failure time by analysing history fault logs of same machines in databases
2219/32372 Petrinet, coloured, inhibitor arc, timed, object token Petrinet
2219/32373 Timed petrinet, timed event graph
2219/32374 Display of petrinet, graph editing
2219/32375 Petrinet synthesis tool
2219/32376 Coloured petrinet
2219/32377 Cbpn controlled batches petrinet, model influence control part on physical part
2219/32378 Fuzzy timed petrinet
2219/32379 Object oriented petrinets
2219/32381 Continuous petrinet, contrary of timed petrinet
2219/32382 Hybrid petrinet, comprises continuous and timed petrinet
2219/32383 Controlled speed continuous petrinet, considers delays in execution and transport time
2219/32384 Fuzzy petrinet fpn
2219/32385 What is simulated, manufacturing process and compare results with real process
2219/32386 Arm accurate robot motion time model, needed in scheduling
2219/32387 Effects of highspeed hardware operations on throughput, use scheduler
2219/32388 Autonomous flexible system, cells and agv autonomous
2219/32389 Reception, assembly, testing, management workorder, schedule, history, file, packing
2219/32391 Machining center, pallet stocker, setup station, conveyor, control unit
2219/32392 Warehouse and loading, unloading station and shop and machining centers and in out buffer
2219/32393 Host and central distribution control between storage and cells
2219/32394 Fractal manufacturing system with autonomous agents: observer, analyser, organiser, resolver, reporter
2219/32395 Manufacturing structure is flow shop, mass production
2219/32396 Job shop, batch production system
2219/32397 Machining cells
2219/32398 Operator controls setting, changing of setting, of different machines
2219/32399 Select lan by switching bus connected to several lan
2219/32401 Select displays by switching bus connected to several displays
2219/32402 Select one lan to be connected to one display by central control
2219/32403 Supervisory control, monitor and control system, by operator or automatic
2219/32404 Scada supervisory control and data acquisition
2219/32405 Hybrid supervisor control, des supervisor and diagnostic and alternate strategy route
2219/32406 Distributed scada
2219/32407 Real time processing of data
2219/32408 Case based diagnosis to assist decision maker, operator
2219/32409 Adaptive agent for diagnostic, helps operator to describe new cases
2219/32411 Derive control data from displayed element, logic for it and feedback data
2219/32412 One engineering, workstation can supervise several processes
2219/32413 Pc generates control strategy, download in plc to monitor and react to events
2219/32414 Workstation has two displays, for process control and for general applications
2219/32415 Select tools in next workcell during transport workpiece
function ANNS artificial neural network with sigmoid
gaussian network
Function, rbf radial basis function network,
network approximation
Wavelet artificial neural network, wavelet
Recurrent artificial neural network
summed
RAM artificial neural network, several lookup
network for unknown signal values
Connect plural macrocircuits, neural network
between output and vigilance nodes
Lapart, two art with lateral priming connection
one output
Local linear nested network, coarse at root,
product in output layer
Pi sigma network, summing in hidden layers,
Time delay artificial neural network
Higher order multilayer artificial neural
associated with codebook vector
Kohonen network, single layer with neurodes,
patterns in clusters during learning
ART adaptive resonance theory, place input
area
Machine workload balance, same tools for pool
of machines for same operations
All tools available, each part can fully be
processed on a single machine
Tool management incorporated in kernel of nc
control
Tool management and database management
Task planning
Task flow editing
Director till display
Director is the nc controller, computer
Algorithm, hashing algorithm
Manual control of manipulator, machine
Manually but assisted by using sensors
Ama allocation manual automatic work
between machine, manipulator and man
Automatically control, manually limited,
operator can override control
Operate manually only in defined, limited zone
area
ART adaptive resonance theory, place input
patterns in clusters during learning
Link between hidden and input layer is
sigmoid, and between output is linear
Kohonen network, single layer with neurodes,
associated with codebook vector
Higher order multilayer artificial neural
network ANN, input terms has square, cubic
terms of input, output
BAM bidirectional associative memory
artificial neural network
Time delay artificial neural network
Pi sigma network, summing in hidden layers,
product in output layer
Local linear nested network, coarse at root,
split up and build tree
Adaline network, n inputs with n weights, sum,
one output
Lapart, two art with lateral priming connection
between output and vigilance nodes
Connect plural macrocircuits, neural network
modules in a larger network
One network for learned signal values, one
network for unknown signal values
Ann with single, only one output
RAM artificial neural network, several lookup
tables addressed by input section, output
summed
Recurrent artificial neural network
Wavelet artificial neural network, wavelet
orthogonal decomposition for artificial neural
network approximation
Artificial neural network controller
Function, rbf radial basis function network,

Spline membership function
2219/33071 . . . Self sufficient, agent responsible for own energy, tools
2219/33072 . . . Two layer agent for execution of tasks and for communication, coordination
2219/33073 . . . Ion control agent has communication, database, suggestion, decision, action, detect
2219/33074 . . . Calculation loop, first one slow changing value, then several quick varying values
2219/33075 . . . Calculate only necessary, critical values, to speed up calculation
2219/33076 . . . Optimize time by parallel execution of independent blocks by two processors
2219/33077 . . . Calculation iterative, recursive
2219/33078 . . . Error table, interpolate between two stored values to correct error
2219/33079 . . . Table with functional, weighting coefficients, function
2219/33081 . . . Parallel computing, pipeline
2219/33082 . . . Data parallelism, one administrative process and many worker process
2219/33083 . . . Clock for microprocessor synchronized with pulses from encoder
2219/33084 . . . Clock for microprocessor synchronized with multiplexer
2219/33085 . . . Real time calendar clock
2219/33086 . . . Interrupt frequency as function of rating of servomotor or desired control frequency
2219/33087 . . . Two clock, clock for software counter and calendar clock, synchronized
2219/33088 . . . Clock
2219/33089 . . . Two clock, one for sequence control, one for motion control, pulses
2219/33091 . . . Two clock, one for controller and one for calibration
2219/33092 . . . Using several selectable and settable dividers
2219/33093 . . . Real time clock interface between serial I-O and processor
2219/33094 . . . Send clock from pc board, via extension bus to PLL circuit on nc boards, to servo
2219/33095 . . . External clock delivers interrupts for real time execution of programs
2219/33096 . . . Use clock to control main spindle rotational speed
2219/33097 . . . Variable ticks, align clocks, to synchronize cycles with other machine, robot
2219/33098 . . . Several nc machines, dnc, cnc
2219/33099 . . . Computer numerical control [CNC]; Software control [SWC]
2219/33101 . . . Dnc, direct numerical control
2219/33102 . . . Dnc and cnc combined
2219/33103 . . . Object manager handles objects having own procedures, messages oop
2219/33104 . . . Tasks, functions are distributed over different cpu
2219/33105 . . . Identification of type of connected module, motor, panel
2219/33106 . . . Configure I-O by using logical and physical address
2219/33107 . . . Designate each actuator by a name and corresponding operations
2219/33108 . . . Exchange of type of controller is easy, before operation, adapt control to type
2219/33109 . . . Select out of plurality of alternative control parameters
2219/33111 . . . Graphic configuration control, connect pictures, objects to each other
2219/33112 . . . Configuration software for network
2219/33113 . . . Initialise each drive during start, load data to drive and image to controller
2219/33114 . . . Configure motion controller to drive any kind of motor type connected
2219/33115 . . . Group functions
2219/33116 . . . Configuration of motion control
2219/33117 . . . Define function by user programmable basic operations
2219/33118 . . . Identify bus, interface select automatic adaption for bus, interface
2219/33119 . . . Servo parameters in memory, configuration of control parameters
2219/33121 . . . Host loads program from attached module to control that module
2219/33122 . . . Adapt nc control to type of machine, read machine and measuring parameters
2219/33123 . . . Identify kind of transducer, encoder used
2219/33124 . . . Configuration of different kind of tool magazines, tool changers and buffers
2219/33125 . . . System configuration, reconfiguration, customization, automatic
2219/33126 . . . Identification of address connected module, processor
2219/33127 . . . Display each control parameter by name and its value
2219/33128 . . . Different spindles, axis controlled by configured paths, channel
2219/33129 . . . Group spindles, axis into motion groups, nc channel structure
2219/33131 . . . Synthesize programmable axis, to simulate a non existing, virtual axis
2219/33132 . . . Configured function disabled if concerned axis not referenced
2219/33133 . . . For each action define function for compensation, enter parameters
2219/33134 . . . Enter parameters for relationship between axis
2219/33135 . . . Data compression before sending data to allow control of more axis, spindles
2219/33136 . . . Com: communication, inter processor communication, either local or network
2219/33137 . . . Time left during polling used for other communication, priority for polling
2219/33138 . . . Control program and communication are totally separated
2219/33139 . . . Design of industrial communication system with expert system
2219/33141 . . . Communication system software module independent from medium, protocol, address
2219/33142 . . . Address switches on each controller, peripheral are set by operator
2219/33143 . . . Position of module in ring, loop determines address of module
2219/33144 . . . Module clock, synchronised by controller message, to send message in time slice
2219/33145 . . . Count clock pulses to determine address of node, module
2219/33146 . . . Each node occupies in address space a length equal to number of bits to be exchanged
2219/33147 . . . Address peripheral, controller
2219/33148 . . . CLS client server architecture, client consumes, server provides services
Publisher, subscriber, publisher, master broadcasts data to slaves, subscriber
Distributed client server
Server has organisation, tree data to access user data, client sends also both
AR application relationship, cooperation through logical links
Data exchange between processors of different axis of same or different cnc
Communication between motor current controller and position controller
Communication between two processors over shared, dualport ram
Between processor and sensor, encoder
Remote procedure call to each other
Communication between acyclic and cyclic, loop programs
Data exchange between controller and processors
Two bus, high speed and low speed bus, linked or not
Multichannel master bus
Bus timing adjustment by buffer with controller
Gpsc gp general purpose serial channel, link
R485 bus to control several modules, motors
Bus arbitration, switch computer to different memory
Two bus, master bus and local servo bus
Name of bus, vme-bus
Sdbus
Multibus
Bitbus
Sds smart distributed system, honeywell
Isa bus
R485, mpi multipoint, multidrop interface
Interface, scsi, parallel
Centronics
Pcmcia
Isdn
Uart, serial datatransmission, modem
IEEE-488, hp interface, instrumentation
Rs232c to rs485 converter
Rs232c switch box, break out box, to connect different devices
Circuit for signal adaption, voltage level shift, filter noise
Serial transmission rs232c, rs422, r485 communicatiion link
Twisted pair
Optical, glass fiber
Data exchange combined with inductively coupled power supply
Radio link, wireless
Inductive transmission of measured values
Data and power supplied over optical fiber
Wave guide, also used as rails for movable station
Data and power each on a different line to all peripheral, bus
Current loop 4-20-mA milliampere
Laser, light link, infrared
Transponder
Twisted pair combined with optical fiber for critical emc zones
Single serial line, virtual second line is earth
Wireless transmission of power and data, inductively, rotary transformer
Optocoupler, galvanic separation, isolation
Coax or optical fiber or twisted pair
Ultrasonic
Physical means, radio, infra red, ultrasonic, inductive link
Superposition of control signals on supply lines
Protocol, mailbox, email, mail system
Polling
Processor for communication with, evaluation of signals form detector to pc
Communication cpu to synchronize axis between different machines
Bus between different axis controllers and cpu
Synchronization pulses on bus for axis controllers
Operational, real time for system, and service for configuration is non real time
Continuity communication controlled by client
Motor encoders, resolvers on common bus with drives, servo controllers
Drives, servo units, main control on internal net, lan, ethernet, tcp-ip, wireless
Drives, servo units, sensors, motors, on local network, ethernet, tcp-ip, wireless
High speed serial link combined with medium speed serial link
Serial ring, loop pam programmable axis manager
Several serial channels, each provided with d-a terminals of servomotor
Interface nc machine to data server
Daisy chain
Safety, echo back to verify correctness message
Detection of line failure, breakage of transmission, failure of receiver
Differential amplifier, xor to cancel noise, balanced rs422
Decoupling, to avoid noise, crosstalk between wires of bus
Detect, respond to lost message
If servo data corrupt, use previous value, no repeat
Detect bad data transfer
Redundant communication channels, processors and signal processing hardware
Add check data to message to check faulty communication
Detect short circuit of bus
Switch from differential to single line communication if short between two wires
Switch off, stop, halt transmission on detection of fault
Compare results from two masters on two busses, if not equal shut down machines
Watchdog for datacommunication, on error switch off supply to bus modules
Detect quality of received data, message
Packet information exchange
Autosend, send information from cad station automatically to peripheral
Timing of transmission data to peripheral
Synchronize transfer, take over, change of parameters and reference values
Time window for each controller or controlled function
Compress, pack data before transmission
Schedule periodic and aperiodic traffic, real time, time critical
Real time synchronous transmission, model
Correction data transmission errors, protection against noise, twisted pair
Serial position feedback, serial to parallel conversion and reverse
Transfer of data parallel
Resolver to digital conversion
Conversion of designed 3-D tolerance, allowance to real coordinates of machine
Common coordinate conversion for multiple heads, spindles
Conversion of measuring robot coordinates to workpiece coordinates
Conversion of detected pulses to voltage, frequency to voltage converter
Current to voltage conversion
Conversion, transformation of coordinates, cartesian or polar
Conversion of angle between links to linear displacement of actuator
Conversion of voltage, resistance to pulses
Pulse to frequency conversion, frequency to pulse
Pneumatic, air to hydraulic conversion
D-A, A-D
Convert cartesian to machine coordinates
Convert workpiece to machine coordinates
Conversion, transformation of data before and after interpolator
DCS distributed, decentralised control system, multiprocessor
Integrated communication and control, transmission delay, sampling rate effect
Distributed, decision made by negotiation among executive components, execute it
Decentralized, each component makes own decision, executes only own decision
Distributed system with host as leader, host with multiple of agents
Cooperation between autonomous modules by receipts, messages, no synchronisation
Expansion by using secondary access to each module, extension module
Architectue, nodes for communication and measuring on serial bus
Node with communication, transducer, common core, application specific modules
Customized nodes for desired functionality
Remote diagnostic
Diagnostic
Test, simulation analyser
Program panel to program, enter data for diagnostic
Switch, select between normal and diagnostic control program
During diagnostic of servocontroller, motor is isolated
Logic analyser function of cnc
Storage oscilloscope function of cnc to diagnose servo drive, axis oscilloscope
For each actuated axis, set a bit in a word in memory, state of axis in word
Nc in case of propagation error, search previous module, origin of error
Fuzzy expert system for diagnostic, monitoring
ANN for diagnostic, monitoring
Diagnostic, test, debug
Remote videoconferencing
Real time, online diagnostic, integrated in normal control system
Simulation during machining
Different sets of monitoring parameters for each operation mode
Expert system for diagnostic, monitoring use of tree and probability
Display of diagnostic
Display of relevant errors together with time mark
Configuration file to set how data will be displayed
On error, failure, fault automatically search and dial maintenance person
If error message not clear, search help by index of message vocabulary
Error recovery, automated error recovery
System code for error recovery
Operator selects action, system stores state, zero based error state
Frames, database with environment and action, relate error to correction action
Failure reason analysis, simple strategy or multiple outcome analysis
Failure detection and reconfiguration
On the fly software replacement on error
Alternative strategy driver revises control behaviour
Knowledge acquisition
Interference justification network
Observation learning
Failure driven learning
Self diagnostic of boards, own test program
What to diagnose, whole system, test, simulate
Diagnostic of only machining, operation
Analyzer, diagnostic for servovalve
Self diagnostic of control system, servo system
Diagnostic for bus system of computer
Measuring system, encoder
Test, diagnostic of field device for correct device, correct parameters
Each processor can execute all programs
Network multiprocessing
Load balancing, distribution between processors
Microprocessor for max 3-D control otherwise host takes over for more axis
2219/33336 . . . first dsp calculates commands for each motor, second dsp regulates position

2219/33337 . . . For each axis a processor, microprocessor

2219/33338 . . . DNC distributed, decentralised nc, concurrent, multiprocessing

2219/33339 . . . Controller with lowest operation rate is selected as master

2219/33341 . . . Peer to peer, change master if overloaded

2219/33342 . . . Master slave, supervisor, front end and slave processor, hierarchical structure

2219/33343 . . . Each slave stores communication program to be used by master, interchangeability

2219/33344 . . . Each slave has several processors operating in parallel

2219/33345 . . . Several master modules, connection modules and slave modules

2219/33346 . . . Only memory of master module stores all position programs of slaves

2219/33347 . . . Master sends servo address, speed, kind of interpolation to slave

2219/33348 . . . Processor adapts signals to connected display

2219/33349 . . . Director, elements to supervisory

2219/34001 . . . PLL phase locked loop

2219/34002 . . . Analog multiplexer

2219/34003 . . . Tri state driver

2219/34004 . . . Shift register

2219/34005 . . . Motion control chip, contains digital filter as control compensator

2219/34006 . . . Fifo

2219/34007 . . . Neuramine, input pulse train, can be inhibited or excited, output TTL, neuron

2219/34008 . . . Asic application specific integrated circuit, single chip microcontroller

2219/34009 . . . Coprocessor

2219/34011 . . . MMU

2219/34012 . . . Smart, intelligent I-O coprocessor, programmable sensor interface

2219/34013 . . . Servocontroller

2219/34014 . . . Sample hold circuit

2219/34015 . . . Axis controller

2219/34016 . . . Pulse processor

2219/34017 . . . Vector processor

2219/34018 . . . Forth controller

2219/34019 . . . Array of processors, parallel computing

2219/34021 . . . Dsp digital sensor signal processor

2219/34022 . . . Dcas digital controlled analog signal processor

2219/34023 . . . Risc processor

2219/34024 . . . Fpga fieldprogrammable gate arrays

2219/34025 . . . Polynomial analysis

2219/34026 . . . Pga programmable gate array

2219/34027 . . . Dual servo controller, for two motors

2219/34028 . . . Hold relay

2219/34029 . . . Pgm programmable axis controller, to control large number of axis

2219/34031 . . . Synchronous detector

2219/34032 . . . Asic and microcontroller cooperate

2219/34033 . . . Control processor and signal processor cooperate

2219/34034 . . . Multiplier, prm, brm

2219/34035 . . . Time relay

2219/34036 . . . Saturable reactor

2219/34037 . . . Brm followed by postprocessor to smooth curve

2219/34038 . . . Web, ftp, internet, intranet server

2219/34039 . . . Access central database through internet

2219/34041 . . . Dda

2219/34042 . . . Filter

2219/34043 . . . Delay line

2219/34044 . . . Mathematical coprocessor - processor

2219/34045 . . . Timer

2219/34046 . . . Analog multiplier

2219/34047 . . . Dsp digital signal processor

2219/34048 . . . Fourier transformation, analysis, fft

2219/34049 . . . Adder

2219/34051 . . . Bed

2219/34052 . . . Software counter

2219/34053 . . . Counters, tellers

2219/34054 . . . Half serial half parallel

2219/34055 . . . Correction 3-excesscode

2219/34056 . . . Nine complement

2219/34057 . . . Complement

2219/34058 . . . Up-down

2219/34059 . . . Preset counter

2219/34061 . . . One counter per axis to unload cpu

2219/34062 . . . Comparator

2219/34063 . . . Bed

2219/34064 . . . N+1 comparator

2219/34065 . . . Fuzzy logic, controller

2219/34066 . . . Fuzzy neural, neuro fuzzy network

2219/34067 . . . Multilayer fuzzy controller, execution and supervisor layer

2219/34068 . . . Fuzzy neural petri controller

2219/34069 . . . Shared memory

2219/34071 . . . Content addressable memory

2219/34072 . . . Non volatile memory, core memory

2219/34073 . . . Backup battery

2219/34074 . . . Associative memory

2219/34075 . . . Cognitive memory

2219/34076 . . . Shared, common or dual port memory, ram

2219/34077 . . . Fuzzy, rules are function of material, tool used

2219/34078 . . . Membership functions as parameters for shape pattern

2219/34079 . . . Extract only rules needed to obtain result

2219/34081 . . . Fuzzy art map neural network, one art for input map, lookup table, other for output

2219/34082 . . . Learning, online reinforcement learning

2219/34083 . . . Interpolation general

2219/34084 . . . Software interpolator using microprocessor

2219/34085 . . . Software interpolator

2219/34086 . . . At fixed periods pulses from table drive plural axis in unison

2219/34087 . . . Enter at fixed periods distances in counter for each axis, pulse distribution

2219/34088 . . . Chamfer, corner shape calculation

2219/34089 . . . Parametric, polynomial representation of path per axis as function of time

2219/34091 . . . Interpolate backwards

2219/34092 . . . Polar interpolation

2219/34093 . . . Real time toolpath generation, no need for large memory to store values

2219/34094 . . . Library with different kind of interpolation curves

2219/34095 . . . Look ahead segment calculation
Approximate, replace curve, surface with circle, linear segments, least error
Calculate movement from part program offline, calculate axis references online
Slope fitting, fairing contour, curve fitting, transition
Extrapolation
Data compression, look ahead segment calculation, max segment length
OCI on line interpolation
Taking planar slices from a 3-D shape
Postprocessor coarse fine
Area pocket machining, space filling curve, to cover whole surface
Using spiral collapsed boundary, contour parallel machining
Zigzag workpiece parallel sweeps, direction parallel machining
Using zigzag isoparametric parallel sweeps
Using spiral bounded area
Using hilbert curves, fractals, only visible points of patches taken
TSP traveling sales problem, SOM self organizing map for tool path
determine centerline, medial axis and branches in shape
Construct concentric polygons
Area, pocket machining for area with partially open boundary
Machine workpiece along, parallel to smallest side, dimension
Machine workpiece along, parallel to largest dimension
Using a pseudo-random or random tool path
Function generator, filter after interpolator to control position error
Edge generator
Function, profile generator
Sine cosine generator
Cordic processing
Sum squares
Overlap of counted axis pulses to servo
Brn followed by postprocessor to smooth curve
General surface replaced by sphere, cylinder, toroid, calculate quickly
Approximation for calculation
Split in approximation and accurate calculation
Choosing largest, major coordinate axis
Choosing slowest axis
Choose optimal coordinate system
Spline
Ellipse, hyperbola
Helicoidal
Cubic interpolation
Parabolic interpolation
B-spline, NURBS non uniform rational b-spline
Polynomial
Approximate corner by polynomial
Involute, evolute
Bezier interpolation, spline
Helical, spiral interpolation
Epitrochoid
Coons interpolation, patch
Circular interpolation
Analog
Circular interpolation in space, on arbitrary planes
Linear interpolation
Analog
Third degree
Slope control, delta x, y proportional to x, y
Synchronize interpolation of different axis boards, simultaneous start
Tangents form curve
Delta theta
Superposition curves, combine xy slides with other xy or polar slides
Linear in one axis, circular in other axis
Rotate a segment
Superposition manual control pulses on motion control pulses
4-D via 2-D+2-D
Select between rectangular and polar controller, interpolator
Coarse fine, macro microinterpolation, preprocessor
External interpolation
Coarse interpolator, path calculator delivers position, speed, acceleration blocks
Generate polynomial fitting in tolerance zone around polygon
Of the two or three axis, only one or two are controlled as function of tangent to other axis, plane
Switch between involute, circular and linear interpolation
Rotate segment over a certain angle
Overlap, between two blocks, continuous, smooth speed change, movement
Block segments, find next point on next segment by cross point circle and segment
Calculate for different inclined segments stitch points evenly distributed
Simulated pulse for better resolution
Variable interpolation speed or resolution
Adapt resolution as function of machining load, in corner, to keep constant surface speed
Variable resolution
Window path, contour of rectangle
Straight cut
Following line+circle
Degree line
Any angle, slope
Safety, stop, slowdown interpolator if speed, position, torque error too large
On each axis, for each block, a software limit switch, for safe slow down
Pneumatic
Memory management
Memory refresh
Bank switching, ping-pong memory for communication between processors
Part program in consecutive memory blocks, each with spare space for corrections
2219/34196 . . . Memory management, dma direct memory access
2219/34197 . . . Search blank memory space to load program, storage, memory allocation
2219/34198 . . . Electric and fluidic modules integrated on one substrate
2219/34199 . . . Module with low maintenance connected to removable module with high maintenance
2219/34201 . . . Each module uses functions of a real time kernel
2219/34202 . . . Reusable software, generic resource model library
2219/34203 . . . Module has a general, high level and a specific, proprietary part
2219/34204 . . . Independent units, stackthrough in cabinet, no backplane
2219/34205 . . . Modular construction, plug-in module, lsi module
2219/34206 . . . Motion controller independent from nc, lmc local motor controller
2219/34207 . . . Array vlsi processor
2219/34208 . . . Motion controller
2219/34209 . . . Microprocessor only for display
2219/34211 . . . Microprocessor only for hand control
2219/34212 . . . Microprocessor only for mdi, control panel
2219/34213 . . . Same microprocessor for data input and for servocntrol
2219/34214 . . . I-apx-432 processor
2219/34215 . . . Microprocessor
2219/34216 . . . Programmable motion controller
2219/34217 . . . Microprocessor with build in pwm
2219/34218 . . . Transputer
2219/34219 . . . Special interface, peripheral to motor
2219/34221 . . . Computer delivers control pulses from table directly to motors
2219/34222 . . . Computer sends displacement and selected device to output register
2219/34223 . . . Combined input output module, single module
2219/34224 . . . Select appropriate interface, according to kind of tool or other detection
2219/34225 . . . Interface board for measuring system, for resolver, encoder or interferometer
2219/34226 . . . Select address of motor, control serial switches in power supply ring
2219/34227 . . . Alterable connector board between controller and machine
2219/34228 . . . Counter takes over measuring and pwm task from microprocessor
2219/34229 . . . SIU serial interface unit takes over communication task from microprocessor
2219/34231 . . . Interface controls either dc, ac or step motors
2219/34232 . . . Test with microcomputer self
2219/34233 . . . Multiplexed subsystem stores state of controlling microprocessor on switch off
2219/34234 . . . Each subsystem has own interrupt which is switched on during multiplex
2219/34235 . . . Control order of multiplexed axis
2219/34236 . . . Multiplex for servos, actuators
2219/34237 . . . Multiplexed d-a-a-d
2219/34238 . . . Hydraulic multiplexer
2219/34239 . . . Multiplex for whole system
2219/34241 . . . For reading data only
2219/34242 . . . For measurement only

2219/34243 . . . Single feedback sensor, transducer for plurality, one at a time, driven tools
2219/34244 . . . Multiplex for control only
2219/34245 . . . Address several motors, each with its own identification
2219/34246 . . . OOC object oriented control
2219/34247 . . . Machining objects are hierarchically organised
2219/34248 . . . Machining object comprises a slide, a palet, workpieces, machining, a contour
2219/34249 . . . Sub divide machining object in machining groups, geometry, start point, special
2219/34251 . . . Cnc works with different operating systems, windows, os-2, vms in parallel
2219/34252 . . . OSY operating system
2219/34253 . . . Unix
2219/34254 . . . Operating system controls selection and execution of program modules
2219/34255 . . . Msdos
2219/34256 . . . Api application programming interface
2219/34257 . . . OS-2
2219/34258 . . . Real time system, qnx, works together with non real time system, windows nt
2219/34259 . . . Common language run time CLR, MS-NET, DOTNET, java run time environment
2219/34261 . . . Windows, microsoft windows
2219/34262 . . . DDE direct data exchange, DLL dynamic library linking
2219/34263 . . . OLE object linking and embedding, OPC ole for process control
2219/34264 . . . Odbc open database connectivity
2219/34265 . . . Windows nt, windows-2000
2219/34266 . . . Windows-95
2219/34267 . . . Windows nt and cooperating real time extension
2219/34268 . . . Cnc and pic controlled alternately by same processor, using timer
2219/34269 . . . Programmable computer controller, plc implemented with pc
2219/34271 . . . Nc integrated into pic, plc, combination of commands
2219/34272 . . . Communication pc and nc, pic over file system of pc, direct access pc to nc, pic
2219/34273 . . . Pc and plc and nc integrated, pcnc concept
2219/34274 . . . Connect pc card to industrial bus, with additional timing and adapting logic
2219/34275 . . . Windows file server to control pc hosted boards under ms windows
2219/34276 . . . Pc has priority over cnc controller
2219/34277 . . . Pc bypasses robot controller processor, access directly encoders, amplifiers
2219/34278 . . . Motion control board, card, in pc
2219/34279 . . . Pc, personal computer as controller
2219/34281 . . . Osaka open system architecture for control in automation, umc universal machine control
2219/34282 . . . Using special api's allowing user access to control machine, motion, servo
2219/34283 . . . Using windows nt for general control and real time unix for motion, plc control
2219/34284 . . . Using an operator console and a motion chassis connected by network
2219/34285 . . . Open system architecture, in general
2219/34286 . . . Intelligent positioning I-O
2219/34287 . . . Plc and motion controller combined
2219/34288 . . . Plc as main controller for cnc
2219/34289 . . . Plc as motion controller combined and plc for work type dependant data, parameter
2219/34291 . . . Programmable interface, pic, plc
2219/34292 . . . Filtering noise I-O
2219/34293 . . . Image table
2219/34294 . . . Diagnostic, locate failures
2219/34295 . . . System, logic analyser, simulation
2219/34296 . . . Level conversion
2219/34297 . . . Analog input, comparator delivers interrupt
2219/34298 . . . Custom window between pic, plc and nc, programmable adapter
2219/34299 . . . Memory with I-O and pointer, external I-O with map, edit map, pointer to adapt I-O
2219/34301 . . . Nc system has direct access to I-O of pic, plc
2219/34302 . . . Plc controls movement via nc, no direct interface to servo
2219/34303 . . . PNC is plc, pic and nc cooperation
2219/34304 . . . Pc as input, edit device for plc
2219/34305 . . . Connect, disconnect host computer by sleep command from local pc
2219/34306 . . . Power down, energy saving
2219/34307 . . . On nc power on or off, synchronize power on or off of displays with own supply
2219/34308 . . . Power supply sets relay switch, allows push button or automatic switch on off nc
2219/34309 . . . Dual power supply, for digital circuit and for analog signals
2219/34311 . . . Energy saving by recuperating braking, deceleration energy
2219/34312 . . . Power supply for servo delivered by, derived from 4-20-mA current loop
2219/34313 . . . Power supply for communication delivered by, derived from 4-20-mA current loop
2219/34314 . . . Slow down, limit speed for energy saving
2219/34315 . . . Power supply turning on or shutting off
2219/34316 . . . Install nc system, check voltages, power supply with incorporated a-d
2219/34317 . . . Execute same program on different machines by differently addressing axis
2219/34318 . . . Verify if workpiece is already machined, by its weight
2219/34319 . . . Sequence as function of nc controlled axis position, axis zone
2219/34321 . . . Database for control of a single machine
2219/34322 . . . Initialize execution program at reference position on workpiece
2219/34323 . . . Commanding different axis in sequential order as function of direction of movement
2219/34324 . . . Switch some axis over to manual control, while other stay automatic
2219/34325 . . . Speed up, optimize execution by combining instructions belonging together
2219/34326 . . . Program controls two operations simultaneously in opposite directions
2219/34327 . . . Modify, adapt system response to signals from process
2219/34328 . . . Cueing commands table
2219/34329 . . . Generate extended plc program during machining, execution of nc program
2219/34331 . . . First processor filters instructions for indexing only, all other instructions for second controller
2219/34332 . . . Program execution as function of direction, forward or backward
2219/34333 . . . Multi threading
2219/34334 . . . Scalability
2219/34335 . . . First look ahead for acyclic execution, followed by cyclic execution
2219/34336 . . . Avoid deadlock, lock-up
2219/34337 . . . Manual to automatic, tracer
2219/34338 . . . Execute control tasks, programs as well as user, application programs
2219/34339 . . . Single step execution of program
2219/34341 . . . Choose between electronic cam or time-dependent as function of required machining accuracy
2219/34342 . . . Matching closest patterns stored in database with actual components
2219/34343 . . . Generation of electronic cam data from nc program
2219/34344 . . . Standby commands, let proces wait while program controls other process
2219/34345 . . . Database for sequential control of several machines by messages
2219/34346 . . . User program fetches part of system program when flags are set and detected
2219/34347 . . . Execute auxiliary function, tool change, while concurrent machining
2219/34348 . . . Coordination of operations, different machines, robots execute different tasks
2219/34349 . . . Proper allocation of control components to the required task
2219/34351 . . . Knowledge acquisition of environment
2219/34352 . . . Explore discrete event properties, reliability, parallelism, availability
2219/34353 . . . Independent positioning motor controlled by microprocessor only if event, limit, pulse passed
2219/34354 . . . DES discrete event system, deds discrete event dynamic system
2219/34355 . . . List of failure events, list of actions, events, trigger actions
2219/34356 . . . Compensation variable interrupt execution delay, interrupt jitter
2219/34357 . . . Interrupt driven message passing network
2219/34358 . . . Interrupt changed to uninterruptable interrupt
2219/34359 . . . Real time based interrupt to control axis, other function
2219/34361 . . . Mask for interrupts, inhibit during more important tasks
2219/34362 . . . Sampling interrupt is product of integer times scheduler interrupt
2219/34363 . . . Encoder generates interrupt to synchronize closed loop
2219/34364 . . . Delay interpolation interrupt as function of machining rates and feeds of machine groups
2219/34365 . . . After interrupt of operation, do other task and go on - resume operation
2219/34366 . . . Interpolation interrupt so as to avoid fractions of command pulses
2219/34367 . . . Interrupts, different tasks foreground, midground, background
2219/34368 . . . Priority
2219/34369 . . . Cause of interrupt is sensor and actuator failure
2219/34371 . . . Abrupt change in system dynamics
2219/34372 . . . Inability to process, execute assigned task within allocated time interval
2219/34373 . . . Actuator overloading
2219/34374 . . . False alarm states
2219/34375 . . . Generate interrupt after a certain number of position, counter pulses
2219/34376 . . . Management nc programs, files
2219/34377 . . . Selection out of several databases according to workpiece or conditions
2219/34378 . . . Erase plural programs in a single operation
2219/34379 . . . Job management
2219/34381 . . . Multitasking
2219/34382 . . . Preemptive multitasking, cpu decides upon priority scheme, which task to start
2219/34383 . . . Dynamic preemptive, special event register manages time slices for applications
2219/34384 . . . Execute next block after predetermined time
2219/34385 . . . Execute next block if largest axis distance is reached
2219/34386 . . . Advance program without M function completion signal
2219/34387 . . . Delay command as function of speed
2219/34388 . . . Detect correct moment, position, advanced, delayed, then next command
2219/34389 . . . After rough plunge grinding, initiate backoff grinding as function of delay wheel position
2219/34391 . . . Synchronize axis movement and tool action, delay action, simulation inertia
2219/34392 . . . Stop program on detection of undefined variable, symbol, enter definition, continue
2219/34393 . . . Stop program if needed workpiece, tool or data lacks, misses
2219/34394 . . . Execute a certain number of program blocks and stop
2219/34395 . . . Synchronize between panel and control
2219/34396 . . . Control different groups of functions, commands simultaneously, synchronized
2219/34397 . . . Synchronize manipulators and machine by using a reference clock for all
2219/34398 . . . Channel stops and waits for marker until other channel puts that marker
2219/34399 . . . Switch between synchronous and asynchronous mode of controllers
2219/34401 . . . Synchronize position controller drive with interpolator
2219/34402 . . . Synchronize programs for machines, processes, tasks, if one stops other also
2219/34403 . . . RTI real time, kernel, processing
2219/34404 . . . Allocate storage, memory in each processor for a copy of needed data
2219/34405 . . . Switch register banks, each storing process states, for quick real time execution
2219/34406 . . . Effect of computer, communication delay in real time control
2219/34407 . . . Calculate elapsed time, store in counter, start task when time elapsed
2219/34408 . . . Design real time control system
2219/34409 . . . Rnos real time networked operating system
2219/34411 . . . Handling time critical and time non critical program sequences
2219/34412 . . . Mark some sequences of time non critical sequences as locked, non interruptable
2219/34413 . . . Add time stamp to command message
2219/34414 . . . Maximize utilisation workstation
2219/34415 . . . Execute urgent jobs quickly
2219/34416 . . . Examine, analyse sensor data for co-exclusion sets, memorize, correlate actions
2219/34417 . . . Multiprocessor scheduling
2219/34418 . . . Scheduler for sequential control, task planning, control sequence
2219/34419 . . . Structure of control system
2219/34421 . . . Termination for each device, enables easy insertion, connection or disconnection
2219/34422 . . . Sbc single board computer
2219/34423 . . . Optical isolation, galvanic isolation
2219/34424 . . . Data flow architecture
2219/34425 . . . Same microprocessor for programming and for machine control
2219/34426 . . . Same hardware, servo controller for different control modes
2219/34427 . . . Diagnostic, monitoring incorporated in controller
2219/34428 . . . Lsi
2219/34429 . . . Servo controller near main cpu but remote from servomotor, integrated in cnc
2219/34431 . . . Main uninterruptable servo loop processor and interruptable servo event processor
2219/34432 . . . Speed and current control integrated into nc control system
2219/34433 . . . Multitask processor controls real time processor via communication memory
2219/34434 . . . Separate power controller for drive, servodrive, one per axis, connected to cnc
2219/34435 . . . Position encoder and motor connection in one interface between motor and microprocessor
2219/34436 . . . Interface circuit build into connector, dongle
2219/34437 . . . Parallel processing of functions, each layer has own sample rate
2219/34438 . . . Panel connected to nc by means of switch matrixes
2219/34439 . . . One cable between controller and amplifier, two between amplifier and motor
2219/34441 . . . Common communication interface for panel and remote I-O
2219/34442 . . . Control unit serves also to match drive motor to power supply
2219/34443 . . . Sensors and actuator integrated into tool
2219/34444 . . . Web control system, with intelligent control components each with web server
2219/34445 . . . Several power modules for same actuator, motor
2219/34446 . . . No change of operation mode when slave axis is out of synchronisation
2219/34447 . . . A microprocessor for programming and a microprocessor for control execution of program
2219/34448 . . . Integrated servo control circuit fixed to housing, remote from cpu
2219/34449 . . . Fault tolerant control, task from one microprocessor can be done by other
2219/34451 . . . False alarm states evaluation, threshold to verify correctness alarm
2219/34452 . . . Synchronize control with pulse, if loss, excess, error, then stop
2219/34453 . . . Stop spreading, propagation failure through system, inhibit drivers defect boards
2219/34454 . . . Check functioning controller, cpu or program
Different parameters are evaluated to indicate different faults
Authorize control of machine, robot if control panel has been connected
Emit alarm signal
Inhibit start or related control switches if path boundary is outside limits
Plausibility check on connection of module, control unit to machine
Inhibit access to area if dangerous, cover taken off
Interlock, stop motor if microprocessor starts interrupt, because no watchdog pulse from microprocessor
Alarm canceled automatically when program corrected
Adaptive threshold, level for alarm, eliminate false alarm
Safety, control of correct operation, abnormal states
Bad circuits, watchdog, alarm, indication
Try again program
Check memory by storing beforehand complement of expected result
Normally messages over network, if failure, messages from operator over I-O
Program memory is inhibited, not accessible as long as power fails
Configure alterable memory as read only, to avoid erasing
Inhibit control until control lever is first set to neutral position
Sense voltage drop of system, shut down servo
Detect abnormality of control system without inverted model, using input command
Local control predicts next command data from past stored data if host control fails
Fault prediction, analyzing signal trends
Urgent safety signals treated with hardware; others with software
Flush enclosure of circuit with air, keep clean air over pressure
EFC explosion free control, intrinsically safe
Redundancy, processors watch each other for correctness
Monitor absolute position independently by two processors, if out of range
Use dual channels
Same functioncode, program is fully used in normal and abnormal case
Monitor axis movement, speed, independently by two processors, if out of range
Redundant diagnostic controllers watch redundant process controllers
One computer, controller replaces other, backup computer
Watchdog with adaptive timeout as function of speed of motor
Count certain number of faults before delivering alarm or stop
Time out, decide only after a lapse, period of time
Supervision, display diagnostic, use or select between different stored screen
Display machining time and real time clock to control machining time
Nc in input of data, input till input file format
Data input, data handling, programming, monitoring of nc
Parametric machine control, direct control from cad data, no nc data
Kad kam knowledge aided design, knowledge aided manufacturing
Mechanical design and electronic design integrated
Sheet metal cad
Object oriented design
Cad makes template of tool as function of spindle, machine tool and set on spindle
Wow cad, world wide design and manufacturing
Dynamic simulation
Use of spreadsheet
Cad cam
Define workpiece, dimension from characteristics, strength, performance
From design, calculate additional parameters, for strength
Calculate production compensation, heat shrinkage, overetching
Analyse model, decide on number of sections to take
Finite elements analysis, finite elements method FEM
Determining bending die radius from part data, estimated radius and calculation
From product constraints select optimum process out of plurality of DTM means
Identify object characteristics, elasticity, density, hardness and select material
Calculate gear dimensions, tooth surfaces for optimum contact
Constraint based modeling, keep relationships between elements
Incremental constraint solving, keep relationships between elements
Design and manufacture jig
Design of machine tool, of cnc machine
Design for assembly DFA, ease of object assembly
Design as function of manufacturing merits, features, for manufacturing, DFM
Design of modular control system
Redesign, use former design
Check correctness, violation of design, rule check
Reliability by design, error free object
Adapt design to customer feedback
Design gear, tooth surfaces
Correct model by comparing 3-D measured data of modified workpiece with original model
Use medial axis transformation to decompose a domain, limits combinations
Combine, superpose model, foot data with style data
Model for analysis of workpiece displacement due to clamping, fixture
2219/35041 . . . Genetic algorithm for self-organizing designs
2219/35042 . . . Add finishing allowances to a cutter path
2219/35043 . . . Tool, fixture design
2219/35044 . . . Tool, design of tool, mold, die tooling
2219/35045 . . . Design tool for minimal tool change
2219/35046 . . . Design tool to minimize manufacturing, machining time
2219/35047 . . . Design tools in pairs, to be used together
2219/35048 . . . Recognition of punch shapes provided in die component catalogue
2219/35049 . . . BCL binary cutter location, rs494 standard CL format
2219/35051 . . . Data exchange between cad systems, cad and cam
2219/35052 . . . High level language conversion program, DXF format to nc format
2219/35053 . . . IGES initial graphics exchange specification
2219/35054 . . . STEP or PDES, standard for exchange of product data, form or surface data
2219/35055 . . . Data modeling language
2219/35056 . . . Manual entry of source, destination, data, format to be used for transfer
2219/35057 . . . Create also operation data concerning operating device
2219/35058 . . . Block cyclus time, time to prepare a block of data to be sent to machine
2219/35059 . . . Convert pcb design data to control data for surface mounting machine
2219/35061 . . . From cad make drawing with text for dimensions, scan it and read dimensions
2219/35062 . . . Derive mating, complementary, mirror part from computer model data
2219/35063 . . . Geometrical transformation of image
2219/35064 . . . Transform sketch by replacing free curves with mathematical curves, two display
2219/35065 . . . Undo part of design
2219/35066 . . . Modify design, modify shape, stretch, scale, add, delete
2219/35067 . . . Parametric function, group of lines, curves, change one, all change
2219/35068 . . . Command files, subroutines for drawing
2219/35069 . . . Derive missing surface from mirror part of computer model
2219/35071 . . . Drawing function, rotate designed figure, rotation
2219/35072 . . . Scale, zoom a designed figure
2219/35073 . . . Copy, duplicate a designed figure
2219/35074 . . . Display object, recognition of geometric forms
2219/35075 . . . Display picture of scanned object together with picture of cad object, combine
2219/35076 . . . Display from bottom or top side, adjust drawing lines, visible or not
2219/35077 . . . Display part and patterns to be machined on part, make selection
2219/35078 . . . Do not load non necessary or obstructive parts of drawing, remove from screen
2219/35079 . . . Features, functions like special relationship, assembly locations
2219/35081 . . . Product design and process machining planning concurrently, machining as function of design
2219/35082 . . . Product, feature based modeling, geometric and engineering info
2219/35083 . . . Parametric design, parameters for geometric design and for process planning
2219/35084 . . . Geometric feature extraction, concave and convex regions, object recognition
2219/35085 . . . Incremental feature recognition, extraction, changes are added as new features
2219/35086 . . . Machining feature extraction, geometry and machining parameters
2219/35087 . . . Hole extraction for sheet metal
2219/35088 . . . Using graph grammars to describe parts
2219/35089 . . . Feature definition language
2219/35091 . . . Feature conversion, from design to process features or else
2219/35092 . . . MBM modular boundary model, FFC face to face composition model
2219/35093 . . . Feature is stad single tool approach direction, or mtad multiple tool approach
2219/35094 . . . Object oriented feature finder
2219/35095 . . . Features library
2219/35096 . . . Kind of feature, rotational parts with machining features and relation
2219/35097 . . . Generation of cutter path, offset curve
2219/35098 . . . Automatic coarse, rough and finish cutting path generation
2219/35099 . . . Generation of cutter path for only a designated part of surface
2219/35101 . . . CC cutter contact path
2219/35102 . . . Isoparametric, contact points at intersection of parameter lines on surface
2219/35103 . . . CI cartesian method, apt style, cutter tangent, parallel to drive planes
2219/35104 . . . Steepest directed tree approach intelligent cutter path planning
2219/35105 . . . Polyhedral machining, cutter moved between centroids of adjacent surface triangles
2219/35106 . . . Contour map, cutter moved along contour lines, terraces of part surface
2219/35107 . . . Generate planar section toolpath
2219/35108 . . . Generate offset tool moving path in restrained curved plane
2219/35109 . . . Clean up region, volume left uncut by too large tool pass after finishing
2219/35111 . . . Automatically search for clean up regions, generate clean up tool pass
2219/35112 . . . Define object with spline, convert to raster, mosaic of points to make object
2219/35113 . . . Generation of compound, composite surface
2219/35114 . . . Generation of connection between two or more surfaces
2219/35115 . . . Project 3-D surface on 2-D plane, define grid in plane
2219/35116 . . . RFS rotation free surfaces, needs c x y z axis, non axis symmetrical surfaces
2219/35117 . . . Define surface by elements, meshes
2219/35118 . . . Generate intersection of offset surfaces
2219/35119 . . . Combine different forms, shapes
2219/35121 . . . Generate connection between two paths
2219/35122 . . . Generate random paths along a raster path
2219/35123 . . . Calculate volume of object
2219/35124 . . . Calculate center of gravity of object
2219/35125 . . . Surface with changing cone angle, different upper and lower surface shape
2219/35126 . . . Bezier or Ferguson surface
Select machining parameters with fuzzy logic

- Automatic selection of machining conditions, optimum cutting conditions

- Automatic generation of set up data as function of form to be machined, kind of operation

- Automatic selection of machining conditions as function of controlled machine

- Lookup tables for technology, machining parameters

- Automatic selection of machine type

- Decide if blank has to be measured beforehand

- Select machining parameters with fuzzy logic

- Constraint, machining constraint, process type like only milling possible

- Power constraint for horizontal and vertical cutting forces

- Machining parameter constraint, feed, speed, dimension of part

- Tolerance constraints as function of process capability and manufacturing costs

- Machining condition constraints, coolant, chip removal, previous forming

- Scallop hull generation and its offset, interference free offset

- Maximizing side step, constant CUSP, scallop height, smaller CL datafile for minimizing machining time

- Variable step over, from toolpath to toolpath

- Select optimum tool radius

- Variable step forward on same toolpath

- Surface ridges, cusps, scallops, distance of tool traverses as function of curvature

- Project workpiece and sheet on screen, position layout to be cut, store contour

- Manufacturing function, derive gripper position on workpiece from cad data

- Project workpiece and gripper, control relative movement, store result

- From design derive sequence of bending so that bending is possible

- Manufacturability

- From workpiece data derive tool data

- Design mosaic, cut tiles, paint tiles and pack mosaic

- From workpiece data derive assembly tool data

- Assemblability

- Combine component electronic catalog, cdrom with cad data to generate nc program

- Processability

- Use cad data to test function of designed part, design for test DFT

- Macroplanning, setup fixture cafp, library machine tables, sequence

- Parametric modelling, variant programming, process planning

- Planning, generic process planning

- Planning of toolstages, comprising selection tools, position and motion

- Microplanning, specific machining operations and parameters

- Design agent selects planning agent, which selects fabrication agent

- Object oriented planning

- Visibility maps, tool sees all points of interest on workpiece

- Propeller blade

- Generate composite surface by a single polynomial calculation

- Generate polynomial surface

- Generate path as function of precision and surface finish of each portion

- B-spline surface fitting

- 3-D cad-cam

- Predict surface machining precision

- Determine offset using closed ball expansion, 2-D square, 3-D cubic approximation

- Create part generic, derive from known part or combination of parts

- Superpose part of 3-D model on a straight, curved wall

- Define surface by cyclides, circular sections with variable radius

- Specify side of zone, line, circle for allowed region

- Generate tile patterns, mosaic

- Reconstruct free form surfaces

- Voxel map, 3-D grid map

- Enter data, calculate 3-D curve or surface, sculptured surface, okisurf

- Generation of nice looking composite surface

- Geometric modeling for swept volume of moving solids

- Generate model with haptic interface, virtual sculpting

- Modeling geometric, generation or forming of curved surface

- Part coding, description from 3-D cad database

- Group and retrieve similar designs from cad data

- Convert 2-D workpiece in rectilinear polygon, simplified skeleton

- From parts catalog, database, define part relationships, product definitions, specifications

- Group technology, identify and group similar parts, tools and machines

- Machinability, productivity, reject nc program if tool motion not possible

- Calculation of contact point of tool on surface, curve

- With nominal blank and model in memory define tool path and machine workpiece

- Determine orientation of workpiece

- Determine workpiece placement, nesting in blank, optimize, minimize loss material

- Generation of inverse offset surface, tool center on surface, tip shows offset

- Reverse engineering, camera and probe to inspect workpiece and machine are the same ones

- Automatic cutter selection

- Virtual boundary method to plan coarse and then fine machining

- Automatic toolpath generation and tool selection
2219/35209 . . . Modifying, adding machining features to elementary cad-parts as function of their assembling
2219/35211 . . . Using a search tree
2219/35212 . . . Estimating a cost associated with each operation, amount of time, target cost
2219/35213 . . . Minimize number of setups
2219/35214 . . . Setup planning, number of them, machines needed, part orientation, order
2219/35215 . . . Generate optimal nc program variant as function of cost, time, surface, energy
2219/35216 . . . Program, generate nc program, code from cad data
2219/35217 . . . Cagd computer aided geometric design, sbgd scanning based geometric design
2219/35218 . . . From cad data derive fixture configuration and assembly program
2219/35219 . . . From cad data derive cutting, stacking, sorting program
2219/35221 . . . Generate cutter path as function of speed, acceleration condition selected by operator
2219/35222 . . . From cad derive data points for endball mill, grinder, then radius compensation
2219/35223 . . . Tolerance, consider tolerance in design, design for assembly
2219/35224 . . . Kinematic tolerance analysis, variation in kinematic function as function of tolerance
2219/35225 . . . Tolerance in setup planning
2219/35226 . . . Analysis of tolerance propagation
2219/35227 . . . Use FMEA failure modes and effects analysis in tolerance assignment design
2219/35228 . . . Automated tolerance chain generation
2219/35229 . . . Code
2219/35231 . . . Biquinary code, 2-of-7 symbols
2219/35232 . . . Bed
2219/35233 . . . Octal
2219/35234 . . . First column has 1-2-4, second column has 8-16-32
2219/35235 . . . Decimal to binary
2219/35236 . . . Excess-code
2219/35237 . . . Under four is 0xxx, over four is 1xxx
2219/35238 . . . Gray-code
2219/35239 . . . Ternary code
2219/35241 . . . End, stop code of program
2219/35242 . . . To enable manual operation on detection of inserted code
2219/35243 . . . Inserted code calls parallel execution of another program, synchronize
2219/35244 . . . Select in corner different program according to inner, outer machining
2219/35245 . . . Expansion of control words, code of standard language to increase functionality
2219/35246 . . . Data handling for auxiliary functions as function of setting of switch, block delete
2219/35247 . . . Mode selection between two machining modes, laser beam and laser shutter control
2219/35248 . . . Pallet exchange code to get mating nc program
2219/35249 . . . In corner change cutting command to piercing command, to keep angle point intact
2219/35251 . . . Several M codes sent to several machines simultaneously
2219/35252 . . . Function, machine codes G, M
2219/35253 . . . To stop program until a cycle start key is pressed
2219/35254 . . . GPF, G preparatory functions, G111 indicate switch to polar, absolute to reference
2219/35255 . . . G112 switch to polar, relative to last polar coordinate
2219/35256 . . . Assign a macro to a key
2219/35257 . . . Macro, assign a name to macro
2219/35258 . . . A named macro can be called from a program, a key, a menu
2219/35259 . . . Divide program in machining division blocks, and name them
2219/35261 . . . Use of mathematical expression, functional equation
2219/35262 . . . Macro instruction, canned cycles, subroutines, subprogram
2219/35263 . . . Using variables, parameters in program, macro, parametrized instruction
2219/35264 . . . Reread same data
2219/35265 . . . Check time differences of command signals
2219/35266 . . . On error display code, message for recovery from fault
2219/35267 . . . Compare ram data to rom data, verify correctness, validity data, tolerance
2219/35268 . . . Detection of presence of rom cassette or similar, if coupled to internal memory
2219/35269 . . . Checking data, parity, diagnostic
2219/35271 . . . Checking electronics
2219/35272 . . . Watchdog, count or integrate number of data errors before alarm
2219/35273 . . . Sensor to detect functioning of signal conditioning elements
2219/35274 . . . Parity
2219/35275 . . . Excess in error
2219/35276 . . . Two identical tapes
2219/35277 . . . Double reader
2219/35278 . . . Checksum CRC
2219/35279 . . . Ignoring invalid program
2219/35281 . . . Detect overlap of program, if new data is entered before old is handled, stop
2219/35282 . . . Verify if loaded program into memory or stored into tape, cassette is correct
2219/35283 . . . Plausibility check for function, program, inhibit dangerous, unallowed program
2219/35284 . . . Programmed speed automatically limited to min and max transmission range speed
2219/35285 . . . Plausibility check for data, within permissible range
2219/35286 . . . Run tape without machining, tape proving, dry run, test run
2219/35287 . . . Verify, check program by drawing, display part, testpiece
2219/35288 . . . Verification of instructions on tape, direct or by comparing with reference
2219/35289 . . . Display machining state and corresponding control program
2219/35291 . . . Record history, log, journal, audit of machine operation
2219/35292 . . . By making, plotting a drawing
2219/35293 . . . Execute program and check block of data, on interrupt display block
2219/35294 . . . Display concentric circles
Display entire part and zoom of detail
workpiece, alarm if error
tool locus, workpiece
Use solid and wire frame plotting to display
Display entire image within an enlarged image
respect to workpiece
Shift view as function of shift of tool with
machining parameter, load motor
Display tool locus together with correlated
tool locus or indicated area
Scale image automatically to display whole
machining
Display of locus with possible correction of
display
Two, more pictures separated on screen,
display
Data handling
Setup data, includes scale, range, type, selected
together with part program
If a pattern contains another pattern, separate
date to avoid overlap
Discriminate between setup data and machining
data
Discriminate between data for servocontrol
directly and nc processing data
Group similar operations, to select correction,
compensation values
Generate data on component arrangement
Merge normal nc program with manual entered
monitoring, diagnostic criteria
Configure buffer dynamically, store two 3-D
blocks or one 6-D block
Fill buffer dynamically, track read out and
write in addresses, fifo
Only read buffer, advance tape while
machining with data from read buffer
Read and work buffer, machine while read in,
no switching between buffers
Read and work buffer, machine while read in,
buffers switched alternative
Data from read instead of work buffer, load
data directly to work buffer
Store variable block, word length into memory
Data storage, buffer

Stop test run, correct instruction or block,
restart test run
Inhibit operation if part shape not compatible
with raw material shape
Convert program to voice output to check
program
Print screen display
Verify if generalised data block has all words
required
On error, push button to reverse execution
mode of block, stop, correct
Set and store command code together with
display colour, detected on execution
Dry run, compare simulated output with desired
finished profile, alarm, inhibit
Real time analysis, check of program, just
before machining
Before machining, verify if all different
machining start points are correct
Interference of all tools of turret, or part of tool
base with chuck, workpiece
Print out of program on paper, on screen
Update simulator with actual machine, control
parameters before start simulation
Actual execution times acquired during
machining used in simulation
Remote simulation of machining program
Display working state, process
Display, validate tool path for boundary,
surface interference
Display workpiece and machine, chuck, jig,
clamp, tool
Projection, two, three section views
Interference checking between tool, machine,
part, chuck, machining range
Display tool shape, to select tool for program,
or for interference
3-D display of workpiece, workspace, tool
track
Show alternatively static and dynamic locus,
during static update of dynamic
Display only tool locus, dynamic
Display dynamic tool locus from entered start
point to present position
Point to two points on tool locus, calculate and
display value
Two, more pictures separated on screen,
display
Display of locus with possible correction of
machining
Scale image automatically to display whole
tool locus or indicated area
Display tool locus together with correlated
machining parameter, load motor
Shift view as function of shift of tool with
respect to workpiece
Display entire image within an enlarged image
Display only machined part
Use solid and wire frame plotting to display
tool locus, workpiece
Display raw material, blank, tool locus,
workpiece, alarm if error
Display entire part and zoom of detail

Display locus image only if tool advanced
over a defined distance
Display locus and corresponding actual block
Program has instruction to display specific
information
Display virtual tool, locus, part to check
possibility of execution next block
A mark for present position of tool, a mark for
end point of block, colour
Display finishing, finishing margin, work, tool
and chuck shape, different colours
Set colour change for a block, display locus for
that block in different colour
Display path and coating thickness and painting
time
Display part, programmed locus and not yet
machined, uncompleted portions of part
Display entry of high level program together
with corresponding nc program
VMMC: virtual machining measuring cell
simulate machining process with modeled
errors, error prediction
Replace tool by light emitter, operator checks
light path on workpiece
Different colour, texture as function of
distance, direction between tool and workpiece
Display part, programmed locus and tool path,
trajec, dynamic locus
While machining probe model, sense drawing
by same program, stop if deviation
By making a testpiece
While machining compare real path with
simulated, command path, contour display
Polar coordinates, turntable
Generate at jump a fictive instruction equal to
sum of previous instructions
Data handling
Setup data, includes scale, range, type, selected
together with part program
If a pattern contains another pattern, separate
date to avoid overlap
Discriminate between setup data and machining
data
Discriminate between data for servocontrol
directly and nc processing data
Group similar operations, to select correction,
compensation values
Generate data on component arrangement
Merge normal nc program with manual entered
monitoring, diagnostic criteria
Configure buffer dynamically, store two 3-D
blocks or one 6-D block
Fill buffer dynamically, track read out and
write in addresses, fifo
Only read buffer, advance tape while
machining with data from read buffer
Read and work buffer, machine while read in,
no switching between buffers
Read and work buffer, machine while read in,
buffers switched alternative
Data from read instead of work buffer, load
data directly to work buffer
Store variable block, word length into memory
Data storage, buffer
Remote instruction to operate machine tool

Special interface for manual input to pc on housing

Clamp detachable teaching box magnetically

DPC direct programming at the console compensate for contour error

Prepare seam data for each pattern size as
store as intermediate data

Divide scanned pattern in several closed area, reference line for stitching

Calculate midline of tapelike contour, as cutting conditions

Calculate allowable machining capability from

cutting conditions

Calculate midpoint of tape-like contour, as
reference line for stitching

Divide scanned pattern in several closed area, store as intermediate data

Prepare seam data for each pattern size as
function of scale and intermediate data

Decompose axis movement, group
components, interpolate separately, superpose pulses

Position data, calculate data to project
characters along curve

Calculate new position data from actual data to compensate for contour error

DPC direct programming at the console

Clamp detachable teaching box magnetically on housing

Special interface for manual input to pc

Manual device is automatically recognised and its interface selected

Remote instruction to operate machine tool

3-D three dimension, space input, spaceball

3-D joystick

Handle, joystick connected to n+1 wires for n degrees of freedom

Bird, free flying hand controller, receives signals from transmitters in space

Four and more-DOF hand controller, joystick, manipulandum

3-D matrix to input a 3-D surface, position displaced elements read by computer

Unit freely movable in space, detect its position, orientation by triangulation

6-DOF force reflective hand controller frhc

16-DOF glove attached to 6-DOF hand controller, superposition

18-DOF glove with fifteen load detectors on each finger, eighty one in total

Prepare, enter next program during execution of actual program, machining

User controls machine with eye motion, activates icons on display

Block selection, search

Enter code number directly for function, no use of function keys

Interactive

Format guide to guide user during input of data

During execution, display asks for parameters, operator answers, machine again

Enter part geometry and manually control path free, directly, real time, cutting

Display, if needed, tolerance memo data at place where real data must be input

Means, manual input, input reference, hand wheel

Decimal

Joystick

Keys or buttons

Production design metaphore, tool, operation like input system

Hand wheel turns resolver to control movement slide

Portable drill, screw driver to set position of axis instead of handwheel

Gesture interface, controlled machine observes operator, executes commands

Joystick for coarse and handwheel for fine movement

Ear protection, earphone

Potentiometer

Datasuit, arm sleeve, actor, operator wears datasuit and generates motion

Joystick and buttons for menu and function selection, scrolling, +sign and -sign

Mouse with additional wheel, switches for position control

Two axis foot pedal

Voice announcement, oral, speech input

Switch between joystick and pedal control

Foot pedal

Disk segments connected to different inputs of microprocessor, represent different positions

Joystick for coarse, rotary encoder for fine movement
G05B

2219/35458 . . . Control command embedded in video, audio stream, signal
2219/35459 . . . Knob, handle, handwheel delivers pulses, electronic handwheel, digitop
2219/35461 . . . Digitizing, menu tablet, pencil
2219/35462 . . . Mouse
2219/35463 . . . Trackball
2219/35464 . . . Glove, movement of fingers
2219/35465 . . . Hand wheel
2219/35466 . . . Select with mouse button coarse or fine movement control
2219/35467 . . . Select between control modes, jog, freeform, grid, corner, locate, contour, slot
2219/35468 . . . Select between teaching, regulate position and direct control of position
2219/35469 . . . Select with button specified picture, interrupt addresses selection table
2219/35471 . . . Select between run and step command mode, step forward, reverse
2219/35472 . . . Mode selection
2219/35473 . . . Input limit values of speed, position, acceleration or force
2219/35474 . . . Enter fuzzy command, instruction, like move closer
2219/35475 . . . Set tolerance values
2219/35476 . . . Switch from auto to manual if operator moves feedback detector, to set parameter
2219/35477 . . . Accelerate input data, exponent as function of pressure, time, turning speed
2219/35478 . . . Set flexibility of axis in working coordinates, to move real axis manually easily
2219/35479 . . . Set values, speed of machine as function of force, pressure, duration on key
2219/35481 . . . Display, panel
2219/35482 . . . Eyephone, head-mounted 2-D or 3-D display, also voice and other control
2219/35483 . . . Synoptic display for work shape during machining
2219/35484 . . . Use two image memories, update second memory while display first memory
2219/35485 . . . Library of images, pictures, select and modify each, compose them
2219/35486 . . . Use of two cursors on screen
2219/35487 . . . Display and voice output incorporated in safety helmet of operator
2219/35488 . . . Graphical user interface, labview
2219/35489 . . . Discriminate, different colour, highlight between two states
2219/35491 . . . Workpiece date display, position, height
2219/35492 . . . Display needed workpiece, tool or data to continue execution of program
2219/35493 . . . Display workpiece and tool data together
2219/35494 . . . Online documentation, manual, procedures, operator, user guidance, assistance
2219/35495 . . . Messages to operator in multimedia, voice and image and text
2219/35496 . . . Display cursor in changing colour to indicate that object can be selected
2219/35497 . . . Use colour tone, hue to indicate amount of processed quantity
2219/35498 . . . Synoptic display of available, selectable control modules with their functions
2219/35499 . . . Model of process, machine and parameters

2219/35501 . . . Colour display
2219/35502 . . . Display picture, image of place of error
2219/35503 . . . Eye tracking associated with head mounted display to detect eye position
2219/35504 . . . Multilingual communication, messages in different languages
2219/35505 . . . Display two windows, one with nc-data, other with general application data
2219/35506 . . . Camera images overlaid with graphics, model
2219/35507 . . . Spider, radar, parallel axes, multivariate plot
2219/35508 . . . Operator chooses among different GUI formats
2219/35509 . . . Double large character on screen
2219/35511 . . . Cursor on screen
2219/35512 . . . Display entered, measured values with bargraph
2219/35513 . . . Setting tool condition, tool set in tool exchanger, present or not
2219/35514 . . . Display tool data
2219/35515 . . . Workpiece set condition, workpiece present or not
2219/35516 . . . Three linear movements in a single plane for three actuators
2219/35517 . . . Use same data, program for workpieces with different length, but same profile
2219/35518 . . . Superposition data, three memories for 2-D projection and z profile and surface structure
2219/35519 . . . Machining data and tool data
2219/35521 . . . Machining and parts on workpiece arrangement data, machine each, then cut out
2219/35522 . . . Database for standard machining data and for personal machining data
2219/35523 . . . Data one bit better than measurement, rest accumulated in memory
2219/35524 . . . Approach data and machining data
2219/35525 . . . Use same data for different operations, coarse and fine, cutting and grinding
2219/35526 . . . Number of workpieces to be machined, cut
2219/35527 . . . Range of number of workpieces to be machined, cut
2219/35528 . . . Create machining conditions database by analyzing actual machining nc program
2219/35529 . . . Monitoring current machining, store information in database as a new working case
2219/35531 . . . Operator inputs manually evaluation of current machining
2219/35532 . . . Comment, work directive, message to operator and control signals together
2219/35533 . . . Use, input 2-D data, sectional profile to machine 3-D surface
2219/35534 . . . Conversion input data
2219/35535 . . . Decimal to binary
2219/35536 . . . Digital to analog
2219/35537 . . . Bed to phase
2219/35538 . . . Bed to decimal
2219/35539 . . . Gray to frequency
2219/35541 . . . Bed to 5-2-1-1-code
2219/35542 . . . Bed to binary
2219/35543 . . . Cartesian to polar and vice versa
2219/35544 . . . Convert male to female form, die to stamp form
2219/35545 . . . Serial to parallel conversion
2219/35546 . . . Convert input data to execution data
2219/35547 . . . 1-to-8-bit conversion
2219/35548 . . . 1-to-16-bit conversion
Function

2219/35549 . . . Convert buffer content to executable data in case of short execution time
2219/35551 . . . Convert and select between EIA and ISO code
2219/35552 . . . ISO and EIA code detected by difference of parity bit
2219/35553 . . . Convert ISO or EIA code to internal or standard code
2219/35554 . . . Mirror, other conversions
2219/35555 . . . Turn figure over 90-degrees or 180-degrees, convert data for new state
2219/35556 . . . Conversion inch to metric
2219/35557 . . . Workpiece related data to axis related data
2219/35558 . . . Convert speed value into two signals sin, cos representing position
2219/35559 . . . Convert 15-bit image into 20-bit image
2219/35561 . . . Analog to digital
2219/35562 . . . Radius to diameter
2219/35563 . . . Use of conversion tables
2219/35564 . . . High speed data processor between host and nc for direct conversion of data
2219/35565 . . . Communications adapter converts program to machine or controls directly machine
2219/35566 . . . Use of only delta x values, no absolute values
2219/35567 . . . Each block contains connection, index to other blocks, to form patterns
2219/35568 . . . Array structure corresponding to display format
2219/35569 . . . Single block format indicates change of speed at start and end
2219/35571 . . . Table with constant speed and corresponding distance for each segment
2219/35572 . . . Data contains header and type of data
2219/35573 . . . Header has code to select proper load program
2219/35574 . . . Header with information for display position
2219/35575 . . . Part program contains movement and condition statements
2219/35576 . . . Data divided in blocks to be covered by small movement, to origin by large movement
2219/35577 . . . Delta x, delta v and delta t
2219/35578 . . . Gerber, hp format to drive plotter or similar xy device
2219/35579 . . . Store motion parameters as function of encoder position
2219/35581 . . . Position data for module and position data within module
2219/35582 . . . Control format in browser, use of xtm and xslt
2219/35583 . . . Difference between signals and sign of difference are the controlling signals
2219/35584 . . . Link geometry, workpiece data with machining data, select region
2219/35585 . . . Motion command profile
2219/35586 . . . Position, time and slope, tangent of curve
2219/35587 . . . Store curves with packed code, indicating bezier curve parameters
2219/35588 . . . Pack, compress data efficiently in memory
2219/36 . . . Nc in input of data, input key till input tape
2219/36001 . . . File format, initial graphics exchange specification, iges standard
2219/36002 . . . Dimensional measurement interface specification dmis standard
2219/36003 . . . Start key, switch to start performing program
2219/36004 . . . Program mask depends on physical position of panel
2219/36005 . . . Same knob, different functions, turn for position, push and turn for speed
2219/36006 . . . A key delivers a series of key codes
2219/36007 . . . Special keys, automatic switch over x or y to numerical values
2219/36008 . . . Illuminated, lighting up keys, build in led, display, show sequence data entry
2219/36009 . . . Keys with variable control code, multifunction keys
2219/36011 . . . Page key, go to next or previous page
2219/36012 . . . Percentage keys, input percentage values
2219/36013 . . . Up-down keys for calling sequentially functions, parameters
2219/36014 . . . Overlay to indicate function of key
2219/36015 . . . Display areas, fields on screen correspond to position of keys on panel, matrix
2219/36016 . . . Unified language for machines and translation to each
2219/36017 . . . Graphic assisted robot programming, display projection of surface
2219/36018 . . . Language for dimensional measuring, inspection
2219/36019 . . . Using interpreted descriptive measuring, using interpreted descriptive commands giving G-codes
2219/36021 . . . Switch high level and assembly, machine language as function of capacity memory and speed
2219/36022 . . . Switch between machining language for execution and high level for editing
2219/36023 . . . Attribute programming
2219/36024 . . . State language
2219/36025 . . . Link, connect icons together to form program
2219/36026 . . . Combine general high level language and specialised plc language
2219/36027 . . . Decompiler, translate machine code to hll, reverse processing, easy modification
2219/36028 . . . C++
2219/36029 . . . Basic
2219/36031 . . . Programming in assembler, machine or high level language
2219/36032 . . . Script, interpreted language
2219/36033 . . . High level graphics language, gks
2219/36034 . . . APT
2219/36035 . . . Special language, task programming, oop object oriented programming
2219/36036 . . . Motion, graphical motion control language gnc
2219/36037 . . . Application programming interface associates component code with driver function
2219/36038 . . . Ladder program for plc, using functions and motion data
2219/36039 . . . Learning task dynamics, process
2219/36041 . . . Edit program step by step
2219/36042 . . . Point to defect, faulty instruction or locus, call up corresponding command block
2219/36043 . . . Correction or modification of program
2219/36044 . . . Program modified after breakage, crash, jamming
2219/36045 . . . Skip of program blocks, jump over certain blocks
2219/36046 . . . Adapt, modify program as function of configuration of machine
Menu keys, function of keys soft defined
Menu, help menu for operator, messages
Programmable, configurable function keys, needed for part program
recall for quick data entry
Store statistical history of selected menus, Operator menu with submenu for each item
select mode
Tree oriented menu, go to root, scroll up down, Mouse with buttons to assist operator with selection of menu instead of pointing
Adapt interactive dialog, help to experience, short cut menu
Machining parameters, modification during operation
Modify offset for whole sections collectively, different offsets for sections
Separate, temporary memory or special storage region for corrections only
Modify, program machining order in real time, during operation, dynamically
Select center of pattern for placement of new scaled pattern
Modify workpiece part program without changing approach program
Modify approach program as function of changed part program
Storage, memory area to store history data for previous corrections, editable
Verify if editing, modifying program is suitable for connected controller
During machining, compare simulated with detected profile, correct, modify program
Modify data by using the four rules of arithmetic such as +, sign, -, sign, x, sign, /, sign
Modify data by entering a compensation rate value
Collectively modify data instead of each in particular
Altering working order of program blocks
Modify program at allowed point of time or program step
Display, on machining error, display error message and correct program
Simulate on screen, if operation value out of limits, edit program
Select pattern, input modification of tolerance
Display original and modified part in different colour, highlight, shading, filling
Display part, select, mark element and edit corresponding block
Set certain command codes, discriminate codes and display in different colour
Select icon and display corresponding instructions
Display and select, modify shape, pattern on screen
Insert, read in new command instruction to modify fixed program
Replace faulty instructions and execute only that portion of the program
Merge, mix original program with taught program
Delete a block by overwriting block with delete control character
Insert a block by using insert control character pointing to address in memory
Insert a block by using insert control character pointing to address in memory
Amend, modify program by inserting wait and wait dismiss command
Replace faulty instructions from rom, tape by instructions from ram, error setting
Select, modify machining, cutting conditions
Edit, modify program for position errors, moving path, use conversion matrix
Machining parameters, override
Machining parameters, modification during operation
Modification, override as function of conditions, distance
Override limit contour
Lookup table with override for each pattern, tool path
Inhibit or permit override by separate manual switch
Inhibit or permit override by program instruction
Override program by selecting another font, size for letters
Override program to scale workpiece
Override program to execute a certain number of same blocks, repeat pattern
Stop machine and correct position manually
During machining keep override log, history, journal, kind of record playback
Display override log and nc instructions, select nc block to modify permanent
Adapt, update machining parameters automatically as function of state of processing
IC card
cd rom
Cassette
Bubble memory
Eeprom, earom, erom
Flash memory
Local memory instead of tape, or combined
Floppy disk, diskette
Rom
Eeprom, prom
Card
Harddisk
Magnetic tape cassette
Adapt interactive dialog, help to experience, short cut menu
Mouse with buttons to assist operator with selection of menu instead of pointing
Tree oriented menu, go to root, scroll up down, select mode
Operator menu with submenu for each item
Store statistical history of selected menus, recall for quick data entry
Screen with certain display menu called by pointer, number
Select out of library, beforehand only functions needed for part program
Programmable, configurable function keys, execute a programmed sequence
Menu, help menu for operator, messages
Function menu, switches, keys replaced by menu
Menu keys, function of keys soft defined
Cyclic selection of functions or values by pushing a single key
Selection of menu with lightpen on screen, display
MMI, HMI: man machine interface, communication
Osf-motif standard
Link between sequence, motion or process and diagnostic control
User configurable graphics selected as function of kind of machining, display builder
Configuration of display device, operator panel
Configuration of operator panel, using os-2 modular programs, masks
Edit templates for screen display, and use of keyboard
Configuration with visual basic extension
Using window display, selection of function calls in a window
Use of icon to represent a function, part of program
Display of not allowed function in a different way, light
In case of alarm a window is maximised automatically
Group windows into coherent sets to facilitate a task
Limit number of windows displayed simultaneously
Main process, alarm window takes priority, always on top, safe view
Window, X window
Display is a TV
Panel
Two, several consoles, displays, panels, two different input, joystick
Two displays, for part shape and for corresponding instructions, block
Plc switches functions of panel when changing kind of machining
Keyboard as a drawer
Pendant control box for handwheel control, mounted on controlled axis
Panel for disabled, scanned sequentially
Detachable or portable programming unit, display, pc, pda
Common program panel for nc, pic, switch display diagnostic or part
Pendant control box
Local as well as remote control panel
Common CRT for two input devices
Common program panel for host and cnc, at cnc place, for data from host, cnc
Several panels can be selected by rotation, limited space needed
Use camera of handheld device, pda, pendant, head mounted display
Touchscreen
Remote, host controlled, operated manual data input, keyboard
Edit velocity, motion profile, graphic plot of speed as function of time, position
Select block, item, highlight, colour this block with respect to rest
Combine record play back, hand wheel with normal cnc programming, software
Program divided into modules
Capture image of part, create automatically geometry, sequence of machining
Edit servo control parameters
Derive finishing allowance, tolerance from shape and work information
Combine nc programming with cad and order system
Input part data, dimensions, without graphical representation of part
First block contour then parameter input
Offline teaching is sound assisted
Record actions of human expert, teach by showing
Application, for cylindrical groove shape
Programming languages for lathe, mill or general use mixed
End shape data input for end surface configuration
Deep drilling cycle
Wheel dressing program
Prepare rough, coarse machining program
End facing
Semi finish and finish machining
Taper angle machining
Assembly, mount of electronic parts onto board
Grinding cycle
Non circular workpiece, radius and angle input
Gear, thread cutting
Laser cutting
Hole machining
Freeform surfaces
Bending of workpiece, also for long slender workpiece
Lathe, turning
For aspheric non symetrical mirrors
Embroidery
Involute curve, compressor
Roll grinding
Specify hole shape pattern for boring and store in hole file
Using different cutter sizes, largest as possible for minimizing machining time
Using generic virtual pocket, having virtual boundary, arbitrarily shaped
Grouping of decomposed volumes with similar features
Pocket machining, area clearance, contained cutting, axis milling
Insert automatically program sequence, for corner execution, avoid machining error
Replace entered position data with previous if difference less than tolerance
Commands trigger programming functions
Reuse stored data as programming data after confirmation
G05B

2219/36219 . . . Calculate machining information, like time, surface to be machined from program
2219/36221 . . . Entry of chamfer, beveling, rounding of corner shape
2219/36222 . . . Indicate entered element on top, next element below, after input, update top
2219/36223 . . . Enter machining conditions, determine automatically machining data
2219/36224 . . . Enter machining and positioning elements, derive order of execution in real time
2219/36225 . . . Select and insert program from library, select case, variant
2219/36226 . . . Global selection of grid or circle of points by number, distance, angle
2219/36227 . . . Assist operator to calculate unknown points, contours
2219/36228 . . . Combine two programs to obtain new shifted positions and new processing data
2219/36229 . . . Generate missed line when last end point is different from next start point
2219/36231 . . . Translate, convert machine independent to machine dependent program
2219/36232 . . . Before machining, convert, adapt program to specific possibilities of machine
2219/36233 . . . Convert program so that it can be executed in reverse order
2219/36234 . . . Convert program for a 2-axis machine into program for 4-axis machine
2219/36235 . . . Convert grinding machine oriented language to nc machine oriented
2219/36236 . . . Convert character, ascii, text code to internal code and vice versa
2219/36237 . . . Prepare nc program for selected, distinct nc machines
2219/36238 . . . Derive marking from punching program, secondary from principal program
2219/36239 . . . Determine automatic, manual machining of workpiece as function of specific possibilities of machine tool
2219/36241 . . . Convert, translate milling to laser machining program
2219/36242 . . . Convert program for different machines with different M-code, G-code, header
2219/36243 . . . Convert source, high level code to machine, object code
2219/36244 . . . Means, use of tables, correlating functions to instructions
2219/36245 . . . Use of tables to store order of execution of functions
2219/36246 . . . Comments, messages displayed with program instructions, explain process
2219/36247 . . . Remarks, comments as hierarchical structure, indented, corresponds to instructions
2219/36248 . . . Generate automatically machining, stitching points from scanned contour
2219/36249 . . . Generate automatically a balance program for workpiece, dynamic balance
2219/36251 . . . Superpose scanned or finished object image on workpiece model for best fitting
2219/36252 . . . Generate machining program based on a simulation to optimize a machine parameter
2219/36253 . . . Generate machining program from previous test run

2219/36254 . . . Generate machining program from history of similar tools
2219/36255 . . . Machining condition, parameter is workpiece conciety, inclination between surfaces
2219/36256 . . . Define upper lower limit of reciprocating machining, chopping
2219/36257 . . . Indicate region and kind of machining on shape of part
2219/36258 . . . Machining planning, indicate kind of operation
2219/36259 . . . Indicate primary and secondary operations on shape, deliver nc data for each
2219/36261 . . . Program with subroutines for machining process
2219/36262 . . . Input workpiece mounting position, setup
2219/36263 . . . Select cutting direction
2219/36264 . . . Program movement from first to second machining area
2219/36265 . . . Set machining start point from tool, machining data avoiding interference
2219/36266 . . . Tool path editor, for offset, multi-passes
2219/36267 . . . Process planning editor
2219/36268 . . . From blank and finished entered shape, derive machining features
2219/36269 . . . Separate machining data as function of dependence or independance of material
2219/36271 . . . Enter, edit workpiece data
2219/36272 . . . Enter start position, program number for each workpiece
2219/36273 . . . Use general and tool data to select available tool and machining operation
2219/36274 . . . Automatic calculation cutting conditions, but operator can enter them also
2219/36275 . . . Select automatically transmission conditions, but operator can enter them also
2219/36276 . . . Program virtual, logical tools, select tool from tables
2219/36277 . . . Flexible fixturing, clamp workpiece, mark clamp regions and store them
2219/36278 . . . Topological classification of forming, machining process
2219/36279 . . . Machining parameter is strategy for making corners
2219/36281 . . . Machining parameter is technology: surface roughness, corner, contour tolerance
2219/36282 . . . Divide complex sculptured surface into smaller, easier to machine areas
2219/36283 . . . Select, enter machining, cutting conditions, material file, tool file
2219/36284 . . . Use of database for machining parameters, material, cutting method, tools
2219/36285 . . . Display symbol pattern for kind of machining performed
2219/36286 . . . Show shape of workpiece, point to coordinates to enter machining parameters
2219/36287 . . . Selection of speed as function of tool diameter
2219/36288 . . . Select machining method, parameters as function of dimensions of workpiece
2219/36289 . . . Cutting, machining conditions by optimisation of time, cost, accuracy
2219/36291 . . . Cutting, machining conditions by empirical equation, like tool life
2219/36292 . . . Method to drill, machine based on ratio bore depth, diameter, select tools
2219/36293 . . . Set feed and speed for specified tool, workpiece as function of ratio cutting force, speed
2219/36294 . . . Stored coefficients, standard cutting conditions, calculate for entered material
2219/36295 . . . Select optimum process for manufacturing articles with longer life
2219/36296 . . . Order, select, determine, change machining sequence, order
2219/36297 . . . Machining plan, indicate order of machining as function of presence of operator
2219/36298 . . . Enter, change order of different programs to be executed
2219/36299 . . . Generate sequences of operations starting from finished product, end with raw
2219/36301 . . . Optimisation of sequence of operations
2219/36302 . . . Determine several machining processes and order as function of available tools
2219/36303 . . . Determine several machining processes and order as function of number of mountable tools
2219/36304 . . . Divide into several machining processes, divide each also in several sub processes
2219/36305 . . . Table, correlation tool type and machining category, process
2219/36306 . . . Table correlation different turrets, slides and possible simultaneous operations
2219/36307 . . . Table with workpiece features and corresponding machining parameters, methods
2219/36308 . . . Table for cutting conditions
2219/36309 . . . Program has different modules, each with own load program
2219/36311 . . . Machining mode selection, pocket, grooving, raster, area, profile
2219/36312 . . . Enter shape with cursor, joystick directions up, down, left, right, slash
2219/36313 . . . If elements cannot be combined, show error
2219/36314 . . . Superpose and combine shapes
2219/36315 . . . Library for shapes of tool holders, fixtures, chucks
2219/36316 . . . Define profile from elements, show only selectable elements
2219/36317 . . . Input symbol for element, search in library and display
2219/36318 . . . Enter start, begin and stop, end point
2219/36319 . . . Simplify display, calculation of shapes by deleting holes, grooves
2219/36321 . . . Program only shape, add approach path and machining conditions automatically
2219/36322 . . . Program shape interactively and tool change position manually by teaching
2219/36323 . . . Shape is alphabetical character
2219/36324 . . . Scan drawing, sketch of part, enter on screen coordinates, lines, circles
2219/36325 . . . Enter shape with mouse, tablet, enter on screen coordinates, lines, circles
2219/36326 . . . Define blank, part, area
2219/36327 . . . Define shape of part
2219/36328 . . . Display closed shape
2219/36329 . . . Display path on cylinder by developing cylinder into a plane
2219/36331 . . . Display block with cursor or highlight actual contour element
2219/36332 . . . Display different faces of work in different colour
2219/36333 . . . Selection from standard forms, shapes, part programs, enter value for variable
2219/36334 . . . Select a shape, select a point or line and enter data
2219/36335 . . . Select and show already defined lines, circles to define from them new element
2219/36336 . . . Select a shape and use it to create a similar shape
2219/36337 . . . Select similar shape and derive motion defining sentences from original shape
2219/36338 . . . Create program for parallel, simultaneous operated slides, timing
2219/36339 . . . Time necessary for one slide equals time for second slide
2219/36341 . . . Prepare program to control multiple slides at the same time
2219/36342 . . . Tool path processing, sequence to cut paths
2219/36343 . . . Select machining method as function of selected tool
2219/36344 . . . Display different tools in different colours
2219/36345 . . . Prepare program for minimal idle strokes with multitool turret
2219/36346 . . . Display feed quantity and cutting speed as function of material to help user
2219/36347 . . . Select tool if tool life duration is sufficient for operation
2219/36348 . . . Enter, edit tool, cutter data
2219/36349 . . . Compensation part program with form of tool, in memory
2219/36351 . . . Display tool shapes to select tool and enter tool dimensions
2219/36352 . . . Select tool as function of part shape, number of grooves and groove width
2219/36353 . . . Display different offset surfaces in different colours to select right tool
2219/36354 . . . Select from table with machining type and corresponding tools
2219/36355 . . . Select tool with fuzzy logic
2219/36356 . . . Select tool as function of collision avoidance
2219/36357 . . . Tool line up, select right order of tool, optimal tool order loading, tool file
2219/36358 . . . Use of cd rom with catalog of tools
2219/36359 . . . As function of tool location
2219/36361 . . . Tool change time, program for optimal tool change time
2219/36362 . . . Tool change time as function of location in tool magazine, index
2219/36363 . . . Tool change time as function of cutter trajectory, spindle and slide times
2219/36364 . . . Tool change time as function of tool switch time, to replace tool with another
2219/36365 . . . Program so that minimal tool changes are needed
2219/36366 . . . Data, read in, distribution
2219/36367 . . . A tape reader for each axis
2219/36368 . . . Tape reader
2219/36369 . . . Measuring object, spectacle glass, to derive position data
2219/36371 . . . Barcode reader
2219/36372 . . . Light, magnetic pen
2219/36373 . . . Common tape reader for two controllers
2219/36374 . . . Dual, multiple tape reader
Combination of two devices, floppy disk and tape reader
Read out of memory synchronized with machine driven axis
Read of several jobs
Either from tape or other source, using same electronics
Read in
Timing, synchronization, start of reader
Speed of read in of data as function of available power for driving servo, safety
Manual input combined with input from computer or tape
Load machining program and workpiece delivery program together
Transfer, load data from rom, bubble memory into ram
Bootstrap loader
Interface between reader and nc
Simulate reader to input data direct to nc, behind tape reader BTR
Switch between input from internal manual thumbwheel and external input
Keep subsystem stopped while load of program
Rewrite date if power loss, check flag area, marked at start, end of writing
Variable read in speed, from max to zero, controls execution speed of program
Read in data from connected pc instead of nc control panel
Load local computer program from host, data transfer ram to rom, BTR
Load also function code needed to execute part program, compact controller
Read reference data only after certain delay, to be sure data will not change
Read of handwritten text
On excess error or on release joystick stop movement, dead man, shut off motors
Record play back, teach position and record it then play back
Use rope, wire, cable, chain to record position and for playback
Incremental detector of position deviation attached to tool for correction
Adapt taught position as function of deviation 3-D, 2-D position workpiece
Adjust path by detecting path, line with a photosensor
Use a spring or gas pressure to keep tool on desired path
Follow path with probe, store deviations for correction during normal operation
During machining, store begin and end of region not finished during first pass
Geometric adaptation by sensing force on surface of workpiece, object
By coarse model of robot to modify commands, learned by feedforward controller
Fine, autonomous movement of end effector by using camera
Adapt playback as function of hardness material, time comparison to reach start point
Compare image detected path with stored reference, difference corrects position
Adjust path and attitude tool by detecting path, line with a photosensor, laser
Adapt taught position as function of deviation 3-D, 2-D position of end effector, tool
Programmed coarse position, fine position by alignment, follow line, path adaptive
Modify trajectory by operator gesture, gesture force sensed by end effector
Compare modified, corrected path with stored reference, difference too large alarm
Assist in correction of position to form a circle or line
During teaching shut off, disable motor to move arm easy
During teaching release brake or decouple clutch from motor
Balance mechanically arm to be moved
Move manually, touch surface, record position
Pilot lamp on end effector to guide operator
Jog feed to a command position, if close enough robot takes over positioning
During teaching set torque instruction for motor to zero
Power assisted positioning
Tv camera in place of tool, on display operator marks points, crosshair
By putting some constraints on some DOF, move within limited volumes, areas, planes, limits motion in x, y or z planes, virtual reality constraints
Position assisted teaching
During teaching direct control signal to power servo for quick response
Electromyographical, myoelectric control signal
Arm follows movement of handheld device, camera detects, analyses motion
Follow coarse programmed surface, detect contact feeler or no force, record point
Manually selection of points on surface to select area to scan automatically
Guide arm in path by slaving arm to projected path, beam riding
Follow contour, line with sensor and record points
Automatically teaching, teach by showing
Auto follow coarse contour, operator can correct contour before recording
Contour, teach contour of sawblade
Mode selection between large displacement and precision work
Keep tool stationary, move workpiece
Project light on path to be followed, keep also distance constant
Teaching, consider workpoint on workpiece temporarily as tip of end effector
During teaching use standard subroutines, assemble them to macro sequences
Handheld toollike probe, work instructor, lightweighted, connected to recorder
Touch points with handheld probe, camera detects position and orientation probe
To be installed

Position and force

Record position, motion and sound

angle, compensate, extra feed

Memorize workpiece deviations as function of

Memorize open and closed state, motion

shift data, independently modified

Each taught point has a correlated amount of

instructions

Recording of position and of command

position, measured data

Record at predetermined distances, read in

position on trigger of touch probe

measured data

Record on predetermined time, read position,
coding wheel

previous position exists

Record points if sufficient difference with

enabled otherwise select local remote

When operator near robot, local pendant is

enforced otherwise select local remote

Record points if sufficient difference with

position exists

Timing record position according to pulses
coding wheel

Record on predetermined time, read in position,
measured data

Record position on trigger of touch probe

Record at predetermined distances, read in
position, measured data

Recording of position and of command
instructions

Recording mechanical properties, tonal quality
by force detection

Each taught point has a correlated amount of
shift data, independently modified

Memorize open and closed state, motion
parameters at each start up

Memorize workpiece deviations as function of
angle, compensate, extra feed

Record position, motion and sound

Record motion and emotion, mimics

Position and force

Contour of workpiece where other workpiece is
to be installed

Record position and orientation, posture of
probe, tool

Position of stillstand if no reverse and
acceleration only, data compression

Record position and inclination of tool, wrist

Recording position and other parameters,
current, tool diameter, voltage

Memorize open, closed state of hand and
corresponding motion parameters such as open,
close and move, no move

Select program, main and secondary program

Main and secondary program for repeating
same operations

Part program, workpiece, geometry and
environment, machining dependant, combine

For each contour a tape, a program

Ram for variable servo data, rom for fixed
servo routine

Adapt program to real coordinates, software
orientation

Adapt program to real coordinates, shape,
dimension of tool, offset path

Compare stored conditions to actual, adapt
program

Store in Rom and Ram

Select program or execute command, control
instructions as function of axis position

Each pallet, workpiece, tool holder, selects
corresponding tape reader, program

Select as function of shape, dimension of
workpiece

Select by a detector

Select by a selector, dip switch

Select out of a plurality of programs, patterns

Select by force, height or other detection

As function of material or pattern direction,
nerves of wood for optimal cutting

Select acceleration deceleration profile as
function of kind of machine

Selecting nc program points to mated
manipulator, robot program

Selection of calibration program as function of
parameter to be calibrated

After sporadic change of program, return to
program in use before

Select by combination of detected force,
acceleration, speed, work rate

Select program using a management,
workpiece number

Select with code on workpiece, fixture, clamp,
object

Selection of Rom and ram

On bad data block, reverse motion, correct and
execute block

Regenerate, hold reference previous block for
bad actual value, block

Separate input for machine data from operator
and for program from programmer

Interlock, inhibit nc control while transferring
data from host

Warn, alert, notify operator to confirm a preset
override value, command

Inhibit, ignore or postpone new command if
previous is still in execution
2219/36532 . . . Detect overflow of buffer  
2219/36533 . . . Writing critical contour data as a whole, inhibit read out during writing  
2219/36534 . . . Manual input overrides automatic control  
2219/36535 . . . Check if instruction is executable, if not message to operator  
2219/36536 . . . Inhibit, forbid, prevent execution of program if no tool or worpiece data  
2219/36537 . . . On error acoustic signal  
2219/36538 . . . Different tunes, melodies, voice patterns for different error indication  
2219/36539 . . . Different colours for program and machine error, failure display  
2219/36541 . . . Operation command stored in register, on completion also in other register  
2219/36542 . . . Cryptography, encrypt, access, authorize with key, code, password  
2219/36543 . . . Input a standard value automatically on power up or after power loss  
2219/36544 . . . Inhibiting manual control while under automatic, other control vice versa  
2219/36545 . . . Safety, save data at power loss  
2219/36546 . . . Memory protection, protected fields  
2219/36547 . . . Use binary code to avoid program tampering  
2219/36548 . . . Save data if trigger signal received  
2219/36549 . . . Regenerate faulty program block from previous and next block  
2219/36551 . . . Inhibiting control after detecting data error  
2219/36552 . . . Inhibiting simultaneous input from local and remote keyboard  
2219/36553 . . . Track, channel on tape for each direction of movement  
2219/36554 . . . Copy modified, corrected program to another tape, keep original intact  
2219/36555 . . . Two tapes, programs one for position data, one for commands  
2219/36556 . . . Compare, check original tape with converted, copy tape  
2219/36557 . . . Copy entered program in memory to tape  
2219/36558 . . . Forward and backward reading of tape, reverse execution program  
2219/36559 . . . Copy one tape to another, transfer program from tape to tape, back-up  
2219/36561 . . . Tape, band  
2219/36562 . . . One tape, copy feeler controls several machines  
2219/36563 . . . Two tapes  
2219/36564 . . . Position of hole in tape corresponds with position of hole on workpiece  
2219/36565 . . . Cartesian and polar data mixed  
2219/36566 . . . Mix polar data with cartesian data  
2219/36567 . . . On tape also commands for equipment attached to machine  
2219/36568 . . . Control data is sequence of position, axis indication, time delay for speed  
2219/36569 . . . Enter, punch only different, changed data, same not repeated in next block  
2219/36571 . . . Coarse and fine dimensions  
2219/36572 . . . Macro data or coarse dimension on tape  
2219/36573 . . . X, y, z and tooloffsetset values or direction values  
2219/36574 . . . Absolute x or delta x values  
2219/36575 . . . On tape reference and command signals  
2219/36576 . . . Relative phase of signals is variable  
2219/36577 . . . Signals have a position dependant frequency  
2219/36578 . . . Tracks for x, two for delta x, one for sign, three for y  
2219/36579 . . . Only true dimension is recorded, no tool offset  
2219/36581 . . . X, Y, Vx, Vy  
2219/36582 . . . Special order  
2219/36583 . . . Each punched hole is one pulse, increment  
2219/36584 . . . X, Y, Z and tool offset or corrections  
2219/36585 . . . Speed and acceleration, rate of change of speed  
2219/36586 . . . Word address format  
2219/36587 . . . Binary format  
2219/36588 . . . Endless loop  
2219/36589 . . . Making control tape  
2219/36591 . . . Tape moves synchronized with machine driven axis  
2219/36592 . . . Each track controls an axis  
2219/37 . . . Measurements  
2219/37001 . . . Measuring problems  
2219/37002 . . . Absence, detect absence, presence or correct position of workpiece  
2219/37003 . . . Detect if no workpiece in holder  
2219/37004 . . . Detect absence of tool  
2219/37005 . . . Absence of tool accessories, material, like nails, staples, glue  
2219/37006 . . . Measuring bars  
2219/37007 . . . Join bars or cilinders binary  
2219/37008 . . . Calibration of measuring system, probe, sensor  
2219/37009 . . . Calibration of vision system, camera, adapt light level  
2219/37011 . . . Set absolute marks on disk as exact position or address to position memory  
2219/37012 . . . Adjust angular position of transducer  
2219/37013 . . . Faulty number of total scale increments corrected evenly over scale  
2219/37014 . . . Use of calibration bar, bar with cams  
2219/37015 . . . Adaptive online camera, vision calibration  
2219/37016 . . . Calibrate dc offset, measure offset and maintain fixed level  
2219/37017 . . . Calibration of vision system, set correct attitude of sensor to workpiece  
2219/37018 . . . Make measuring scale machine tool  
2219/37019 . . . Position detection integrated in actuator, lvdt integrated linear actuator  
2219/37021 . . . Robot controls position of touch probe  
2219/37022 . . . Detector, measuring device incorporated within workpiece holder  
2219/37023 . . . Step motor used as measuring device and as drive motor  
2219/37024 . . . Measure single value, parameter with two detectors  
2219/37025 . . . Retract, swing out of the way, measuring device during normal machining for protection  
2219/37026 . . . Adjust sensor radially  
2219/37027 . . . Sensor integrated with tool or machine  
2219/37028 . . . Detail, extended range, discrimination, switch from one range to other  
2219/37029 . . . Power supply position detector in common with drive motor  
2219/37031 . . . Lvdv for x and y in a plane, center lines intersect at locating point  
2219/37032 . . . Generate vibrations, ultrasound  
2219/37033 . . . Energy saving by powering feedback device, potentiometer only during measuring  
2219/37034 . . . Actuator coil is also used as measuring coil
Sensor in air gap of drive, detect directly speed or position
Position normally, stop, measure position tool with second independent sensor
Remeasure workpiece regularly for deformation
Protection cover over measuring device, probe, feeler opened when measuring
Digitize position with flexible feeler, correction of position as function of flexion
digitize, electric wires form grid on surface
Photographic, picture on film, photogrammetry
Touch probe, store position of touch point on surface
Ultrasound transmitters on surface, touch probe detects ultrasound, triangulation
Probe detects electromagnetic fields from grid, antenna like digitizing tablet
Use simultaneous several pairs of stereo cameras, synchronized
After digitizing, edit graphically data
Split beam, stripe projection on object, lines detected with cameras
First a rasterscan, then align workpiece as function of height average, scan again
First coarse measurement, around each point a fine measurement of surface
Sense surface, mean value used as reference surface
Optical triangulation
Digitize every grid point of a raster
Project stripes having a regular sine wave
Mark point to be digitized graphically on screen
Several feelers, probes touch model in rasterpoints
Digitize not only position but also colour
Probe connected to three pair of wires of which the length is measured
Use matrix of optical sensors to detect form, edges of object
Regulated scanning, the head deflection is controlled by a regulation circuit
Controlled scanning, the head is moved along a given path
After digitizing, reconstruct surface by interpolating the initial mesh points
Map of stiffness, compliance of object
Image from object together with references on background
Calibrate work surface, reference markings on object, work surface
Setting reference coordinate frame
Calibrate probe, imitated tool, repeated measurements for different orientations
Measurement program is created, executed on object data, no real object, no CMM is present
Surface covered with grid of electric wires, of coloured tape on object
Workpiece surface covered with shielding coating, against disturbing fields
Projection device, monitor, track tool, workpiece form, process on display
Print out of document measured results or record on tape
Display load on tool, motor graphically on screen
Relative movement
Display machining, processing parameters with curves, pictograms
Display probing result on drawing taken from cad data
Display machining parameters
Indicate, point region on path, locus, display path and machining parameters
Switch display from normal mode to inspection mode, to monitor conditions
Display tool parameters
Display in real time of state variables of control system
Display real, measured machining load
Cutting forces
Indicate service condition, status
Speed error
Motion and force
Display position actual and or target
Display speed
Hall sensor
Digital handheld device with data interface
Invar scale, low temperature coefficient
Marker on workpiece to detect reference position
X y scale plate instead of two ruler scale, two dimensional scale
One detector for coarse and fine target location, variable resolution
Vector gauge, telescopic ballbar
Single detector for whole range, both x and y axis
Limit, proximity switch
Absolute encoder
Soft limit, store limits in counters, use content of counters as limit
Inductive, differential transformer, pins
Acupin
Rasters, grid on xy-plane
Photoelectric scanned raster, rule and photocell, microscope
Rule and photocell, microscope
Several scales with one device
Psd position sensitive detector, light spot on surface gives x, y position
Precision screw
Photogrammetric position detection
Shape sensor leads tool, in front of tool
Optical sensor, delivers analog signal as function of displacement
Inductive, coil moves over conical, tapered core
Atomic force probe
Linear transducer
Signal analyser
Extensible ball bar with potentiometer, lvdt
Magnetic sensor
Photosensor, as contactless analog position sensor, signal as function of position
2219/37126 . . . Wire, tape around cylinder measures displacement, string encoder
2219/37127 . . . Spm scanning probe microscopy, stm scanning tunneling microscopy
2219/37128 . . . Tool itself emits vibrations to be detected to build an image of surface
2219/37129 . . . Mark, engrave workpiece at specific surface point for measurement, calibration
2219/37131 . . . Moire pattern, diffraction grating, fringe
2219/37132 . . . Polyhedral prism
2219/37133 . . . Linear, rotary variable differential transformer, lvdt, rvdt
2219/37134 . . . Gyroscope
2219/37135 . . . Two counters receiving pulses from two encoders, one for speed, one for position
2219/37136 . . . Control resolution of encoder
2219/37137 . . . Encoder combined with barcode label, reader
2219/37138 . . . Encoder and gear and absolute coder, give together absolute position of rotation
2219/37139 . . . Sampling output of encoder at precisely defined intervals
2219/37141 . . . Programmable divider for counter as buffer for microprocessor, read on interrupt
2219/37142 . . . Center position between two pulses, in the middle of a bit
2219/37143 . . . Divide feedback pulses to make feedback independent from resolution encoder
2219/37144 . . . Delay marker to synchronize motions
2219/37145 . . . Multturn fine counter counts total pulses, index counter counts turns
2219/37146 . . . Second counter reset to zero on marker, to detect counting errors
2219/37147 . . . Sampling rate low during power loss
2219/37148 . . . Switch between rise, fall of pulses of one phase and of both phases, coarse fine
2219/37149 . . . Multiplexer to send encoder and rotor pole position to same output lines
2219/37151 . . . Handling encoder signal, compensation for light variation, stray light
2219/37152 . . . Combination 00-01-10-11, previous, actual pulses, or two series of pulses, and rom
2219/37153 . . . Encoder delivers only one channel of pulses, using only one detector
2219/37154 . . . Encoder and absolute position counter
2219/37155 . . . Encoder and delta position counter
2219/37156 . . . Pulse derived from belt driving drum
2219/37157 . . . Pulses derived from brake disk having north and south poles
2219/37158 . . . Pulse derived from perforated belt along track
2219/37159 . . . Source of pulse, pulse derived from gear, plate teeth
2219/37161 . . . Motor rotor has a normal magnetised ring and a second ring, magnetic decoder
2219/37162 . . . Marker, reflector mounted on chuck, workpiece holder
2219/37163 . . . Marker derived from phase of motor
2219/37164 . . . Pulse derived from encoder built into ball bearing
2219/37165 . . . Derive pulse from commution position, build into brushless motor
2219/37166 . . . Rotating magnets shunt motor over resistance, cause current variations
2219/37167 . . . Count number of periods of voltage supply

2219/37168 . . . Inductive sensor senses fluctuations, spikes in motor current
2219/37169 . . . Derive incremental pulse from motor current deviation
2219/37171 . . . Commutation brushes, sensors deliver increment
2219/37172 . . . Encoder with hall effect and reed relays, and decoder gives absolute position
2219/37173 . . . Encapsulate electronics of encoder in resin, electronics and encoder integrated
2219/37174 . . . Encoder with infrared
2219/37175 . . . Normal encoder, disk for pulses, incremental
2219/37176 . . . Disk emits phase shifted pulses, special convertor
2219/37177 . . . Linear encoder
2219/37178 . . . Magnetic marks on screw
2219/37179 . . . Coarse encoder combined with fine grid ccd detector
2219/37180 . . . Encoder delivers sinusoidal signals
2219/37181 . . . Marker or index or coded information as well as position pulses
2219/37182 . . . Sliit plate encoder
2219/37183 . . . Hall generator cooperates with magnetic ring, gives signal with dc offset
2219/37184 . . . Magnetic ring and sensor
2219/37185 . . . Camera reads large number of marks, derive frequency of dark-light
2219/37187 . . . Disk with magnetic, inductive sensors
2219/37188 . . . Encoder pulses reset high resolution clock, get position from counting clock pulses
2219/37189 . . . Camera with image processing emulates encoder output
2219/37191 . . . General problems for standing waves, torque, surface inspection
2219/37192 . . . Problems
2219/37193 . . . Multicoordinate measuring system, machine, cmm
2219/37194 . . . Probe work, calculate shape independent of position, orientation, best fit
2219/37195 . . . Measuring dimension independent from accuracy of nc, machine tool
2219/37196 . . . Measuring station, flexible, integrated cmm
2219/37197 . . . From measured data derive form, roundness, orientation, parallel, straightness
2219/37198 . . . Machine as measuring station, use tool or probe, in process incycle
2219/37199 . . . Hole location
2219/37201 . . . Measuring several points at the same time
2219/37202 . . . Footprint, probe piece on machine, then on cmm to avoid errors of machine
2219/37203 . . . Compensate probed values as function of reference plane of fixture, clamp
2219/37204 . . . Move synchronously associated sensor elements independently at both sides
2219/37205 . . . Compare measured, vision data with computer model, cad data
2219/37206 . . . Inspection of surface
2219/37207 . . . Verify, probe, workpiece
2219/37208 . . . Vision, visual inspection of workpiece
2219/37209 . . . Estimate life of gear, drive
2219/37211 . . . Measure temperature, compensate cmm program for temperature
2219/37212 . . . Visual inspection of workpiece and tool

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2219/37213 . . . Inhibit measuring if one of the joints is near endstop
2219/37214 . . . Detect failed machine component, machine performance degradation
2219/37215 . . . Inspect application of solder paste, glue to workpiece
2219/37216 . . . Inspect component placement
2219/37217 . . . Inspect solder joint, machined part, workpiece, welding result
2219/37218 . . . Compensate for offset due to probe diameter, detect exact contact point
2219/37219 . . . Predict next probed point from previous probed points
2219/37221 . . . Probe fixture to know datum points
2219/37222 . . . Probe workpiece for correct setup
2219/37223 . . . Identify minimum number of appropriate measuring points
2219/37224 . . . Inspect wafer
2219/37225 . . . Tool holder, measure forces in chuck, tool holder
2219/37226 . . . Monitor condition of spindle, tool holder, transmit to nc controller
2219/37227 . . . Probing tool for its geometry
2219/37228 . . . Tool inspection, condition, dull tool
2219/37229 . . . Test quality tool by measuring time needed for machining
2219/37231 . . . Tool used as touch probe, sensor
2219/37232 . . . Wear, breakage detection derived from tailstock, headstock or rest
2219/37233 . . . Breakage, wear of rotating tool with multident saw, mill, drill
2219/37234 . . . Monitor tool before, after and during machining
2219/37235 . . . Detect bad tool by relative movement of tool with respect to tool holder
2219/37236 . . . Tool serves, acts also as measuring device
2219/37237 . . . Tool collision, interference
2219/37238 . . . Missing tool
2219/37239 . . . Plastic deformation of tool
2219/37241 . . . Displacement of tool, miss inserted
2219/37242 . . . Tool signature, compare pattern with detected signal
2219/37243 . . . Tool breakage by comparing tool image, length before and after machining
2219/37244 . . . Detect tool breakage already in tool magazine
2219/37245 . . . Breakage tool, failure
2219/37246 . . . Compare estimated torques of different axis with reference for breakage
2219/37247 . . . By electrical contact, disappears when breakage
2219/37248 . . . By monitoring changes in capacitive circuit
2219/37249 . . . Correction coefficient of life time as function of kind of machining
2219/37251 . . . Selfcorrecting, counter for tool life adapts correction
2219/37252 . . . Life of tool, service life, decay, wear estimation
2219/37253 . . . Fail estimation as function of lapsed time of use
2219/37254 . . . Estimate wear of subsystem of machine with measures from other subsystems
2219/37255 . . . Using fuzzy logic techniques
2219/37256 . . . Wear, tool wear
2219/37257 . . . Crater wear of tool
2219/37258 . . . Calculate wear from workpiece and tool material, machining operations
2219/37259 . . . Resolver for coarse, photo cell for fine position on grid crossing
2219/37260 . . . Encoder and potentiometer to detect fault measurement
2219/37261 . . . Mixing pins and fine positioning
2219/37262 . . . Absolute and incremental encoder, detector combined
2219/37263 . . . Cam for absolute positions, encoder for incremental position
2219/37264 . . . Rotary potentiometer and incremental counter for each maximum
2219/37265 . . . Infrared
2219/37266 . . . Thermocouple
2219/37267 . . . Tool workpiece junction, thermoelectric interface
2219/37268 . . . Ultrasonic, ultrasound, sonar
2219/37269 . . . Using standing waves
2219/37270 . . . Capacitive
2219/37271 . . . Wheatstone bridge
2219/37272 . . . Strain gauge
2219/37273 . . . Laser, interferometer
2219/37274 . . . Position changes frequency
2219/37275 . . . Inductive proximity sensor
2219/37276 . . . Optical waveguide, fiberoptic sensor
2219/37277 . . . Fiber optic proximity sensor
2219/37278 . . . Laser range finder
2219/37279 . . . Current transformer
2219/37280 . . . Photoelectric sensor
2219/37281 . . . Capacitive 3-D proximity sensor
2219/37282 . . . Load, current taken by motor
2219/37283 . . . Photoelectric sensor with reflection, emits and receives modulated light
2219/37284 . . . Fiber optic interferometer
2219/37285 . . . Tracking lasers follow object, reflection gives 3-D position
2219/37286 . . . Inductive
2219/37287 . . . Electro acoustic
2219/37288 . . . Eddy current
2219/37289 . . . Magnetostrictive effect on ferrous rod, ultrasonic wave, time delay measured
2219/37290 . . . Coarse digitized position combined with fine digitized analog position signal
2219/37291 . . . Measure workpiece while machining other workpiece
2219/37292 . . . Electronic graduation, scale expansion, interpolation
2219/37293 . . . Two measurements, on driving motor and on slide or on both sides of motor
2219/37294 . . . Measure same parameter from three different space directions
2219/37295 . . . Two measurements, speed with tachometer and speed with encoder
2219/37296 . . . Measure tool length, workpiece configuration without stopping movement
2219/37297 . . . Two measurements, speed of motor and speed of load
2219/37298 . . . Combined position measurement, encoder and separate laser, two different sensors
Drive step motor with pulses, at stop with dc current to avoid emi when measuring
Two sensors and two scales for same measurement of relative movement between x y
Detector in line, in plane of tool to avoid parallax
Measure workpiece relieved from stress, redrawn, disengaged tool
Selecting a desired sensor structure
Derive speed from current, use of lookup table
Derive speed from motor current
Derive speed from position
Derive position from speed
High speed and low speed signals are derived in a different way
Derive speed from two phased position signals, with high range and resolution
Derive position from current, voltage, back electromotive force bemf
Derive speed from back electromotive force, bemf
Derive acceleration, force, torque from current
Derive acceleration from net driving force
Derive acceleration from frequency power supply
Derive acceleration from position or speed
Derive position, speed from acceleration
Multisensor integration, fusion, redundant
Automatic configuration of multisensor, adaptive, active sensing
Select lookup table corresponding to sensor
Decentralised data fusion
Far and near by sensor groups
Sensor fusion using extended kalman filter
Detect power of noise source using sound and visual sensors
Position of control valve and position of controlled actuator
Diameter of tool with teeth
Diameter tool
Cutting, machining time
Noise, acoustic emission, sound
Magnetic or electric property of tool to control feed
Eccentricity, cylindricity, circularity
Sectional distortion of machining face of workpiece
Overload of motor, tool
Load, vectorial components of load
Torque, thrust, twist, machining force measurement
Dimension of workpiece, diameter
Cutting, chip quality
Speed, velocity
Power, wattmeter voltage times current
Unbalance of tool or tool holder
Detect vibration, ultrasound
Frequency
Amplitude
Powerfactor, phase between voltage and current
Cutting, milling, machining force
Torsion, twist
Force, pressure, weight or deflection
Depth of cut
Contour, to sense corners, edges of surface
acoustic feedback, for speed, if speed very low hearing is better than seeing
Hardness
Texture
Thermal conductivity
Surface shape, gradient
Colour, surface colour
Grinding rate
Displacement perpendicular to probe movement
Measure tool length and diameter together with single sensor
Flow
Position and speed
Friction
Deflection
Climate, temperature and humidity
Inclination, gradient of machine base
Roundness of workpiece
Balance of workpiece from vibration sensor and angle sensor
Profile, diameter along workpiece
Force in steady rest
Voltage over or short circuit between tool and workpiece
Tool length
Change of actuator current
Peripheral speed
Lateral movement of tool
Nanometer position
Acceleration or deceleration, inertial measurement
Magnetic flux
Null, initial load, no load torque detection or other parameter at no load
Motion
acoustic feedback varies as function of positional error
Measuring diameter of workpieces with longitudinal grooves
Detection sparks during machining
Tactile feedback, operator feels reaction, force reflection
Measuring gap between tool and workpiece
Thickness
Pressure
Differential pressure
Flatness, roughness of surface
Bending, springback angle
Orientation of workpiece or tool, surface sensor
Contact detection between workpiece and tool, probe, feeler
Detect position of detector contact point relative to reference on tool slide
Detect position of detector contact point relative to reference on tool
Combination of contact and contactless detection to avoid tool contact with workpiece
Measure different pressure of fluid flow on contacting surface
2219/37411 . . . Measure contact from force and velocity
detection
2219/37412 . . . acoustical detection of contact
2219/37413 . . . By conductivity, short circuit between tool,
probe and metallic surface
2219/37414 . . . By microswitch
2219/37415 . . . By cutting light beam
2219/37416 . . . By measuring phase shift between voltage and
current of feed motor
2219/37417 . . . By linear varying electrical signal
2219/37418 . . . By capacitive means
2219/37419 . . . Measuring rotation of non driven axis after
being touched by driven axis
2219/37421 . . . Measure braking, slower rotation of driven
axis, tool upon contact
2219/37422 . . . Distance and attitude detector
2219/37423 . . . Distance, gap between tool and surface sensor
2219/37424 . . . Calculate distance from known inner diameter
of coil, bobbin and detected image
2219/37425 . . . Distance, range
2219/37426 . . . Detected with infrared sensor
2219/37427 . . . Detected with thermocouple
2219/37428 . . . Temperature of tool
2219/37429 . . . Temperature of motor
2219/37431 . . . Temperature
2219/37432 . . . Detected by accelerometer, piezo electric
2219/37433 . . . Detected by acoustic emission, microphone
2219/37434 . . . Measuring vibration of machine or workpiece
or tool
2219/37435 . . . Vibration of machine
2219/37436 . . . Prediction of displacement, relative or absolute,
motion
2219/37437 . . . Prediction of cutting force with flexible ball
end milling model
2219/37438 . . . Prediction of machining error with flexible ball
end milling model
2219/37439 . . . Computer assisted inspection, cad interactive
with manual commands
2219/37441 . . . Use nc machining program, cad data for
measuring, inspection
2219/37442 . . . Cad and cap for cmm
2219/37443 . . . Program cmm, coordinate measuring machine,
use cad data
2219/37444 . . . Program cmm by using a stylus to detect points
on a real workpiece
2219/37445 . . . Load teaching program from file server, enter
teaching data at pendant
2219/37446 . . . Select measuring program together with control
parameters
2219/37447 . . . Path planning using ann, for measurement task
pattern, optimal path, dummy points
2219/37448 . . . Inspection process planner
2219/37449 . . . Inspection path planner
2219/37451 . . . Plan sensor placement for optimal inspection
2219/37452 . . . Generate nc program from metrology program,
defining cmm probe path
2219/37453 . . . Simulate measuring program, graphical
interactive generation of program
2219/37454 . . . Interactive, enter also tolerance
2219/37455 . . . After entering one measuring cycle, display in
separate window instruction list
2219/37456 . . . Program proposes measuring points
2219/37457 . . . On machine, on workpiece
Ignore position information from detector during invalid intervals.

Measure drift of servo during positioning, not use of tool.

Detect swarf, building up of swarf.

Count number of machining cycles, frequency of machining.

Detect, discriminate cutting or non cutting.

Start, begin and end, halt, stop of machining.

Deformation of machined material.

Detect separation, cutting, penetration, measuring errors.

Correction of position error.

Select and process only those detected signals needed for a certain purpose.

Cross correlation.

Intelligent sensor, incorporation temperature compensation.

Select and process only those detected signals needed for a certain purpose.

Conversion of position to frequency domain signal, online monitoring.

Error separation, eliminate eccentricity.

Combine results, opinions of multiple but same sensors, fuzzy logic.

Compensation of position for vibration of probe, calibration x-y lookup table.

Prediction, estimation of machining parameters from cutting data.

From machining parameters classify different fault cases.

Ann to map sensor signals to decision signals.

Determine validity of measured signals.

Reduce noise by combination of digital filter and estimator.

Sampling of forces and signal analysis are triggered as function of rotation angle.

Mean, average values, statistical derived values.

Determine time or position to take a measurement.

Frequency filtering and amplitude qualification.

Separate force signal into static and dynamic component.

Synchronous demodulation.

Superpose modulated measuring signal on servo command reference.

Synchronized data acquisition.

Real time processing of data acquisition, monitoring.

Frequency analysis.

Signal processing, ratio of signals against fluctuation of signals.

Rate of change, derivative.

Virtual sensor.

Window for signal, to detect signal at peak or zero values.

Read values twice, for correctness.

Switch off measuring, control system during test of encoder, resolver.

Curve fitting measured points, predict, extrapolate dimension in time.

Set, compare to maximum, peak, minimum value.

Compare detected signal to several references to derive several control actions.

References to be compared vary with evolution of measured signals, auto-calibrate.

Compare two positions measured with different methods, alarm if difference too high.

Ignore position information from detector during invalid intervals.

Avoid false motion condition, jitter, compare three recent values with possible values.

Limit switch protected against overload.

Select for each detector type corresponding signal processor.

Detect loss of correct excitation moment of step motor, correct excitation.

Two cameras one for coarse scanning, other for fine scanning.

Two camera, or tiltable camera to detect different surfaces of the object.

Camera detects orientation, position workpiece, points of workpiece.

Camera detects fictive contour of workpiece, by reflection.

Camera for coarse, acoustic array for fine vision.

Optical sensor, scanner.

Camera, vision of tool, compute tool center, detect tool wear.

Move camera until image corresponds to stored image of same workpiece.

Scan mark at certain angle, to avoid glare noise.

Ccd, tv camera.

Center of camera vision aligned with axis of drill.

Camera to detect precisely, crosshair, positions on workpiece by operator.

Explore autonomous, explore surface until useful measurement possible.

3-D vision, stereo vision, with two cameras.

3-D spectacles, glasses, left and right synchronised with images on screen.

Radiography in x and y, x-ray images.

Camera detecting reflected light from laser.

Camera, tv, vision.

In-cycle, insitu, during machining workpiece is measured continuously.

In-process, in cycle, machine part, measure part, machine same part.

Pre-process, measure workpiece before machining.

Post-process, measure workpiece after machining, use results for new or same part.

In-process and post-process measurement combined.

Compare images of workpiece before and after machining.

Run away measured value by differentiating measured signal, rate of change.

Measuring errors.

Position, angle of workpiece surface.

Detect separation, cutting, penetration, piercing, break through material.

Deformation of machined material.

Start, begin and end, halt, stop of machining.

Detect, discriminate cutting or non cutting machining state.

Count number of machining cycles, frequency use of tool.

Detect swarf, building up of swarf.

Measure drift of servo during positioning, not disturbing actual position.
Robotics, robotics to robotics hand
Move end effector on ellipse, circle, sphere

Calibrate only for end position

Two cameras detect same reference on common reference grid

Determine position of two cameras by using a from end effector and joint speeds

Screw axis measurement, jacobian estimation from wrist and joint torques, no motion

Touch probe senses constraint known plane, derive kinematic calibration

Calibrate only some links, part of dofs, lock mounted

Calibration of manipulator while tool is mounted

Calibrate only some links, part of dofs, lock some links, ref pins on links

Relative to base calibrated 6-DOF device, cmn connected between wrist and base

Verify if calibration position is a correct, by comparing with range in rom

Use of model for robot and for measuring device

Touch probe senses constraint known plane, derive kinematic calibration

Laser tracking of end effector, measure orientation of rotatable mirror

Use of telescopic ballbar

Screw axis measurement, each joint moved in circle, cpa circle point analysis

Screw axis measurement, jacobian estimation from wrist and joint torques, no motion

Screw axis measurement, jacobian estimation from end effector and joint speeds

Determine position of two cameras by using a common reference grid

Two cameras detect same reference on workpiece to define its position in space

Calibrate only for end position

Calibrate by switching links to mirror position, tip remains on reference point

Fixed camera detects deviation end effector from reference on workpiece, object

Calibrate arm during scanning operation for identification of object

Locate movable manipulator relative to object, compare to stored gridpoints

Match virtual world with real world

With different manipulator configurations, contact known sphere, ballbar

Simultaneous calibration of manipulator and camera

Forward calibration, find actual pose world space for given joint configuration

Inverse calibration, find exact joint angles for given location in world space

Calibration by cmn coordinate measuring machine over a certain volume

With probe, touch reference positions

Transform between measuring and manipulator coordinate system

Shut off, disable motor and rotate arm to reference pin

Calibration of manipulator

Spheric tool interrupts transmitted calibration beam, in different configurations

Calibration of manipulator while tool is mounted

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Two cameras detect same reference on workpiece to define its position in space

Calibrate only for end position
G05B

2219/39042 . . . Interchange robot and reference pattern, measure by camera at same location
2219/39043 . . . Self calibration using ANN to map robot poses to the commands, only distortions
2219/39044 . . . Estimate error model from error at different attitudes and points
2219/39045 . . . Camera on end effector detects reference pattern
2219/39046 . . . Compare image of plate on robot with reference, move till coincidence, camera
2219/39047 . . . Calibration plate mounted on robot, plate comprises sensors for measuring target
2219/39048 . . . Closed loop kinematic self calibration, grip part of robot with hand
2219/39049 . . . Calibration cooperating manipulators, closed kinematic chain by bolting
2219/39051 . . . Calibration cooperating manipulators, closed kinematic chain by alignment
2219/39052 . . . Self calibration of parallel manipulators
2219/39053 . . . Probe, camera on hand scans many points on own robot body, no extra jig
2219/39054 . . . From taught different attitudes for same point calculate tool tip position
2219/39055 . . . Correction of end effector attachment, calculated from model and real position
2219/39056 . . . On line relative position error and orientation error calibration
2219/39057 . . . Hand eye calibration, eye, camera on hand, end effector
2219/39058 . . . Sensor, calibration of sensor, potentiometer
2219/39059 . . . Sensor adaptation for robots by software
2219/39061 . . . Calculation direct dynamics
2219/39062 . . . Calculate, jacobian matrix estimator
2219/39063 . . . Quick calculation of coordinates by using precalculated, stored matrices, inverses
2219/39064 . . . Learn kinematics by ann mapping, map spatial directions to joint rotations
2219/39065 . . . Calculate workspace for end effector, manipulator
2219/39066 . . . Two stage inverse kinematics algorithm, first inner joint variables, then outer
2219/39067 . . . Calculate max load a manipulator can repeatedly lift
2219/39068 . . . Time needed to execute an instruction
2219/39069 . . . Inverse kinematics by arm splitting, divide six link arm into two three link arms
2219/39071 . . . Solve inverse kinematics by ann learning nonlinear mappings, consider smoothness
2219/39072 . . . Solve inverse kinematics by linear hopfield network
2219/39073 . . . Solve inverse kinematics by fuzzy algorithm
2219/39074 . . . By formal substitution of two consecutive joints by a spherical joint
2219/39075 . . . Solve inverse kinematics by error back propagation ebp
2219/39076 . . . Learn by function division, change only one variable at a time, combine shapes
2219/39077 . . . Solve inverse geometric model by iteration, no matrices inversion
2219/39078 . . . Divide workspace in sectors, lookup table for sector joint angle
2219/39079 . . . Solve inverse differential kinematics in closed, feedback loop, iterate
2219/39081 . . . Inexact solution for orientation or other DOF with relation to type of task
2219/39082 . . . Collision, real time collision avoidance
2219/39083 . . . Robot interference, between two robot arms
2219/39084 . . . Parts handling, during assembly
2219/39085 . . . Use of two dimensional maps and feedback of external and joint sensors
2219/39086 . . . Reduce impact effect by impact configuration of redundant manipulator
2219/39087 . . . Artificial field potential algorithm, force repulsion from obstacle
2219/39088 . . . Inhibit movement in one axis if collision danger
2219/39089 . . . On collision, lead arm around obstacle manually
2219/39091 . . . Avoid collision with moving obstacles
2219/39092 . . . Treat interference in hardware, circuit and also in software
2219/39093 . . . On collision, ann, bam, learns path on line, used next time for same command
2219/39094 . . . Interference checking between robot and fixture
2219/39095 . . . Use neural geometric modeler, overlapping spheres
2219/39096 . . . Self-collision, internal collision, collision between links of one robot
2219/39097 . . . Estimate own stop, brake time, then verify if in safe distance
2219/39098 . . . Estimate stop, brake distance in predefined time, then verify if in safe distance
2219/39099 . . . Interlocks inserted in movement process if necessary to avoid collision
2219/39101 . . . Cooperation with one or more rotating workpiece holders, manipulators
2219/39102 . . . Manipulator cooperating with conveyor
2219/39103 . . . Multicooperating sensing modules
2219/39104 . . . Manipulator control orders conveyor to stop, to visualize, pick up
2219/39105 . . . Manipulator cooperates with moving machine, like press brake
2219/39106 . . . Conveyor, pick up article, object from conveyor, bring to test unit, place it
2219/39107 . . . Pick up article, object, measure, test it during motion path, place it
2219/39108 . . . Re-grasp object as function of impact
2219/39109 . . . Dual arm, multiarm manipulation, object handled in cooperation
2219/39111 . . . Use of flexibility or free joint in manipulator to avoid large forces
2219/39112 . . . Force, load distribution
2219/39113 . . . Select grasp pattern based on motion oriented coordinability
2219/39114 . . . Hand eye cooperation, active camera on first arm follows movement of second arm
2219/39115 . . . Optimal hold and moving force, torque
2219/39116 . . . Constraint object handled in cooperation
2219/39117 . . . Task distribution between involved manipulators
2219/39118 . . . Cooperation between manipulator and vehicle with manipulator
2219/39119 . . . Path constraint handling of object
2219/39121 . . . Two manipulators operate on same object
2219/39122 . . . Follower, slave mirrors leader, master
Manipulate, handle flexible object

Grasp common rigid object, no movement end effectors relative to object

Task is grasp object with movable parts, like pliers

Manipulate very large objects, not possible to grasp, open palm and use of links

Roll object on base by link control

Grasp tool with two manipulators, rigidity, and use tool

One manipulator holds one piece, other inserts, screws other piece, dexterity

Each of the manipulators holds one of the pieces to be welded together

Robot welds, operates on moving workpiece, moved by other robot

Convert taught program for fixed workpiece to program for moving workpiece

Teach point, move workpiece, follow point with tip, place tip on next point

For multiple manipulators operating at same time, avoid collision

Teach each manipulator independently or dependently from each other

Manual teaching, set next point when tool touches other tool, workpiece

Calculate path of robots from path of point on gripped object

Produce program of slave from path of master and desired relative position

Slave program has no taught positions, receives position from master, convert from master

Moving time between positions in slave program coordinated online with master

One program in robot controller for both robot and machine, press, mold

Scale moving time of all robots, machines to match slowest, no waiting

Slave path is the same as master path and superposed desired relative movement

Swarm, multiagent, distributed multitask fusion, cooperation multi robots

Group transport, transfer object, ant problem

To push or pull on objects, boxes

To assemble two objects, objects manipulation

Use intention inference, observe behaviour of other robots for their intention

Basic behaviour, avoid, follow, aggregate, disperse, home, wander, grasp, drop

Human supervisory control of swarm

Each robot can pick up an information carrier, read and write it, exchange it

Motion skill, relate sensor data to certain situation and motion

To machine together workpiece, desktop flexible manufacturing

Collectively grasping object to be transported

Configuration description language, to define behaviour of system

Task modelling

Search, grip object and bring to a home area, gather object, object placement

Learn social rules, greedy robots become non-greedy, adapt to other robots

Formation control, robots form a rigid formation, fixed relationship

Embodied evolution, evolutionary robots with basic ann learn by interactions with each other

Evolution, best performing control strategy is transmitted to other robots

Coordinate activity by sending pheromone messages between robots, no central control

Resources scheduling and balancing

Multiple robots searching an object

Redundant communication channels with central control

Vehicle moves towards arm if stretched arm, away from it if folded, singular point

Vehicle, coordination between manipulator arm and its moving vehicle

Dynamic interaction between vehicle and manipulator

Add DOFs of mobility to DOFs of manipulator to add user defined tasks to motion

Cooperation between fixed manipulator and manipulator on vehicle

Compensation deflection arm

Compensation position working point as function of inclination tool, hand

Compensation inertia arms

Of movement after lock stop by small movement against load, stop again

Compensation of coulomb friction in joint

Compensation for base, floor deformation

Compliance compensation

Forward compensation in robot world space, inverse in joint space

ANN as compensator

Flexible joint

Coriolis and centripetal compensation

Torque compensation

Compensate for dead weight of tool as function of inclination tool

Compensation for errors in mechanical components

Compensate thermal effects, expansion of links

Compensate movement before lock stop, by small movement against load, gravity

Compensation gravity

Control, avoid oscillation, vibration due to low rigidity

Use of passive joint, no actuator but brake, brake on or off

Passive compliance, no input of force reference, mechanical resilience, spring

Manipulator used as workpiece handler and for machining operation

Active vibration absorber

Control of joint stiffness

Invariant inertia, constant inertia matrix independent of joint positions

Fuzzy petrinet controller

Petrinet controller

Markov model

Joint space position control

Manipulator is passive, gives operator only feedback of what is currently done
Robot is active, realizes planned trajectory by itself
Switch over from free space motion to constraint motion
If operator on platform moves in certain direction, arm will follow
Select between autonomous or teleoperation control
Distributed tasks, space motion, contact, kinematic conditioning tasks
Compensate tracking error by using model, polynomial network
Adaptive control with stabilizing compensation
Motion scaling
Keep constant orientation of handled object while moving manipulator
Force tracking
Trajectory tracking
Control angular position of joint by length of linear actuator
Disturbance rejection, suppression
Resonance ratio control, between arm and motor
Jacobian transpose control of force vector in configuration and cartesian space
Rmfc resolved motion force control, apply known acceleration to payload mass
Operational space formulation, project model into cartesian coordinates
Configuration control, generate end effector forces to compensate dynamics
Computed torque method and H-compensation
Linear parameterization of robot dynamics
Parameterization of inertia, coriolis and centrifugal matrix
Fuzzy adaptation of sliding mode controller
Adaptive switching of multiple models, same model but different initial estimates, different robot model for different areas
Constraint accelerated feedback, distance dependant sampling rate
Track surface without knowing surface geometry
Hybrid integrator back-stepping control, cascaded motor and manipulator subsystems
Torque disturbance control
Trajectory feedforward and feedback to input ann, output a control function
Control additional actuator in each flexible link
Force and vibration control
Velocity blending, change in a certain time from first to second velocity
Adaptive trajectory tracking
Generic motion control operations, primitive skills each for special task
Computed torque fuzzy controller
Control position and orientation of handled object
Control speed, acceleration as function of load and rate of fatigue
Visual servoing combined with inertial measurements

Computed torque controller combined with ann compensating switch type controller
Autonomous distributed control, joint and link is a subsystem, communication intensive
Autonomous distributed control, task distributed into each subsystem, task space
Virtual arm, has end effector on any joint of real manipulator
Behaviour controller, robot have feelings, learns behaviour
Penalty invariance; distribute disturbance equally over all joints, nodes
Task space controller
Switch from task space to joint space controller when close to singularity
Three objective attitude control
GPS to control robotic arm
Calculate driving torque from dynamic model, computed torque method variant
Position joint to minimize energy in previous joints, equilibrium point, attractor
Normal and overload operation modes, robot speed or torque higher than nominal
Torque control using hardware designed for position control
Cutting force disturbances compensated by accelerating a mass within tool head
Algorithm for control
Uncertainty estimation by the bounds
Layer perceptron, drive torque from state variables
Neural adaptation followed by fuzzy correction
Ann artificial neural network, ffw-nn, feedforward neural network
Course by expert rule based system to correct fine fuzzy system
Neural oscillator
CMAC cerebellar model articulation controller network
Ann in parallel to known dynamics model to correct for unknown dynamics
FFW and PD and ANN for compensation position error
Segmented tree ANN
Ann with pd in parallel, pd corrects response of ANN
Ann parallel with p controller
Ann for compensation torque
FFW ann for torque command, adapt as function of speed and detected speed
Fwv ann to compensate torque or speed
NSC neural servo controller
From database find strategy and select corresponding neural servo controller
Forward inverse, dynamics model, relaxation neural network model firm
Position and speed error to fuzzy input, output corrected by ann as function of position
Track control with ann
Adaptive ann controller
Fuzzy neural for adaptive force control
Neural brain based controller based on simplified model of vertebrate nervous system
Fuzzy adaptive force and position control, hybrid

Adaptive force control

Switch between position and force control by fuzzy logic

Adaptive force and position control

Force and position control

Model compensates positions as function of position to compensate force deformations

Model compensates positions as function of position to compensate force deformations

Fuzzy adaptive force control

Fuzzy pi force control

Adaptive force and position control

Adaptive force control

Fuzzy adaptive force control

Fuzzy position control

Learn position correction values to be added to reference values

Learn inverse and forward model together

First learn inverse model, then fine tune with ffw error learning

Trajectory learning

Learn forward dynamics

Learn feedforward control

Backpropagation end effector location error through the link equations

Feedback error learn inverse dynamics, ffe use position reference and error

Feedback error learn inverse dynamics, use actual position and error

Learn, detect kinematic contraints in a plane from displacement and force

Three networks, data to cartesian, cartesian to joint angle, joint angle to control

Multiple ann, trajectory control net and force control net

Position control net, pcn combined with velocity control net, vcn

Inverse dynamic network combined with time scaling network for trajectory plan

Multilayer, MNN, four layer perceptor, sigmoidal neural network

Double neural network for tracking, slave microprocessor for servo control

Ann for joint control, ann for trajectory optimization

Ann for identification, ann for convergence, ann for tracking control

Art ann classifier and input selector, bam ann to retrieve collision free path

Two ann, second ann trained with calibration data to learn error first ann

Adapt weights MNN online, MNN as feedforward, maps inputs to joint torques

Position loop ann and velocity loop ann and force loop ann

Force control, force as reference, active compliance

Force control as function of position of tool

Force and position control

Force and motion control

Force as function of distance from boundary, border of grinding area

External force control, additional loop comparing forces corrects position

Model compensates positions as function of position to compensate force deformations

Fuzzy adaptive force control

Fuzzy pi force control

Adaptive force and position control

Adaptive force control

Fuzzy adaptive force and position control, hybrid

Fuzzy reinforcement compliance control

Independent joint control, decentralised

Pd controller combined with disturbance rejection at joint

Pd controller combined with joint energy based controller

Impedance control, also mechanical

Admittance control, admittance is tip speed-force

Sliding mode based impedance control

Adaptive impedance control

Force based impedance control

Cooperative impedance control, between fingers or arms

Active compliance control, control tension of spring with dc motor

Workspace impedance control

Joint space impedance control

Generalized impedance control

RCC remote center compliance device inserted between wrist and gripper

Compensation ann for uncertain trajectory in impedance control

Feedback error learning, ffw ann compensates torque, feedback from pd to ann

Joint space observer

Operation, work space observer

Observer, disturbance observer

Fuzzy logic velocity observer, to estimate velocity in joints

Execute motion of path in minimum of time

Time optimal control along path for singular points, having velocity constraints

Tracking path, priority control for component perpendicular to path

Minimize time-energy cost

Adapth path of gripping point as function of position of cooperating machine

Track circular path on inclined surface

Path, correction of path in function of load

By using a cue, part of a stimulus to prompt an adapted reaction pattern

SMC sensory motor coordination

Using a motion map, association between visual position and joint position

Sensorimotor command layer, between task space and sensor, motor space

Host and robot controller and vision processing

Host and robot controller

Expert rule based system to correct parameters impedance controller

Fuzzy for planning, fuzzy neural for adaptive force control

Ffww and ann combined to compensate torque

MMI to path planner to servo controller

Hierarchical, learning, recognition and skill level and adaptation servo level

Task level supervisor and planner, organizer and execution and path tracking

Control panel separated from power control of articulations

Open architecture such as nasrem, ngc, dicam, saridis, chimera, gisc, utap, nomad, robline
2219/39381 ...... Map task, application to behaviour, force tracking, singularity to motion to actuator
2219/39382 ...... Level, organization and coordination or distribution of tasks and execution level
2219/39383 ...... Supervisor communicates with several ion control agents
2219/39384 ...... Control unit near robot, control and teaching panel in safe zone
2219/39385 ...... Hybrid control system with neural brain based controller and classical controller
2219/39386 ...... Cell configuration, selection and connection of cell combinations
2219/39387 ...... Reflex control, follow movement, track face, work, hand, visual servoing
2219/39388 ...... Visual compliance, xy constraint is 2-D image, z position controlled
2219/39389 ...... Laparoscopic surgery, camera on center of operated part, view around, scale
2219/39391 ...... Visual servoing, track end effector with camera image feedback
2219/39392 ...... Dynamic pyramiding, change vision field to small area if high tracking speed, zoom
2219/39393 ...... Camera detects projected image, compare with reference image, position end effector
2219/39394 ...... Compensate hand position with camera detected deviation, new end effector attitude
2219/39395 ...... Expectation based visual servoing, use of model
2219/39396 ...... Manipulator action on screen depends from displayed position on screen
2219/39397 ...... Map image error directly to robot movement, position with relation to world, base not needed, image based visual servoing
2219/39398 ...... Convert hand to tool coordinates, derive transform matrix
2219/39399 ...... Convert position of old, teach to new, changed, actual tool by transform matrix
2219/39401 ...... Machine tool coordinates to manipulator coordinates
2219/39402 ...... Transfer matrix for moving object and robot to absolute space, motion independent
2219/39403 ...... Method, axial rotation of tool to make tool and base coordinates parallel
2219/39404 ...... Design of manipulator
2219/39405 ...... Develop inverse model of system with ann
2219/39406 ...... Obtain optimal parameters of model of system
2219/39407 ...... Power metrics, energy efficiency
2219/39408 ...... Integrated structure and control design
2219/39409 ...... Design of gripper, hand
2219/39411 ...... Effect of scaling drive arms
2219/39412 ...... Diagnostic of robot, estimation of parameters
2219/39413 ...... Robot self diagnostics
2219/39414 ...... 7-DOF
2219/39415 ...... Hyper redundant, infinite number of DOFs
2219/39416 ...... 12-DOF
2219/39417 ...... 6-DOF
2219/39418 ...... 3-DOF
2219/39419 ...... 4-DOF
2219/39421 ...... DOF is degree of freedom, 2-DOF
2219/39422 ...... 7-DOF for arm and 6-DOF for end effector
2219/39423 ...... 5-DOF
2219/39424 ...... 16-DOF
2219/39425 ...... 9-DOF
2219/39426 ...... 10-DOF
2219/39427 ...... Panel on arm, hand of robot, controlled axis
2219/39428 ...... Panel with special keys for robot programming, like gripper, hand, wrist
2219/39429 ...... Using graphic kinematic perspective entered and represented by keys
2219/39431 ...... Keys represent function of gripper, open, close
2219/39432 ...... Direct robot control, click on mouse on variety of display command buttons
2219/39433 ...... Enter a move file, robot will follow a series of instructions
2219/39434 ...... Each function key of pc corresponds to a motor, jog each motor
2219/39435 ...... Free movable unit has push buttons for other than position, orientation control
2219/39436 ...... Joystick mimics manipulator to provide spatial correspondence
2219/39437 ...... Joystick with additional handle for wrist and gripper control
2219/39438 ...... Direct programming at the console
2219/39439 ...... Joystick, handle, lever controls manipulator directly, manually by operator
2219/39441 ...... Voice command, camera detects object, grasp, move
2219/39442 ...... Set manual a coordinate system by jog feed operation
2219/39443 ...... Portable, adapted to handpalm, with joystick, function keys, display
2219/39444 ...... Display of position, of shape of robot and tool
2219/39445 ...... Select between jog modes, user, robot coordinates, tool, system feed, joint feed
2219/39446 ...... Display of manipulator and workpiece and jog directions
2219/39447 ...... Dead man switch
2219/39448 ...... Same teach pendant connects to many robot controllers over network
2219/39449 ...... Pendant, pda displaying camera images overlayed with graphics, augmented reality
2219/39451 ...... Augmented reality for robot programming
2219/39452 ...... Select with mouse button a coordinate plane for micromanipulation
2219/39453 ...... Select program as function of location of mobile manipulator
2219/39454 ...... Rubber actuator, two muscle drive, one for extension other for traction
2219/39455 ...... Flexible microactuator, fluidic controlled fibre reinforced rubber, three tubes
2219/39456 ...... Direct drive
2219/39457 ...... Tendon drive
2219/39458 ...... Vehicle levitated, arm pushes to position vehicle
2219/39459 ...... Finger actuator, ac motor and harmonic gear and encoder
2219/39460 ...... Rotate arm in one direction, forearm in other direction but double speed
2219/39462 ...... Pneumatic actuator, imitates human muscle
2219/39463 ...... Exercise treatment end effector, dexter cube with various switches for tasks
2219/39464 ...... Estimation of human hand impedance in multijoint arm movements
2219/39465 ...... Two fingers each with 2-DOF
2219/39466 ...... Hand, gripper, end effector of manipulator
2219/39467 . . . Select hand as function of geometric form of hand
2219/39468 . . . Changeable hand, tool, code carrier, detector
2219/39469 . . . Grip flexible, deformable plate, object and manipulate it
2219/39471 . . . Push workpiece in order to grip it correctly
2219/39472 . . . Braced manipulator, for fine positioning hand is resting on table
2219/39473 . . . Autonomous grasping, find, approach, grasp object, sensory motor coordination
2219/39474 . . . Coordination of reaching and grasping
2219/39475 . . . Grasp slightly, rotate object between two fingers by action of gravity
2219/39476 . . . Finger tracks moving light spot on object
2219/39477 . . . Control force and posture of hand
2219/39479 . . . Grip, release again to put object in correct position in tray, regrip and move
2219/39481 . . . Control distance finger from center, radius
2219/39482 . . . Control position of center of grip
2219/39483 . . . Control angle of rotation
2219/39484 . . . Locate, reach and grasp, visual guided grasping
2219/39485 . . . Lift workpiece with two fingers, then grasp it with two additional fingers
2219/39486 . . . Fingered hand, multifingered hand
2219/39487 . . . Parallel jaws, two fingered hand
2219/39488 . . . Each finger gets 1-DOF, one more movement, translation or rotation
2219/39489 . . . Soft fingertip, electro rheological controlled fluid
2219/39491 . . . Each finger controlled by a controller
2219/39492 . . . Finger impedance control
2219/39493 . . . Passive compliant finger, array of resilient rods in tip
2219/39494 . . . Each finger has 4-DOF
2219/39495 . . . Active electromechanical compliance for each finger
2219/39496 . . . 3-Fingered hand
2219/39497 . . . Each finger can be controlled independently
2219/39498 . . . Each finger has force torque sensor in tip of finger
2219/39499 . . . 4-Fingers with each 6-DOF
2219/39501 . . . 5-Fingers with each 4-DOF
2219/39502 . . . 4-Fingers with each 3-DOF
2219/39503 . . . 4-Fingers with each 4-DOF
2219/39504 . . . Grip object in gravity center
2219/39505 . . . Control of gripping, grasping, contacting force, force distribution
2219/39506 . . . Grip flexible wire at fixed base, move gripper to top of wire and grip
2219/39507 . . . Control of slip motion
2219/39508 . . . Reorientation of object, orient, regrasp object
2219/39509 . . . Gripping, grasping, links embrace, encircle, envelop object to grasp
2219/39511 . . . Reorient, rotate object in hand between fingers by action of fingers
2219/39512 . . . Whole hand manipulation, use of fingertips and hand surface
2219/39513 . . . Tipprehension grasp, grasp with tip of fingers
2219/39514 . . . Stability of grasped objects
2219/39515 . . . Grapple object, grip in compliant mode, self alignment of fingers and object
2219/39516 . . . Push align object against wall, detect each time distance from grip point to wall
2219/39517 . . . Control orientation and position of object in hand, roll between plates
2219/39518 . . . Rolling contact between fingers, robot arms and object
2219/39519 . . . Concurrent grasp, all forces converge in one point
2219/39521 . . . Pencil grasp, forces act in two points, along line of intersection of two planes
2219/39522 . . . Regulus grasp, forces do not intersect at all
2219/39523 . . . Set holding force as function of dimension, weight, shape, hardness, surface
2219/39524 . . . Power grasp, between thumb and four fingers, acting as a virtual middle finger
2219/39525 . . . Lateral grasp, between thumb and four fingers, acting as virtual index finger
2219/39526 . . . Three fingers used, thumb, index, middle finger for lateral precision
2219/39527 . . . Workpiece detector, sensor mounted in, near hand, gripper
2219/39528 . . . Measuring, gripping force sensor build into hand
2219/39529 . . . Force, torque sensor in wrist, end effector
2219/39531 . . . Several different sensors integrated into hand
2219/39532 . . . Gripping force sensor build into finger
2219/39533 . . . Measure grasping posture and pressure distribution
2219/39534 . . . By positioning fingers, dimension of object can be measured
2219/39535 . . . Measuring, test unit build into hand, end effector
2219/39536 . . . Planning of hand motion, grasping
2219/39537 . . . First slide object on table in order to be able to grasp it, grasp it
2219/39538 . . . Rotate object with one or more fingers, while sliding on table
2219/39539 . . . Plan hand shape
2219/39541 . . . Place fingers to reorient object while grasping
2219/39542 . . . Plan grasp points, grip matrix and initial grasp force
2219/39543 . . . Recognize object and plan hand shapes in grasping movements
2219/39544 . . . Fuzzy dynamic programming, generate trajectory of finger during tracking
2219/39545 . . . Trajectory generation for smoothly grasping moving object
2219/39546 . . . Map human grasps to manipulator grasps
2219/39547 . . . Program, plan gripping force, range and speed
2219/39548 . . . Enter interactively parameter for gripper, then teach movement
2219/39549 . . . Structure, hand has connector for power supply and control signals
2219/39551 . . . Pivoting gripper, so part takes always vertical orientation
2219/39552 . . . Stewart platform hand, parallel structured hand
2219/39553 . . . Dual gripper, two heads to pick up different objects
2219/39554 . . . Gripper is formed by flexible tube, embraces object like a finger
2219/39555 . . . Revolver with several grippers, hands
2219/39556 . . . Control system build into hand itself
Robotics, robotics mapping to robotics vision

object, moves with object on table

Ball in cup

Hockey playing, puck and paddle

Kick a ball, leg and foot movement simulator

Gripping workpiece to place it in another place, tray on conveyor belt

handling part to each other

textile material

Remove and replace machine part, module

Place a box, block in a corner

upon arrival of workpiece on conveyor

Optimize sequence of pick and place operations

placing, box stacking

Grip, grasp non rigid material, piece of cloth

Task, tool manipulation

Tool guidance along path

Passive compliant hand, wrist

Wrist, flexible wrist

Magnetically levitated wrist

Active electromechanical compliance for wrist

Axis wrist

Robotics, robotics mapping to robotics vision

Laser color indicates type of machining

Camera, robot follows direction movement of operator head, helmet, headstick

Move end effector so that image center is shifted to desired position

Window function, only a specific region is analyzed

Vision, analyse image at one station during manipulation at next station

Placing, palletize, un palletize, paper roll placing, box stacking

Optimize sequence of pick and place operations upon arrival of workpiece on conveyor

Place a box, block in a corner

Remove and replace machine part, module

Lay down, laying non rigid material, handle flat textile material

Pick and place by chain of three manipulators, handling part to each other

Kitting, place parts from belt into tray, place tray on conveyor belt

Gripping workpiece to place it in another place

Soccer playing

Kick a ball, leg and foot movement simulator

Hockey playing, puck and paddle

Ball in cup

Placing and assembly, throw object correctly on table

Batting, to redirect a projectile

Snatching, dynamic pick, effector contacts object, moves with object

Dynamic closure, remain contact by acceleration forces

Catching

Dynamic manipulation, throwing

Juggling, tennis playing, throw and catch

Preying, object capture, interception, mouse-buster

Insert flexible rod, beam into hole

Mount elastic ring on a cylinder

Dual peg in hole

Peg and hole insertion, mating and joining, remote center compliance

Assembly, microassembly

Disassembly, for recycling

Shake grasped parts for dropping excess entangled parts back into pin

Transport plates or sheets between two locations without motion inversion

No incomplete containers allowed to exit on output conveyor

Black list, exclude operation on workpiece when not possible, collision error

Robot mounted or sliding inside vehicle, on assembly line or for test, service

Robot operates panel like car radio by pushing, turning buttons, knobs

Control tilting angle of surface carried by robot

Move object without swinging, no pendulum or swing motion at stop point

Unfold flexible material

Fill bucket, if hard rock, follow contour rock

Fill bucket with sand, move horizontally, if resistance move up, move horizontally

Machine overhanging sculptured surfaces

Transport bar by two mobile robots on wavy road

Cut material with scissors

Manipulate flexible material fixed with one end to a wall

Deform, bend flexible material

Pick 3-D object from pile of objects

Supply sheet to bending machine

Wire stripping

Slide an edge over an edge

Contour tracking, edge following

Align box, block with a surface

Mount, couple and demount, decouple exchangeable mechanical modules

Disconnect cable

Door opening

Transport dish pile and dispense material in each dish of pile

Pierce, penetrate soft tissue

Approach, touch and then push object

Stack and align identical layers, laminates, electronic substrate layers

Stack irregular packages

Collective, group transport

Flattening, sweeping non rigid material, take out wrinkles

Relative positioning, grinding and polishing against rotating belt

Exert a screwing motion
State, generate tasks

Task planning

Using graph grammars and fuzzy logic

For assembly

Consider each part to be assembled as an agent, behaving autonomously
Tele-operation, computer assisted manual operation

Force reflective, impedance shaping tele
Micromanipulation fine, hand for gripper

Control modes, velocity for coarse, position for operator during manipulation

Autonomous manipulation, computer assists operator during manipulation

Micromanipulation

Force reflective, impedance shaping tele operation

Tele-operation, computer assisted manual operation

Moving of objects

Purpose is grasping objects

Input work program as well as timing schedule changes plans during execution

Correlate actual image at angle with image presented to operator without angle

Between operator and sensor a world modeler, local intelligence

Visual display of machining, operation, remote viewing

Sound display of machining operation

Measuring, predictive information feedback to operator

Fault recovery from task execution errors

Sensor data to display depends on robot status

Surface display, virtual object translated into real surface, movable rods

Switch between simulated display of remote site, and actual display

Simulated display of remote site, driven by operator interaction

Display of actual situation at the remote site

Set a common coordinate system for all remotely controlled robots

Stop command transmission if no feedback signal received at remote site

Stop robot if no command received within interval

Robot teleoperation through internet

Inclination, tilt of operator seat, chair serves as control command, like handle

Encode operator actions into symbolic commands for transmission to remote

Nanomanipulation

Distributed top, resource availability in network

Design of controller

Operator can fine position in small area, free, but if contact, force feedback

Master has different configuration than slave manipulator

Tele-machining

Compliant teleoperation, operator controls motion, system controls contact, force

Decoupled coarse fine motion coordination

Reachability control, permits slave to reach commanded position

Indexed position control, master controls only small part of slave space

Position control with scaling, master small movement, slave large movement

Modes, coarse by rate controller, fine by position controller

Autonomous manipulation, computer assists operator during manipulation

Control modes, velocity for coarse, position for fine, hand for gripper

Micromanipulation

Force reflective, impedance shaping tele operation

Tele-operation, computer assisted manual operation

Projecting light on floor to delimit danger zone around robot

Suppress, execute command depending on physical position of control panel

Contact with human allowed if under pain tolerance limit

Soft material covers links, arms for shock and pain attenuation

Detect contact, collision with human

Human robot coexistence

Detect position of operator, create non material barrier to protect operator

Each fault condition has a different recovery procedure

Multiple arm systems

Redundant serial manipulators, kinematic fault tolerance

Parallel structured modules, more joints than DOF

Dual redundant actuators

If speed is important processors execute each different code, otherwise same code

Fault tolerant, if one joint, actuator fails, others take over, reconfiguration

Two-way clutch for joint, prevents movement in unallowable direction

Record history, log of instructions sent from task planner to path planner

Command rejection module

Limit link kinetic energy to amount another element can dissipate upon impact

Record image of working robot; display to detect errors

Individual emergency stop lines for each part of system

Check conditions before allowing unlocking of joint brake

Detect contact, proximity of other manipulators

Individual and common power cutoff switch for several robots

Lock arm if somebody is looking into the hand for several robots

If insertion force to high, alarm, stop for operator assistance

If robot gets a return signal, go to initial condition position

During start up, control robot with low speed, after a while gradually higher

Input control signals to control system and to model, compare their outputs

If one access robot fails, other pushes it out of the way

If deviation of compliant tool is too large, stop and alarm

Analytical redundancy, use available functional redundancy of model

Safety, dual clutched freewheel for joint, if error no movement possible

Lock mechanical arm if servo, cpu error, other arms remain free

Portable robot

Snake arm, flexi-digit robotic manipulator, a hand at each end

Parallel robot, structure
With opposing actuators on same joint, agonist, flexor, muscle

Bus for communication with sensors

Dual arm robot, one picks up one part from conveyor as other places other part in machine

Common control box for several robot control boards and additional control boards

Underactuated robot, has less actuators than number of DOF

End effector with motor to provide a yaw, roll and pitch motion

Global positioning robot

Walking manipulator with integrated Stewart, parallel arm

Gripper on crawling device, smaller than two cm

6-DOF 3-ppsp parallel manipulator

Series manipulator mounted on parallel manipulator

Manipulator on slide

Whole arm manipulator, grip object not with end effector but with all links

Ghders generalized high dimensional robotic system, virtual decomposition

Robot on track, rail moves only back and forth

Soft arm robot, light, rubber, very compliant

Serial to parallel, branching manipulator, one macro and several parallel arms

End effector attached to cable for gravity balance suspension

Large, heavy manipulator

Flexible macro manipulator with rigid attached micromanipulator

Robot can be fixed in orientation and height to ground, plurality of such points

Set friction in each joint to optimal value

Self reproducing, replicating fabrication machine, tools, structure, info for this

Two link arm with a free, attached to base, and an active joint between links

Dual use mobile detachable manipulator

Human like, type robot arm

Use of inflatable links, can easily be folded, compressed air for stiffness

Resonant manipulator, springs cooperate with latches, motor only for lost energy

Parallel manipulator, end effector connected to at least two independent links

Master attached to tip of macro manipulator, controls slave micromanipulator

Naturally compliant robot arm

Underwater, submarine movable manipulator

Manipulator on slide, track

Wire manipulator, crane type manipulator with three wires

Cebot segments are mobile manipulators, connected by manipulator arm self

Manipulator mounted on satellite, space manipulator

Aqua robot manipulator

Hybrid, connect parallel manipulators in series, Stewart truss

Compact, foldable manipulator

Flexible arm, link

Closed kinematic loop, chain mechanisms, closed linkage systems

Vehicle supports manipulator and other controlled devices

Reservoir with additional material on vehicle with manipulator

Toolrack on vehicle with manipulator, toolchanger

Variable geometry manipulator, camlock

End effector with offset arm, to carry hose to feed material

Workpiece manipulator and tool manipulator cooperate

Integrate sensor, actuator units into a virtual manipulator

Scara for coarse movement, xy table for fine movement

Instead of two links, two eccentrically rotating disks for full circle working

Manipulator is positioned by a crane to cover a large workpiece, extended range

Gantry, portal

Portable robot can be fixed, attached to different workplaces, stations

Sensors at the elbow to detect obstacles

Second arm can be attached to first arm, modular

Macro manipulator and microhand, distributed positioning

Manipulator on vehicle, wheels, mobile

Holonic, made of similar modules, truss manipulator

Scara, selective compliance assembly robot arm, links, arms in a plane

Dynamically reconfigurable robot, adapt structure to tasks, cellular robot, cebot

Arm somersaults over grid, place one hand on grid point, release other hand

Modular structure

Exoskeleton, human robot interaction, extenders

Two or more independent robots

Two, dual arm robot, arm used synchronously, or each separately, asynchronously

Machine, conveyor model in library contains coe robot path

Simulation of human hand motion

Real time simulation

OOP object oriented programming for simulation

Graphic motion simulation for ergonomic analysis

Simulation of program locally before remote operation

Simulation with boundary graphs

Simulation of human-like robot joint, restricted 3-D motion

For collision avoidance and detection

Simulation of reaction force and moment, force simulation

Simulate contact of object and obstacle, reduce to pairs with only one contact
Multipoint impedance control, redundant manipulator

Elbow reaches its target position before the end of the movement.

Configuration control, select other tasks by adjusting the position of robot platform as additional task for the same robot, e.g., wrist and TCP.

Elbow high or low, avoid obstacle collision.

Category of performance criteria:
- Constraint, physical limitations
- Compliance, design and operational issues

Singularity detection
- Position, and task for link movement
- Combination of priority, basic task, tip position, and task for link movement
- Split robot into two virtual robot, origin of second equals tip of first
- Geometric, task independent
- Kinetic energy, content and distribution
- Compliance, design and operational issues
- Inertial, from dynamic models
- Constraint, physical limitations
- Category of performance criteria
- Elbow high or low, avoid obstacle collision with redundancy control
- Two independent paths planned, interpolations for same robot, e.g., wrist and TCP
- Position of robot platform as additional task
- Configuration control, select other tasks by configuration of link positions
- Elbow reaches its target position before the end effector
- Redundant manipulator
- Multipoint impedance control, redundant manipulator can touch several obstacles

Generate all possible arm postures associated with end effector position
- Control trajectory to avoid joint limit as well as obstacle collision
- Control end effector impedance
- Control of trajectory in case of a limb, joint disturbance, failure
- Control trajectory in case of distortion of visual input
- Control trajectory in case of changed tool length
- Moving center of mass and end effector for dynamic task of lifting heavy weight
- Impact force on stationary end effector, move center of mass, no reaction to base
- Keep center of mass fixed, no counterweight, no reaction on base
- Manipulability
- Control trajectory in case of joint limit, clamping of joint
- Limit allowable area where robot can be taught
- Correction, modification program by detection type workpiece
- Optimize taught path by data acquisition followed by genetic algorithm
- Compare offline taught point with online taught point, modify rest as function of error
- Search around taught point until operation has success, correct program
- Modify without repeating teaching operation
- Two channels between robot and teaching panel, rs232c and video
- Use robot control language also to write non robotic user, application programs
- Human to robot skill transfer
- Programming, visual robot programming language
- Learn natural high level command, associate its template with a plan, sequence
- Combine offline with online information to generate robot actions
- Composite movement with primitive movement segments from database
- Intermediate code for robots, bridge, conversion to controller
- Programming language for robots, universal, user oriented
- Opto-electronic follow-up of movement of head, eyelids, finger to control robot
- Selection of master-slave operation mode
- Convert workspace of master to workspace of slave
- Control button on master for quick movement, for fine slow movement
- Master for walk through, slave uses data for motion control and simulation
- Separate master controls macro and microslave manipulator
- Master slave position control
- Master slave rate control
- Master slave, master is replica of slave
- Intention learning
2219/40409 . . . Robot brings object near operator, operator places object in correct position
2219/40411 . . . Robot assists human in non-industrial environment like home or office
2219/40412 . . . Sensor knowledge command fusion network, data and feature and action and constraint
2219/40413 . . . Robot has multisensors surrounding operator, to understand intention of operator
2219/40414 . . . Man robot interface, exchange of information between operator and robot
2219/40415 . . . Semi active robot, cobot, guides surgeon, operator to planned trajectory, constraint
2219/40416 . . . Planning for variable length tool, laser beam as tool
2219/40417 . . . For cooperating manipulators
2219/40418 . . . Presurgical planning, on screen indicate regions to be operated on
2219/40419 . . . Task, motion planning of objects in contact, task level programming, not robot level
2219/40421 . . . Motion planning for manipulator handling sheet metal profiles
2219/40422 . . . Force controlled velocity motion planning, adaptive
2219/40423 . . . Map task space to sensor space
2219/40424 . . . Online motion planning, in real time, use vision to detect workspace changes
2219/40425 . . . Sensing, vision based motion planning
2219/40426 . . . Adaptive trajectory planning as function of force on end effector, bucket
2219/40427 . . . Integrate sensing and action in planning
2219/40428 . . . Using rapidly exploring random trees algorithm RRT-algorithm
2219/40429 . . . Stochastic, probabilistic generation of intermediate points
2219/40431 . . . Grid of preoptimised paths as function of target position, choose closest, fine adapt
2219/40432 . . . Pass states by weighted transitions
2219/40433 . . . Distributed, trajectory planning for each virtual arm
2219/40434 . . . Decompose in motion planning for swarm of robots and motion planning for object to be transported
2219/40435 . . . Extract minimum number of via points from a trajectory
2219/40436 . . . Distributed search of attainable positions, parallel computed
2219/40437 . . . Local, directly search robot workspace
2219/40438 . . . Global, compute free configuration space, connectivity graph is then searched
2219/40439 . . . Feasible map algorithm
2219/40441 . . . Probabilistic backprojection
2219/40442 . . . Voxel map, 3-D grid map
2219/40443 . . . Conditional and iterative planning
2219/40444 . . . Hierarchical planning, in levels
2219/40445 . . . Decompose n-dimension with n-links into smaller m-dimension with m-1-links
2219/40446 . . . Graph based
2219/40447 . . . Bitmap based
2219/40448 . . . Preprocess nodes with arm configurations, c-space and planning by connecting nodes
2219/40449 . . . Continuous, smooth robot motion
2219/40451 . . . Closest, nearest arm, robot executes task, minimum travel time
2219/40452 . . . Evaluation function derived from skilled, experimented operator data
2219/40453 . . . Maximum torque for each axis
2219/40454 . . . Max velocity, acceleration limit for workpiece and arm jerk rate as constraints
2219/40455 . . . Proximity of obstacles
2219/40456 . . . End effector orientation error
2219/40457 . . . End effector position error
2219/40458 . . . Grid adaptive optimization
2219/40459 . . . Minimum torque change model
2219/40461 . . . Plan for even distribution of motor load of joints
2219/40462 . . . Constant consumed energy, regenerate acceleration energy during deceleration
2219/40463 . . . Shortest distance in time, or metric, time optimal
2219/40464 . . . Minimum relative velocities
2219/40465 . . . Criteria is lowest cost function, minimum work path
2219/40466 . . . Plan for minimum time trajectory, at least one joint maximum torque
2219/40467 . . . Virtual springs, impedance method
2219/40468 . . . Using polytree intersection method
2219/40469 . . . Using fuzzy logic performance, distances are fuzzy, very close to very far
2219/40471 . . . Using gradient method
2219/40472 . . . Using exact cell decomposition
2219/40473 . . . Using genetic algorithm GA
2219/40474 . . . Using potential fields
2219/40475 . . . In presence of moving obstacles, dynamic environment
2219/40476 . . . Collision, planning for collision free path
2219/40477 . . . Plan path independent from obstacles, then correction for obstacles
2219/40478 . . . Graphic display of work area of robot, forbidden, permitted zone
2219/40479 . . . Use graphic display, layout of robot path, obstacles to indicate interference
2219/40481 . . . Search pattern according to type of assembly to be performed
2219/40482 . . . Before assembly arrange parts
2219/40483 . . . Find possible contacts
2219/40484 . . . Using several tethered motors, attached to powersupply cable, move over surface
2219/40485 . . . Generate goal regions in presence of uncertainty, interference
2219/40486 . . . If physical limitation, execute regrasping steps
2219/40487 . . . Sensing to task planning to assembly execution, integration, automatic
2219/40488 . . . Coarse and fine motion planning combined
2219/40489 . . . Assembly, polyhedra in contact
2219/40491 . . . Gravity stable assembly, upper part cannot fall apart
2219/40492 . . . Model manipulator by spheres for collision avoidance
2219/40493 . . . Task to parameter designer, adapts parameters of impedance model as function of sensors
2219/40494 . . . Neural network for object trajectory prediction, fuzzy for robot path
2219/40495 . . . Inverse kinematics model controls trajectory planning and servo system
2219/40496 . . . Hierarchical, learning, recognition level controls adaptation, servo level
Identification and location, position of components, objects

Object dimension

Identification and location, position of components, objects

Object dimension

Identification and location, position of components, objects

Object dimension

Identification and location, position of components, objects
Selection gain according to selection of speed or positioning mode

G05B

- At least three cameras, for tracking, general overview and underview
- Two virtual infrared range sensors
- Push object and hold, detect moved distance
- Two range sensors for recognizing 3-D objects
- Camera to monitor deviation of each joint, due to bending of link
- Encoder in each joint
- Measure, calculate angular momentum, gyro of rotating body at end effector
- Measure velocity, speed of end effector
- Force, torque sensor integrated in joint
- Reference sensors
- Robot control test platform
- Infrared stimulated ultrasonic button on end effector, two fixed receivers
- Two camera, global vision camera, end effector neighbourhood vision camera
- Two cameras, each on a different end effector to measure relative position
- Force, torque sensor in finger
- Fixed camera to observe workspace, object, workpiece, global
- Camera rotates around end effector, no calibration needed
- Camera to monitor end effector as well as object to be handled
- Camera to monitor endpoint, end effector position
- 6-DOF ultrasonic or infrared external measurement
- Camera, laser scanner on end effector, hand eye manipulator, local
- Whole arm proximity sensor WHAP
- Integrate sensor placement, configuration with vision tracking
- Sensor planning, sensor configuration, parameters as function of task
- Agile eye, control position of camera, active vision, pan-tilt camera, follow object
- Measure gripping force offline, calibrate gripper for gripping force
- Haptic, combination of tactile and proprioceptive sensing
- Triangulation sensor
- Detect orientation of workpiece during movement of end effector
- Track position of end effector by laser beam
- Optical beam area sensor
- Tactile sensor
- Proprioceptive, detect relative link position, form object from hand contact
- Tactile image sensor, matrix, array of tactile elements, tixels
- Progressive constraints
- Manipulation planning, consider manipulation task, path, grasping
- Servomotor, servo controller till figures
- Servo problems
- Servo amplifier
- Control power amplifier with data on data bus
- Selection gain according to selection of speed or positioning mode

- Update servo gain not for each microprocessor cycle, but after a certain displacement
- Change gain as function of speed and position
- Select gain as function of gear ratio
- Speed gain high, position gain low in speed mode and inverse in position mode
- Sum output of amplifiers with different gains
- Adapt gain as function of followup error, model can be used
- Adjust feedforward gain
- Lower gain in high frequency region
- Cubic raise of gain until friction overcome, then linear raise
- Adjust position and speed gain of different axis
- Adjust gain to maintain operating bandwidth for guaranteed servo performance
- High gain in narrow band of frequencies centered around frequency of rotation
- High gain for motor control during acceleration, low during deceleration
- Measure time needed from first to second speed, to adapt gain to aging condition
- Variable gain
- Small gain for small movements, large gain for large movements
- Large pd gain initially switched to smaller pd gain afterwards
- High gain for low command speed, torque or position error equals or near zero
- Detect oscillation, instability of servo and change gain to stabilize again
- Change gain as function of speed
- Control signal exponentially to error
- Select gain with memory, rom table
- Adjust gain as function of position error and position
- Raise gain at zero speed until position error or speed is zero, then normal gain
- Backlash
- Constant counter torque
- Two motors driven in opposite direction to take up backlash
- Voltage injection
- Position error in memory, lookup table for correction actual position
- With computer
- Compensation pulses
- Change compensation slowly, gradually, smooth error with filter
- Compensation pulses as function of direction movement
- Switch between rapid, quick feed and cut, slow workspeed feed backlash
- Memory table with motor current and corresponding correction for lost motion
- For several transducers a table, select table as function of transducer
- For several modes and feed speeds, a table, registers for several backlash
- Fiw compensation using adaptive inverse backlash model
- Recirculating ballnut, ballscree, preloaded bearing
Relieve backlash by stepping back a little and verify position.

Block position pulses until movement detected, automatic compensation.

Detect end of lost motion by detecting changing current.

By detecting change of velocity.

How to integrate position error, add to speed loop.

Using neural network techniques.

Kind of compensation such as pitch error compensation.

Compensation for changing stiffness, deformation of workpiece.

Stiffness, deformation of slide, drive.

For deformation of screw.

Play in gear, screw backlash, lost motion.

Backlash for linear deviations.

Compensation for two, three axis at the same time, crosscoupling.

Lineary distributing pitch error over interpolated distance, add pulses, smoothing.

Reference screw, simulation axis, electronic simulated axis.

Resolver or inductosyn correction.

Keep nut at constant distance from screw.

Correction screw.

Measuring and feedback.

With cam.

Backlash for non orthogonal axis.

Cam transmits movement to resolver.

Tuning potentiometers and programming them.

Learn, calibrate at start for indetermined position, drive until movement.

Calibrate at start if new screw or slide has been installed, new lookup table.

For each replacement of a movable part, reload pitch error correction.

Self tuning, test run, detect, compute optimal backlash, deformation compensation.

Backlash acceleration compensation when reversing, reversing direction.

Cross coupled backlash for two other axis on reversing third axis.

Approach position from same direction.

Timer, speed integration to control duration of backlash correction.

Upon reversing direction, lower, change gain.

Compensation speed axis with changing, reversing direction, quadrant circle.

Compensation pulses on inversion of direction of rotation, movement.

Bang bang control.

Determine switch point.

If error too large, switch over to signal identification and servo correction.

Align, calibrate control so that one pulse or signal represents certain movement.

Alignment, zeroing, nulling, set parallel to axis.

References, calibration positions for correction of value position counter.

By injection of sinusoidal signal, superposed on reference.

Removable interferometer, store exact position, needed drive current, temperature.

References, calibration positions to adapt gain of servo.

For several positions store dead zone in memory.

Align stepping motor with driven valve.

Automatic recalibration.

Calibration by going to two extremes, limits, counting pulses, storing values.

Stop, halt step, ac motor on certain excitation phase, after sensing a reference.

Analog comparator.

One comparator for both speed and position feedback.

Start fine position after coarse position stopped.

Coarse fine.

Coarse fine take over, transition, switch over.

Coarse by hydraulic cylinder, fine by step motor superposed on piston.

Controlled parameter such as gas mass flow rate.

Drilling rate, feed rate.

Vertical position and orientation with respect to vertical.

Control parameter such as motor controlled by a torque signal.

Compensation for path radius.

Compensation for gravity, counter balance gravity.

Compensation periodical disturbance, like chatter, non-circular workpiece.

Compensation for instability.

Cancel vibration during positioning of slide.

Drift-compensation for servo, anti-hunt.

Servo error compensation.

Eliminating oscillations, hunting motor, actuator.

Mechanical vibrations in servo, antihunt also safety, stray pulses, jitter.

Correction inertia of servo.

Nonlinear compensation.

Compensate position as function of phase lag of drive motor.

Compensation for current ripple of drive or transducer.

Compensation for temperature variations of servo.

Compensate vibration beam, gantry, feedback of speed of non driven end.

Force compensation for non linearity of system.

Enter manually a compensation, correction for a better positioning.

Motor ripple compensation.

Compensation non linear transfer function.

Ann compensates output of pd controller.

Avoid stray pulses, jitter, use two d-flipflops, or integrate pulse duration.

Compensation of position for slip of ac motor.

Torque compensation for levitation effect of motor.
Compensation of lag during standstill

PI precompensation for position loop

Serial precompensation during actual positioning

Repetitive control, adaptive, previous error from lookup memory or substracted to speed reference

Derivative compensation for speed loop, added function of sampling and computation time on system into phase margin

Adapt coefficients of compensator to bring movement

Different compensation for left and right movement

Adapt coefficients of compensator to bring system into phase margin

Delay of compensation output signal as function of sampling and computation time

Compensator in feedback loop

Derivative compensation for speed loop, added or substracted to speed reference

Compensation control, position error with data from lookup memory

Repetitive control, adaptive, previous error during actual positioning

Serial precompensation

PI precompensation for speed loop

PID precompensation for position loop

PI precompensation for position loop

Compensation of lag during standstill

Compensation of lag during constant speed movement

Send reference data in inverse order to model, filter to get inverted phase

Lag

Inverse, reciprocal filter, transfer function, reduce lag in contouring

Compensate position error between two different axis as function of type of transducer

Several axis, compensation for load for several axis at the same time

Cancel vibration by positioning two slides, opposite acceleration

Compensation for different response times, delay of axis

Active damping of tool vibrations by cross coupling

Axis error, one axis is corrected on other axis

Cross coupled feedback, position change one axis effects control of other

Adaptive prefiltering

Adaptive postfiltering

Fuzzy precompensation of pid, pd

Feedforward compensation of pid

Fuzzy compensation of statecontroller

Structure, compensation circuit after comparator in loop

Lead-phase compensation, lag-phase compensation servo

Compensation circuit for input, reference, before comparator

Compensation circuit in speed feedback loop

Lookup table, memory with certain relationships

Lookup table with position command, deviation and correction value

Lookup table for load, motor torque as function of actual position error

Lookup table with compensation as function of reference and feedback value

For surface deviations from reference surface

Gains for pid compensator as function of xy position

Lookup table for load, motor torque as function of actual position

Lookup table for current as function of actual position

Lookup table for speed as function of actual position error

Two lookup tables, for forward and reverse movement

Command preshape, guidance, reference for better dynamic response, forcing feedforward

Posicast, break reference into two parts, better settling time

To compensate path, track error, calculate, use compensated reference

Fuzzy shaping

Modified command filtering

Ann shaping, objective position, trajectory is shaped by ann

Shaping a bang-bang input
Drive in two directions

Ballscrew and ball spline nut driven
direction to avoid local wear

Two cascade slides controlled in opposite
twelve

twist

Servo loop with stepping motor, see figure SE-

Coupling, clutch and brake unit

function of contouring, spindle orientation

Switch control mode of spindle drive as
using levers

Binary summing of motions, by stacking or
using levers

Switch control mode of spindle drive as
function of contouring, spindle orientation

Driven by two motors

To avoid backlash

Coulpling, clutch and brake unit

Servo loop with stepping motor, see figure SE-
twelve

Two cascade slides controlled in opposite
direction to avoid local wear

Ball screw and ball spline nut driven
synchronously or independently

Drive in two directions

2219/41225 . . . Profile generator for reference and for feedforward torque
2219/41226 . . . Zero vibration and zero derivative input shaper ZVD
2219/41227 . . . Extra insensitive input shaper, some vibration allowed
2219/41228 . . . Frequency of commutation updates depends on motor speed
2219/41229 . . . Adding a vibration, noise signal to reference signal of position, speed or acceleration
2219/41231 . . . Using impulse shaping filter
2219/41232 . . . Notch filter
2219/41233 . . . Feedforward simulation filter, with model
2219/41234 . . . Design, modeling of position controller
2219/41235 . . . Design, modeling of motion controller
2219/41236 . . . Use of sfc sequential function charts for specification
2219/41237 . . . Use of petrinets for verification, simulation
2219/41238 . . . Design with control bandwidth beyond lowest natural frequency
2219/41239 . . . Lyapunov direct controller design
2219/41241 . . . Anti-coincidence, synchronizer
2219/41242 . . . Pulse height modulation PHM
2219/41243 . . . Prevent, detect overflow of counter
2219/41244 . . . Dead band, zone
2219/41245 . . . Discrimination of direction
2219/41246 . . . Modulate command according to hystereris so that ideal curve is followed
2219/41247 . . . Servo lock
2219/41248 . . . Adapting characteristics of servo
2219/41249 . . . Several slides along one axis
2219/41251 . . . Servo with spring, resilient, elastic element, twist
2219/41252 . . . Avoid housing vibration, slide and auxiliary slide controlled with opposite phase
2219/41253 . . . From measured signature, select in database corresponding servo valve type
2219/41254 . . . Avoid cumulative measuring, calculation errors, sum remainder
2219/41255 . . . Mode switch, select independent or dependent control of axis
2219/41256 . . . Chattering control
2219/41257 . . . Display of gain
2219/41258 . . . Single position detector for plural motors driving a single load
2219/41259 . . . Coupling, clutch
2219/41261 . . . Flexible coupling between carriage, slide and actuator, motor
2219/41262 . . . Binary summing of motions, by stacking or using levers
2219/41263 . . . Switch control mode of spindle drive as function of contouring, spindle orientation
2219/41264 . . . Driven by two motors
2219/41265 . . . To avoid backlash
2219/41266 . . . Coupling, clutch and brake unit
2219/41267 . . . Servo loop with stepping motor, see figure SE-twelve
2219/41268 . . . Two cascade slides controlled in opposite direction to avoid local wear
2219/41269 . . . Ball screw and ball spline nut driven synchronously or independently
2219/41271 . . . Drive in two directions
2219/41321 . . . Brushless dc motor
2219/41322 . . . Vector, field oriented controlled motor
2219/41323 . . . Permanent magnetic synchronous actuator, motor
2219/41324 . . . Modular servo drive, simo drive
2219/41325 . . . Linear electric actuator for position combined with pneumatic actuator for force
2219/41326 . . . Step motor
2219/41327 . . . Linear induction motor
2219/41328 . . . Direct motor drive
2219/41329 . . . Dc motor
2219/41331 . . . Galvano driver
2219/41332 . . . Electromagnet driven core, position of core controlled
2219/41333 . . . Non linear solenoid actuator
2219/41334 . . . Electrostatic levitator
2219/41335 . . . Reluctance motor
2219/41336 . . . Voltage and frequency controlled ac motor
2219/41337 . . . Linear drive motor, voice coil
2219/41338 . . . High torque, low inertia motor, printed circuit motor
2219/41339 . . . Using, switch reluctance or asynchronous motor in, to stepping mode motor
2219/41341 . . . Ultrasonic motor
2219/41342 . . . Shape memory metal actuator
2219/41343 . . . Magnetostriective motor
2219/41344 . . . Piezo, electrostrictive linear drive
2219/41345 . . . Micropositioner
2219/41346 . . . Micropositioner in x, y and theta
2219/41347 . . . Piezo cycloid motor
2219/41348 . . . Hydraulic pressure block
2219/41349 . . . 6-Dof combined magnetic fluidic floating motion stage 100-micrometer cube range
2219/41351 . . . Piezo impact force, rapid extension of small mass moves object a bit
2219/41352 . . . Alternative clamping dilation of piezo, caterpillar motion, inchworm
2219/41353 . . . Optical piezo electric element, light converted in movement
2219/41354 . . . Magnetic, thermal, bimetal peltier effect displacement, positioning
2219/41355 . . . Electro magnetic coil actuator, voice coil
2219/41356 . . . Variable speed transmission, Van Doorne, Reeves
2219/41357 . . . Belt
2219/41358 . . . Transmission, variable gear ratio
2219/41359 . . . Gearbox
2219/41361 . . . Differential
2219/41362 . . . Registration, display of servo error
2219/41363 . . . Excess in error, error too large, follow up error
2219/41364 . . . Excess in error for speed, follow up error for speed
2219/41365 . . . Servo error converted to frequency
2219/41366 . . . Linearization of embedded position signals
2219/41367 . . . Estimator, state observer, space state controller
2219/41368 . . . Disturbance observer, inject disturbance, adapt controller to resulting effect
2219/41369 . . . Two estimators
2219/41371 . . . Force estimation using velocity observer
2219/41372 . . . Force estimator using disturbance estimator observer
2219/41373 . . . Observe position and driving signal, estimate disturbance and speed
2219/41374 . . . Observe position and driving signal, predict, estimate disturbance signal
2219/41375 . . . Observe speed and select torque as function of position reference, to compensate torque
2219/41376 . . . Tool wear, flank and crater, estimation from cutting force
2219/41377 . . . Estimate cutting torque in real time
2219/41378 . . . Estimate torque as function of speed, voltage and current
2219/41379 . . . Estimate torque from command torque and measured speed
2219/41381 . . . Torque disturbance observer to estimate inertia
2219/41382 . . . Observe position from encoder, estimate speed with ann
2219/41383 . . . Observe current, voltage, derive position
2219/41384 . . . Force estimation using position observer
2219/41385 . . . Observe position from encoder, estimate speed, position with kalman filter
2219/41386 . . . System identifier adapts coefficients tables for state and observer controller
2219/41387 . . . Observe reference torque, position and feedback position, estimate contact force
2219/41388 . . . Observe input torque and feedback position, estimate reaction torque
2219/41389 . . . Estimate torque from command torque and feedback acceleration
2219/41391 . . . Flux observer, flux estimated from current and voltage
2219/41392 . . . Observer for each axis, link, freedom, gives greater speed
2219/41393 . . . Synchronize observer with pulse from encoder
2219/41394 . . . Estimate speed and position error from motor current, torque
2219/41395 . . . Observe actual position to estimate compensation torque
2219/41396 . . . Estimate acceleration from three phase current values
2219/41397 . . . Estimate voltage control signal as function of voltage control signal and position error
2219/41398 . . . Estimate twist between motor and load, observe motor position and speed
2219/41399 . . . Reduced order estimator
2219/41401 . . . Estimate position from max and min speeds in open loop
2219/41402 . . . Observe speed and driving signal, estimate speed
2219/41403 . . . Machine deformation estimator as function of commanded position
2219/41404 . . . Hysteresis, bang bang feedback of velocity
2219/41405 . . . Inverse kinematic, dynamic
2219/41406 . . . LQR linear quadratic regulator to calculate gain for several known variables
2219/41407 . . . Master changes resistor, slave restores value in order to follow master
2219/41408 . . . Control of jerk, change of acceleration
2219/41409 . . . Update position feedback during speed control
2219/41411 . . . Avoid integrator wind-up, saturation actuator by dead zone feedback for integral
2219/41412 . . . Bandwidth of velocity loop is just below natural frequency of drive support
2219/41413 . . . Forward kinematics
2219/41414 . . . Time delay control, estimate non linear dynamics, correct with time delayed input
Superposition of movement figure SE-two

Inverse, feedforward controller is inverse of compensation

Feedback signal is doubled, reference signal is doubled plus one

Resolution of feedback of incremental position decreases with velocity speed

Position reference ffw for compensation of speed reference and speed error

Inverse, feedforward controller is inverse of closed loop system

Noise filter as function of rate of displacement, speed, for stabilisation

Select a controller as function of large or small error

Position generates force ffw combined with position error

Value of previous feedforward values

Delay position command as function of calculation time for feedforward, or order of system

Feedforward of acceleration

Feedforward of position

Mean value of previous feedforward values

Feedforward of position and speed

Feedforward of speed only during deceleration

Feedforward of position and speed loop, step value

Feedforward of position loop

Feedforward of current

Feedforward of speed and acceleration

Feedforward of speed

Feedforward of speed only during deceleration

Position reference ffw for compensation speed reference and speed error

Position reference ffw for compensation speed reference

Position reference ffw for compensation of position

Speed reference ffw for compensation of speed error

Servo loop with phase counter and phase discriminator, see figure SE-four

Servo loop with position and reference counter, see figure SE-seven

Servo loop with position and reference counter, see figure SE-sixteen

Servo loop with phase comparator, see figure SE-ten

Servo loop with oscillator, see figure SE-eleven

Servo loop with coincidence detector, see figure SE-thirteen

Servo loop with adder, see figure SE-fourteen

Servo loop with u-down counter, see figure SE-fifteen

Servo loop with position error indicates speed step value

Servo loop with position and speed loop, problems of speed loop

Servo loop with absolute digital position sensor

Servo loop with absolute digital position sensor for continuous path control

Servo loop with analog position sensor

Servo loop with analog position sensor for continuous path control

Servo loop with combination of analog and digital sensor

Servo loop with position loop

Divide command, block in subcommands, subblocks

Servomotor, servo controller kind till VSS

Statistical process control spc

Proportional

Three point, hysteresis comparator, controller

PD proportional derivative

Disturbance decoupling, rejection, suppression

Digital event dynamic system control

Nonlinear PD

P regulator for position loop

I regulator for speed loop

H-infinite controller

Two pd controllers, one for coarse, one for fine motion

P pseudo derivative control with feedforward of gain

P integrator, look at past periodic errors, fading memory, repetitive controller

Dynamic impedance control, load does not influence speed, force, position

Mimo controller with many inputs and outputs

Pid learning controller, gains adapted as function of previous error

Pi for position controller

Pi for current loop

Three point, hysteresis controller with variable hysteresis as function of error

Non linear pi
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2219/42024 . . . Stage controller, zpc and fuzzy smc and compensation controller
2219/42025 . . . Pidaf, pid with acceleration and friction compensation
2219/42026 . . . Pi position controller and fuzzy logic speed controller
2219/42027 . . . Flsp frequency locked steeping position control servo
2219/42028 . . . Five point, hysteresis controller
2219/42029 . . . Crane controller, fractional or fractal or non integer order robust controller
2219/42031 . . . All denominator model, the model form is expanded in denominator taylor series
2219/42032 . . . Differential feedback pd
2219/42033 . . . Kind of servo controller
2219/42034 . . . Pi regulator
2219/42035 . . . I regulator
2219/42036 . . . Adaptive control, adaptive nonlinear control
2219/42037 . . . Adaptive pi
2219/42038 . . . Real time adaptive control
2219/42039 . . . Select servo parameter set from table for fixed linear working points
2219/42041 . . . Adaptive pd
2219/42042 . . . Adaptive robust controller
2219/42043 . . . Adapt regulator as function of its output
2219/42044 . . . Adapt model as function of difference between real and calculated position
2219/42045 . . . Ann, error to pd, output pd to plant and also sets weights in ann
2219/42046 . . . Fuzzy pd controller, with position and velocity inputs
2219/42047 . . . Pid like fuzzy controller with position and velocity inputs
2219/42048 . . . Fuzzy pi control
2219/42049 . . . Fuzzy p
2219/42051 . . . Fuzzy position controller
2219/42052 . . . Fuzzy pi and d control
2219/42053 . . . Dynamic fuzzy position controller
2219/42054 . . . Loop, p control for position loop
2219/42055 . . . Pi control for speed
2219/42056 . . . Pi current controller
2219/42057 . . . Predictive fuzzy controller
2219/42058 . . . General predictive controller GPC
2219/42059 . . . Delta gpc, using derivative in time, predict over finite horizon
2219/42061 . . . Stochastic predictive controller spc
2219/42062 . . . Position and speed and current
2219/42063 . . . Position and speed and current and force, moment, torque
2219/42064 . . . Position, speed and acceleration
2219/42065 . . . Feedforward combined with pid feedback
2219/42066 . . . Position and speed and acceleration and current feedback
2219/42067 . . . Position and current
2219/42068 . . . Quasi smc, smc combined with other regulators
2219/42069 . . . Observer combined with pd and zero phase error tracking fww controller
2219/42071 . . . Two clocks for each of the two loops
2219/42072 . . . Position feedback and speed feedforward, speed from data of tape
2219/42073 . . . Position and speed feedback, speed derived from position reference
2219/42074 . . . Position feedback and speed feedback, speed measured with tacho
2219/42075 . . . Two position loops
2219/42076 . . . Hybrid, digital control sets reference, coefficients for quick analog, pid, control
2219/42077 . . . Position, speed or current, combined with vibration feedback
2219/42078 . . . Observer combined with pd
2219/42079 . . . P position loop, fuzzy speed loop
2219/42081 . . . Fuzzy position controller and smc for motor voltage control
2219/42082 . . . Force control in one axis, velocity control in other axis
2219/42083 . . . Position, speed and force feedback
2219/42084 . . . Hybrid, analog loop, reference compensated by digital loop
2219/42085 . . . Error between reference model and controller compensated with fuzzy controller
2219/42086 . . . Position, speed and deflection feedback
2219/42087 . . . Speed and force loop
2219/42088 . . . I parallel to non linear controller
2219/42089 . . . Quick but coarse loop and slow but fine loop, dexterity
2219/42091 . . . Loop combinations, add a second loop, cascade control
2219/42092 . . . Position and force control loop together
2219/42093 . . . Position and current, torque control loop
2219/42094 . . . Speed then pressure or force loop
2219/42095 . . . First closed loop, then open loop
2219/42096 . . . Add, subtract i part of speed feedback as function of sign speed error
2219/42097 . . . Dual mode servo, slow and precise, quick and coarse movement
2219/42098 . . . First open, then closed loop to correct setpoint of open loop
2219/42099 . . . Slow coarse loop followed by fine quick loop
2219/42101 . . . Coarse position with microprocessor, fine with hardware centering, tracking
2219/42102 . . . Coarse 8-bit positioning in closed loop, fine 10-bit in open loop
2219/42103 . . . Switch from pi, if large error to disturbance mode control if small error
2219/42104 . . . Loop switch, speed loop then position loop, mode switch
2219/42105 . . . Switch from pid to bang-bang to energy dissipation as function of speed, error
2219/42106 . . . Speed regulation starts only in braking range, less processor time needed
2219/42107 . . . Always position loop, first open loop for speed, then also closed loop speed
2219/42108 . . . Open loop for positioning, closed loop for calibration
2219/42109 . . . Coarse is speed loop, fine is position loop
2219/42111 . . . Change from pd, if small error, to bangbang if large error
2219/42112 . . . Switch between motion and stall mode, if speed is below certain value
2219/42113 . . . Position closed loop or open loop pressure control
2219/42114 . . . Loop mode, dual mode incremental coarse, analog fine
2219/42115 . . . Switch from continuous drive to pwm, near stop or out of acceleration period
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2219/42116 . . . Switch from pid to pd or pd to pid
2219/42117 . . . Speed mode then stepping mode
2219/42118 . . . Breaking of control loop, closing open control loop
2219/42119 . . . Switch between motion and stall mode if actuator voltage current below limit
2219/42121 . . . Switch from bang-bang control to dead beat, finite time settling control
2219/42122 . . . First open loop, then closed loop
2219/42123 . . . Position loop then force, current loop
2219/42124 . . . Change over between two controllers, transfer error signal
2219/42125 . . . Switch from pi to p or to pd-controller
2219/42126 . . . Bumpless, smooth transfer between two control modes
2219/42127 . . . Timing, switch over on detection of marker on spindle
2219/42128 . . . Servo characteristics, drive parameters, during test move
2219/42129 . . . Teach, learn position table, model, for each reference a motor control output
2219/42131 . . . Speed model created by entering estimated speed at references
2219/42132 . . . Correct, modify position table, model if detected error too large
2219/42133 . . . Position references as function of time, correlated speed, acceleration in memory, signature
2219/42134 . . . Fuzzy logic tuning of controller as function of error
2219/42135 . . . Fuzzy model reference learning controller, synthesis, tune rule base automatically
2219/42136 . . . Fuzzy feedback adapts parameters model
2219/42137 . . . Automatic tune fuzzy controller
2219/42138 . . . Network tunes controller
2219/42139 . . . Tune fuzzy controller by three attributes: rise time, overshoot, settling time
2219/42141 . . . Filter error learning
2219/42142 . . . Fuzzy control learning of starting friction coefficient
2219/42143 . . . offline optimization of fuzzy controller
2219/42144 . . . Online tuning of fuzzy controller by ann
2219/42145 . . . Coarse tune with genetic algorithm, fine with gradient descent, hill climbing
2219/42146 . . . In each position, upper, lower drive current needed to move more, less, store mean
2219/42147 . . . Tune with genetic algorithm
2219/42148 . . . Position references as function of time, correlated noise, temperature in memory
2219/42149 . . . During learning relation between control and controlled signal, open loop
2219/42151 . . . Learn dynamics of servomotor system by ann
2219/42152 . . . Learn, self, auto tuning, calibrating, environment adaptation, repetition
2219/42153 . . . Inverse dynamics model idm, computed torque method
2219/42154 . . . Model itself controlled by position and speed loop
2219/42155 . . . Model
2219/42156 . . . Forward dynamics model fdm
2219/42157 . . . Reference model uses only output and input measurements
2219/42158 . . . Fuzzy model of cutting process of milling machine
2219/42159 . . . ARMA, AR autoregressive for poles, MA moving average model for zeros, in combination
2219/42161 . . . One model for load, one model for motor inertia
2219/42162 . . . Model reference adaptive control MRAC, correction fictive-real error, position
2219/42163 . . . Simulator
2219/42164 . . . Compensation of integration time of model
2219/42165 . . . Compensation of gain of speed control circuit for model
2219/42166 . . . Criterium is minimum jerk
2219/42167 . . . Minimum torque change
2219/42168 . . . Measuring of needed force for servo
2219/42169 . . . Decoder
2219/42171 . . . Velocity profile, variable gain, multiplication factors, rom ram
2219/42172 . . . Special code
2219/42173 . . . Acceleration deceleration
2219/42174 . . . Memory with position profile and force limits
2219/42175 . . . Velocity, speed points, profile and corresponding acceleration, delta v
2219/42176 . . . Motion profile
2219/42177 . . . Configuration memory for step motor
2219/42178 . . . Reduce cable connection by pre-memorized positions
2219/42179 . . . Normalize velocity profile, calculate real velocity from additional parameters
2219/42181 . . . Rom contains sin and cos table to drive step motor
2219/42182 . . . Memory is Rom for servo control
2219/42183 . . . Memory is Ram
2219/42184 . . . Master slave with feedforward for compensation of contour error
2219/42185 . . . Master slave with contour controller
2219/42186 . . . Master slave, motion proportional to axis
2219/42187 . . . Position mirror, axis, display, back of seat as function of position of seat, other axis
2219/42188 . . . Slave controlled as function of reference and actual position and derived speed of master
2219/42189 . . . Motion look up table as function of cam angle
2219/42191 . . . Adjust proportionality factor to optimize slave axis movement
2219/42192 . . . Each axis drive has own queue of commands, executed in synchronism
2219/42193 . . . Select between limit switches as function of current position and destination
2219/42194 . . . Derive position from command speed, integrate speed
2219/42195 . . . Position a stop, move workpiece against stop to cut stock, bar
2219/42196 . . . Follow dynamically contour warped surface with tool
2219/42197 . . . Brake as function of machining load, to keep total load on tool constant, avoid oscillation
2219/42198 . . . Step motor driven by step size and step duration data
2219/42199 . . . Fine position with gauge, coarse with limit switch, transducer
2219/42201 . . . Deriving speed from commanded position
2219/42202 . . . Square of distance
2219/42203 . . . Using a counter and a limit switch
2219/42204 . . . Absolute positions
2219/42205 . . . With potentiometer
2219/42206 . . . Block, stop pulses in one axis, not in other axis
2219/42207 . . . Generate points between start and end position, linear interpolation
2219/42208 . . . Set position of proximity switch
2219/42209 . . . Two slides, fine and quick, coarse and slow, piggyback, multirate positioner
2219/42211 . . . Command position by time value, proportional to total displacement
2219/42212 . . . Rotation over, selection of smallest, shortest angle, distance
2219/42213 . . . Position overshoot, axis still moves after stop
2219/42214 . . . Near desired position, control actuator by pulse in each clock, otherwise continuously
2219/42215 . . . Stop machine in a predetermined position
2219/42216 . . . Changing position range, stroke, between closed and fully open
2219/42217 . . . Time optimal position control
2219/42218 . . . Coarse and fine position control combined, each by ann
2219/42219 . . . Slow positioning with low pass, concurrent quick with high pass part of command
2219/42221 . . . Control position by equilibrium between spring and actuator force
2219/42222 . . . Compare reflected image from object with reference image, adjust object
2219/42223 . . . Number and frequency of pwm signals define mean position in time
2219/42224 . . . Process received reference to adapt it to range of servo
2219/42225 . . . Coarse and fine position control combined, added, superposed
2219/42226 . . . If deviation, return to desired position after a delay if within position range
2219/42227 . . . Using incremental control actuator
2219/42228 . . . Stop motor where torque will be maximum
2219/42229 . . . Shut off control, system, power on detection of zero or neutral position
2219/42231 . . . Detent, stop lock, current through motor in stop, locked, hold, blocked position
2219/42232 . . . Select, switch between long, extended and short range to position
2219/42233 . . . Pwm signal to low pass filter, compared to feedback position, if equal stop motor
2219/42234 . . . Regression ann to map position error to pulse width
2219/42235 . . . Adaptive pulsing, augment time duration until movement detected
2219/42236 . . . Use of a certain number of ac periods
2219/42237 . . . Pwm pulse width modulation, pulse to position modulation ppm
2219/42238 . . . Control motor position with direction signal and pwm signal for position
2219/42239 . . . Adaptive pulsing, take into account next cycle, command
2219/42241 . . . Select minimum value of two reference values
2219/42242 . . . Reference generator for position
2219/42243 . . . Enter velocity in reference generator, delivers position signals
2219/42244 . . . Enter acceleration, jerk, generator outputs acceleration, speed, position by integration

2219/42245 . . . Reference generates upper and lower range value at both sides of reference
2219/42246 . . . Add compensation to reference value
2219/42247 . . . Remote reference transmitted to servo
2219/42248 . . . Command reference limited, clipped, only between upper and lower values
2219/42249 . . . Relative positioning
2219/42251 . . . Control position of beam in coordination with xy slide
2219/42252 . . . Position beam to keep centerline
2219/42253 . . . Double resolution for one pulse of computer
2219/42254 . . . Resolution one axis different from resolution other axis
2219/42255 . . . Acceleration, deceleration time is a multiple of sampling time
2219/42256 . . . Sampling the signal
2219/42257 . . . Sampling time in fixed relation to timer interrupt
2219/42258 . . . Two sampling frequencies, for online measurements, for offline calculations
2219/42259 . . . Variable sampling rate as function of thermal displacement
2219/42261 . . . Two sampling frequencies, one for motion, one for stillstand
2219/42262 . . . Variable sampling rate as function of position error
2219/42263 . . . Different sample rates, multiple sample rates for the different loops
2219/42264 . . . Slow down sampling if power down is detected
2219/42265 . . . Sampling rate for sending reference values equals interpolation rate
2219/42266 . . . Variable sampling rate, slow at low velocity
2219/42267 . . . Stability analysis
2219/42268 . . . Safety, excess in error
2219/42269 . . . Inject, superpose test signal on reference, monitor functionality servo
2219/42271 . . . Monitor parameters, conditions servo for maintenance, lubrication, repair purposes
2219/42272 . . . Total movement is divided in several zones with different protection parameters
2219/42273 . . . On restart, power up, overload replace reference with feedback signal, free rotate
2219/42274 . . . On power failure keep last servoposition by cutting off air supply
2219/42275 . . . Alarm if working cycle fraction with values exceeding nominal exceeds threshold
2219/42276 . . . Action, on power failure, close pilot valve entirely by return spring
2219/42277 . . . If no position command in a period, servo to rest position, shut off power
2219/42278 . . . If direction bad, change direction sign or phase sequence automatically
2219/42279 . . . Allow temporary motor overload if temperature still under maximum, heat inertia
2219/42281 . . . If estimated temperature rise of motor is too high, inhibit motor
2219/42282 . . . If displacement rate of actuator exceeds limit, lower it
2219/42283 . . . Motor only actuated if hardware and software permission and control signal together
2219/42284 . . . Stop and brake motor
2219/42285 . . . Stop axis contour controlled
2219/42286 . . . Speed, contour controlled slow down of motor
2219/42287 . . . On feedback failure, use profile stored in memory during learning
2219/42288 . . . Limit, stop drive current if axis obstructed, blocked, force against stop
2219/42289 . . . Avoid overload servo motor, actuator limit servo torque
2219/42291 . . . Regenerate faulty feedback by last measurement after detection excess error
2219/42292 . . . If speed detection fails, regenerate speed from position signal
2219/42293 . . . Regenerate faulty feedback by using previous value, substitute
2219/42294 . . . Software monitoring of time delay of feedback pulses, feedback failure
2219/42295 . . . Detect augmenting torque of drive motor
2219/42296 . . . Detect diminishing torque of drive motor, below low limit
2219/42297 . . . Detect phase lag of driving motor
2219/42298 . . . Measure backlash, time difference between point A to point B and from B to A, if too large
2219/42299 . . . Measure current during first acceleration command
2219/42301 . . . Detect correct connection of servomotor to powersupply
2219/42302 . . . Detect insufficient acceleration, diminishing speed
2219/42303 . . . Detect no speeding up of motor
2219/42304 . . . Load, torque threshold as function of speed
2219/42305 . . . Detect loss of pulse step motor
2219/42306 . . . Excess in error, compare reference with feedback
2219/42307 . . . Compare actual feedback with predicted, simulated value to detect run away
2219/42308 . . . Watchdog or integrator to detect no change or excess in feedback
2219/42309 . . . Excess in speed
2219/42311 . . . Store working torque profiles as function of time, position, compare with real torque
2219/42312 . . . Compare feedback with upper and lower limit, store result as 0-1 if in tolerance
2219/42313 . . . Excess in error for speed and different sign of position and speed feedback
2219/42314 . . . Warning signals are send when excess in error for speed, acceleration, amplitude
2219/42315 . . . Two, double counter to check measurement
2219/42316 . . . Additional hardware to detect which part of feedback is defect, failed
2219/42317 . . . Redundant, two actuators
2219/42318 . . . Using two, more, redundant measurements or scales to detect bad function
2219/42319 . . . What kind of actuator failure
2219/42321 . . . Wrong direction or sign of measured value, eventually stop
2219/42322 . . . Emit dummy pulses, detect loss of pulses, feedback failure, wire brake, short
2219/42323 . . . Detect wire break, short circuit of feedback
2219/42324 . . . Axis breaking, between motor and slide, table
2219/42325 . . . Stalling of drive motor, overload
2219/42326 . . . Protection servo for saturation of amplifier
2219/42327 . . . Detect hallscREW wear
2219/42328 . . . Detect bearing, clamp wear
2219/42329 . . . Defective measurement, sensor failure
2219/42331 . . . Bad parameter configuration for spindle, gear ratio, encoder resolution
2219/42332 . . . Detect failure of servo controller
2219/42333 . . . Synchronization by opposite correction for both axis
2219/42334 . . . Synchronous tracking servo for biaxial positioning tables, contouring
2219/42335 . . . If one slave axis out of synchronisation, synchronise all other axes to that one
2219/42336 . . . To synchronize axis, adapt gain of each axis as function of max, min, average gain
2219/42337 . . . Tracking control
2219/42338 . . . Position tracking control
2219/42339 . . . Speed tracking control
2219/42340 . . . Force tracking control
2219/42342 . . . Path, trajectory tracking control
2219/42343 . . . Optimum, adaptive sliding mode controller
2219/42344 . . . Chattering alleviation control, chattering about switching surface
2219/42345 . . . VSTC variable structure tracking control
2219/42346 . . . Fuzzy sliding mode control fsmc
2219/42347 . . . Switch to a saturation control signal if deviation from switch line is too large
2219/42348 . . . Slimsoc sliding mode self organizing controller
2219/42349 . . . Sliding mode control with perturbation estimation smce
2219/42351 . . . PIVSC proportional integral compensated vsc
2219/42352 . . . Sliding mode controller SMC, select other gain
2219/42353 . . . Variable structure system, control VSS VSC
2219/42354 . . . Speed, acceleration, deceleration control ADC
2219/42355 . . . Speed, feed, infeed, acceleration, stopping problems
2219/42356 . . . Acceleration, deceleration for forward, backward reciprocating movement
2219/42357 . . . Acceleration deceleration in presence of backlash, dynamic backlash
2219/42358 . . . Decelerate to follow desired velocity
2219/42359 . . . Corner distance variables to keep path when programmed speed changes
2219/42360 . . . Acceleration, deceleration control
2219/42361 . . . Acceleration from rest
2219/42362 . . . Deceleration and stopping
2219/42363 . . . Acceleration deceleration for each block of data, segment
2219/42364 . . . Shorter time by adjusting corner speed, avoid zero speed when engage corner
2219/42365 . . . Profile is defined by series of bits, for each actuator, sensor
2219/42366 . . . Ramp signal from division of sum of registers
2219/42367 . . . Calculate inertia ratio from full acceleration and full deceleration trial
2219/42368 . . . Calculate square root x
2219/42369 . . . Acceleration, deceleration as function of feed rate override
2219/42370 . . . Acceleration is larger than deceleration to compensate for friction
2219/42371 . . . Compensation, correction of acceleration, deceleration time
2219/42372 . . . Compensate acceleration for sudden change in load, shockless
2219/42373 . . . At several positions detect acceleration error, compensate for it
2219/42374 . . . Compensate for friction as function of position
2219/43023 . . . Switch from acceleration to deceleration if mid stroke speed not reached
2219/43024 . . . Parabolic velocity profile, linear acceleration, keep energy dissipation minimal
2219/43025 . . . Acceleration, deceleration is polynomial, derivative is zero on stop position
2219/43026 . . . Predict deceleration start from measured characteristics and actual performance
2219/43027 . . . Parabolic acceleration, deceleration trajectory at start, stop
2219/43028 . . . Switching points for trapezoidal form are stored in memory
2219/43029 . . . Acceleration larger than deceleration for safe stopping at slow speed
2219/43031 . . . Feed speed reduction dependent on tool surface
2219/43032 . . . Non symmetric acceleration profile
2219/43033 . . . Sinusoidal acceleration profile
2219/43034 . . . Form of profile, ramp, trapezoid, S-curve, exponential
2219/43035 . . . Vertical start and stop phase
2219/43036 . . . Velocity profile with given starting and stopping speed vector
2219/43037 . . . Position, speed as function of position is trapezoid
2219/43038 . . . Parabolic acceleration, constant speed, parabolic acceleration as function of position
2219/43039 . . . Time, exponential acceleration, constant speed, exponential deceleration as function of time
2219/43041 . . . Prediction, look ahead deceleration control, calculate start deceleration
2219/43042 . . . Convolution of speed curve with torque curve
2219/43043 . . . Normal and maximum deceleration mode, switch as function of position deviation, error
2219/43044 . . . Drive and brake alternative to decelerate and stop
2219/43045 . . . Max torque, acceleration, then variable, then reverse, variable then max deceleration
2219/43046 . . . Determine time constant from command speed and needed max acceleration torque
2219/43047 . . . If speed below reference, small acceleration, if above, large deceleration
2219/43048 . . . Step change in reference, soft start, smoothing reference
2219/43049 . . . Digital convolution for velocity profile, also successive convolution
2219/43051 . . . Translate generic motion description into acceleration profiles
2219/43052 . . . Set for each block time constant and speed target
2219/43053 . . . Slow acceleration, rapid deceleration
2219/43054 . . . Take up gear backlash during deceleration
2219/43055 . . . Same acceleration deceleration pattern for position and velocity loop
2219/43056 . . . Asynchronous acceleration between slow, fast axes, rotational, linear axes
2219/43057 . . . Adjust acceleration, speed until maximum allowable moment for axis
2219/43058 . . . Limitation of acceleration, permissible, tolerable acceleration
2219/43059 . . . Accelerate, decelerate all axis as function of max, min, average speed axis
2219/43061 . . . Maximum acceleration deceleration lookup table as function of distance
2219/43062 . . . Maximum acceleration, limit
2219/43063 . . . Acceleration deceleration as function of maximum allowable speed
2219/43064 . . . Brake, decelerate at least one axis at maximum speed
2219/43065 . . . Limitation of jerk
2219/43066 . . . Max centrifugal acceleration, especially for cmm
2219/43067 . . . Reach maximum speed at zero acceleration
2219/43068 . . . Adapt acceleration as function of load, developed heat in motor
2219/43069 . . . Measure acceleration, derive limit torque, adapt acceleration
2219/43070 . . . Open closing acceleration deceleration control
2219/43071 . . . Position controlled opening profile
2219/43072 . . . Time controlled opening profile
2219/43074 . . . Control speed, acceleration so as to follow desired speed profile
2219/43075 . . . Two modes, one normal and one for obstruction by objects
2219/43076 . . . Switch from acceleration to constant speed as function of detected speed limit
2219/43077 . . . Limit switch starts braking, stop, no braking, low torque movement until end
2219/43078 . . . Near end position limit switch, brake by reversing, then slow until end limit
2219/43079 . . . Acceleration, deceleration controlled by switches along path
2219/43081 . . . Set parameters of profile generator, creep distance and speed, flight time
2219/43082 . . . Near end position limit switch, lower speed and brake
2219/43083 . . . Structure, step motor
2219/43084 . . . Acceleration deceleration circuit implemented in software, algorithm
2219/43085 . . . Acceleration-deceleration circuit before interpolator
2219/43086 . . . Acceleration-deceleration circuit after interpolator
2219/43087 . . . Stop valves to stop fluid flow of hydraulic drive cylinder
2219/43088 . . . Select out of plurality of acceleration profiles
2219/43089 . . . Rom, ram with speed and acceleration
2219/43091 . . . Ram with optimum motion curve
2219/43092 . . . Torque curve, wave stored in ram, ram
2219/43093 . . . Speed pattern, table together with timing data in ram
2219/43094 . . . Acceleration and deceleration together with their respective time
2219/43095 . . . Maximum speed and acceleration deceleration time constant as function of position
2219/43096 . . . Position, trajectory and speed stored in ram
2219/43097 . . . Table, rom, ram speed table
2219/43098 . . . Change ADC time constant during start and end of interpolation
2219/43099 . . . Select acceleration deceleration time constants as function of weight, load, position
2219/43101 . . . Change time constants acceleration, deceleration as function of feed rate override
2219/43102 . . . Time constant acceleration, deceleration as function of machining conditions
2219/43103 . . . Switch adc time constants as function of type of axis, spindle feed or position axis
2219/43104 . . . Minimize time constant based on operation program
2219/43105 . . . ADC time constants as function of type of axis rotational or linear
2219/43106 . . . Time constant acceleration, deceleration as function of temperature of motor
2219/43107 . . . Correction acceleration and deceleration as function of speed, time constants in rom
2219/43108 . . . Delay stop command as function of error between reference and multiple of increments
2219/43109 . . . Adaptive stopping with correction for both directions
2219/43111 . . . Measure time needed from first to second speed, to adapt position command
2219/43112 . . . Using feedforward prediction of position
2219/43113 . . . Give stop order a certain number of motor rotations before end stop
2219/43114 . . . Detect position, speed or time of object between begin and end, adapt motion
2219/43115 . . . Adaptive stopping
2219/43116 . . . Calculate overshoot from supply voltage change, adapt motion
2219/43117 . . . Torque compensation as function of position reference, feedback of speed and position
2219/43118 . . . Adjust position reference as function of position reference, feedback of speed and position
2219/43119 . . . Adapt robot motion to machine speed as function of error from programmed speed
2219/43121 . . . Axis speed as function of probing signal during probing of workpiece
2219/43122 . . . Adapt speed, feed as function of duration of transmission of instruction
2219/43123 . . . Speed of cutter as function of position of cutter, probe
2219/43124 . . . Adapt speed as function of material, thickness, depth, volume, width, uniform surface quality
2219/43125 . . . Speed as function of size of chuck, diameter tool
2219/43126 . . . Pivoting speed of workpiece as function of inverse of work, machining time needed
2219/43127 . . . As a function of, select reference velocity as function of gear ratio
2219/43128 . . . Feed as function of number of press operations
2219/43129 . . . Speed as function of curvature, in curves, corners smaller than in straight line
2219/43131 . . . Adapt speed as function of lag, follow up error
2219/43132 . . . Rotation speed as function of minimum wave energy, toolwear, first learn for different speeds
2219/43133 . . . Delay movement start as function of lag, follow up error
2219/43134 . . . Feed or speed as function of magnetic characteristic, code, form of tool
2219/43135 . . . Reduce path speed near centre of axis
2219/43136 . . . Lower speed of indexing motor if door to turret lathe is open
2219/43137 . . . Constant path speed for combined rotational and linear movement
2219/43138 . . . Set speed by controlling position of pulley of variable transmission
2219/43139 . . . VCO variable frequency oscillator or two oscillators with different frequency
2219/43141 . . . Surface, path, tangential speed
2219/43142 . . . Control relative speed between two spindles
2219/43143 . . . ADC ramp and velocities are set by potentiometers which control digital valve
2219/43144 . . . Accelerate one slide and decelerate other slide to keep speed constant
2219/43145 . . . Machine first with low spindle speed, then with high speed, avoid chatter
2219/43146 . . . Control of speed, velocity of movement of tool as function of power of tool
2219/43147 . . . Control power of tool as function of speed, velocity of movement
2219/43148 . . . Rapid return, retract stroke
2219/43149 . . . Rapid approach, then slow, then pressure for clamping, bonding
2219/43151 . . . Rapid feed in, slow workspeed during entering material, then high work speed
2219/43152 . . . Feed in, transfer line, rapid traverse to work, grip speed
2219/43153 . . . Control depth of feed in by timer
2219/43154 . . . Quick feed in to workpiece without gauging, then normal feed with gauging
2219/43155 . . . Rapid speed for approach then slow speed for working
2219/43156 . . . Feed rate
2219/43157 . . . Feed rate
2219/43158 . . . Feedrate override
2219/43159 . . . Feedrate override only for x y, not for z or only for z and not for x y
2219/43161 . . . Second, independent feedrate override
2219/43162 . . . Motion control, movement speed combined with position
2219/43163 . . . Based on unit motions, primitive b-spline motions, time shifted and weighted
2219/43164 . . . Independent, uncoordinated motion control of several motors to initialise
2219/43165 . . . Superposition of special effects motion on normal motion
2219/43166 . . . Simulation of mechanical gear
2219/43167 . . . Distributed motion control
2219/43168 . . . Motion profile planning for point to point control
2219/43169 . . . Motor drives a mechanical cam
2219/43171 . . . Correction servo and constant velocity motor as input to differential, sum motion
2219/43172 . . . Change velocities on the fly during a motion
2219/43173 . . . Synchronize motion with scenery, sound
2219/43174 . . . Simulating cam motion mechanism
2219/43175 . . . Motion in several blocks, for each part in open and part in closed loop
2219/43176 . . . Scale velocity profile
2219/43177 . . . Single cycle positioning, start, move, stop for single rotation
2219/43178 . . . Filter resonance frequency from acceleration pattern, derive new speed pattern
2219/43179 . . . Speed changes gradually from constant value to zero
2219/43181 . . . Reaching reference position by spiraling speed reference
2219/43182 . . . Speed control with feedback and as reference the programmed value
2219/43183 . . . Speed control, input is the reference, but no feedback
2219/43184 . . . From desired speed, derive delta positions during equal intervals
2219/43185 . . . Speed invariant motions, path accuracy independent of speed
Pulses from handle, knob, hand wheel control speed
Vector speed, ratio between axis, without feedback
Vector speed with feedback
Sum of squares
Approximation
Brake while driving to obtain very low speed, step wise movement, then stop
Variable slope speed steps as function of position, pulse pump controller
Speed steps, switch over as function of position
Using a tri-phase motor and a step motor
Using two motors
Two axis at the same time
Coupling and step motor
Safety, limitation of feedrate
Limit speed to allowable speed for all axis
Limitation of speed, permissible, allowable, maximum speed
Different, dynamic current limits as function of speed
General tape speed controls speed of axis
Tape speed controls speed of axis
Nc applications
Antenna orientation
To application field of control
Harvester
Mining
Registration machine, chart recorder
Valves
Toy
Theatre
Glassforming
To be assigned
Excavator
Spraying, coating, painting
Elevator, lift
Roller blind, shutter
Radar
Agriculture machine, tractor
Car, auto, vehicle
Balancing wheels
Wheel mounting
Auto seat, dentist chair, roll wheel chair
Align head lamps of car
Simulation car ride
Position, mount glass window, sunroof in car body
Circuit board, pcb
Masking, project image on wafer semiconductor, photo tracer
Lithography
Mount and solder parts on board
Manufacturing semiconductor wafers
Wafer manufacture; interlock, load-lock module
Wire bonding, wire wrap
Adjusting, trimming circuits on printed boards
Printed circuit boards, also holes to be drilled in a plate
Waterjet cutting
Veneer cutting
Cutting plotter
Slitter, scoring
Laser cutting
Hot wire cutting, use of polystyrene or similar material
EDM machine, wire cutting
Cutting
Maintenance, automatic storage and retrieval system
Crane
Sorting
Packaging
Forklift
Transfer line
Filling vehicle with material
Coil, bobbin handling
Handling, conveyor
Assembly
Handling cases, boxes
Storage handling for disks or material
Grinding, polishing robot
Drilling robot
Measuring robot
Surface finishing robot
Pick and place manipulator
Assembly robot
Sealing, painting robot
Inspection robot
Assembly
Cutting robot
Computer controlled automata, doll
Aircraft, airplane, ship cleaning manipulator, paint stripping
Sewer cleaning manipulator
Microrobot
Edge treating robot, machine
Sewer repair
Gas, fuel refilling
Sculpturing manipulator
Window cleaning, end effector contains detection and cleaning means
Stripping robot, strip pieces of garments from table
Tuning robot for amplifiers
Sanding robot, to clean surfaces
Manipulators, robot
Service robot
Space robot
Brick laying, masonry robot
Gymnast robot, acrobat
Assembling parts, machine
Cable harnessing robot
2219/45219 . . . Making intermeshing helical rotors, for pump, compressor
2219/45221 . . . Edm, electrical discharge machining, electroerosion, ec, chemical
2219/45222 . . . Cloth making
2219/45223 . . . Making mirror, mirror segment
2219/45224 . . . Electrode making
2219/45225 . . . Making impellers, propellers
2219/45226 . . . Process control
2219/45227 . . . Stamp making
2219/45228 . . . Making spheres
2219/45229 . . . Woodworking
2219/45231 . . . Stonewworking
2219/45232 . . . CMP chemical mechanical polishing of wafer
2219/45233 . . . Repairing pipelines, tubes
2219/45234 . . . Thin flat workpiece, sheet metal machining
2219/45235 . . . Dispensing adhesive, solder paste, for pcb
2219/45236 . . . Facimg, polygon working, polyhedron machining
2219/45237 . . . Honing machine
2219/45238 . . . Tape, fiber, glue, material dispensing in layers, beads, filling, sealing
2219/45239 . . . Filament, coil winding
2219/45241 . . . Coke oven
2219/45242 . . . Door, panel, window operation, opening, closing
2219/45243 . . . Shoe, footwear making
2219/45244 . . . Injection molding
2219/45245 . . . Making key
2219/45246 . . . Turn cylindrical workpiece, crowned
2219/45247 . . . Diamond turning, tool is diamond point
2219/45248 . . . Turning
2219/47 . . . Tracing, tracking
2219/4701 . . . Edge detector, project line, inclined camera detects discontinuity
2219/4702 . . . Project several lines on surface, to detect discontinuity by camera
2219/4703 . . . View whole surface before edge detection, coarse scan then fine tracking
2219/4704 . . . Store actual edge, seam in memory before machining, compare with detected
2219/4705 . . . Detect edge during machining, welding, sewing
2219/4706 . . . Edge detector is incorporated into machine
2219/4707 . . . Trace groove always at bottom of groove
2219/4708 . . . Command codes, marks along line to control operation, velocity
2219/4709 . . . Command code in form of a sticker
2219/4711 . . . Using a pantograph
2219/4712 . . . Using photocell sensible to different colours
2219/4713 . . . Limit scanning surface by marks, stored limit, limit switches
2219/4714 . . . Use of help paths to go to different workpiece paths to be followed
2219/4715 . . . Second photocell in advance of first, to control speed or other operation
2219/4716 . . . Trace electric potential lines to control z motion
2219/4717 . . . Machine 3-D model by tracing two 2-D models
2219/4718 . . . Two mode switch over tracking as function of predetermined cmm probe angle
2219/4719 . . . Line detector with laser beam, adjustable optical axis
2219/49 . . . Nc machine tool, till multiple
2219/49001 . . . Machine tool problems
2219/49002 . . . Map unfolded surface on flat surface to make dies, composite objects, free form
2219/49003 . . . Make two halves of tool, model at the same time
2219/49004 . . . Modeling, making, manufacturing model to control machine, cmm
2219/49005 . . . Map 2-D pattern on 3-D
2219/49006 . . . Nc machine makes cams, model to control, or make a copy, on other machines
2219/49007 . . . Making, forming 3-D object, model, surface
2219/49008 . . . Making 3-D object with model in computer memory
2219/49009 . . . Model stored in a memory of a prototype
2219/49011 . . . Machine 2-D slices, build 3-D model, laminated object manufacturing LOM
2219/49012 . . . Remove material by laser beam, air, water jet to form 3-D object
2219/49013 . . . Deposit layers, cured by scanning laser, stereo lithography SLA, prototyping
2219/49014 . . . Calculate number and form of 2-D slices automatically from volume on screen
2219/49015 . . . Wire, strang laying, deposit fluid, welding, adhesive, hardening, solidification, fuse
2219/49016 . . . Desktop manufacturing [DTM]; Solid freeform machining [SFM]; Solid freeform fabrication [SFF]
2219/49017 . . . DTM desktop manufacturing, prototyping
2219/49018 . . . Laser sintering of powder in layers, selective laser sintering SLS
2219/49019 . . . Machine 3-D siering of powder in layers, stratified object manufacturing SOM
2219/49021 . . . Deposit layer, machine, mill layer, then new layer, SDM solid deposit manufacturing
2219/49022 . . . Photo masking, mask cures whole layer at one time, add wax, mill, new layer
2219/49023 . . . 3-D printing, layer of powder, add drops of binder in layer, new powder
2219/49024 . . . LEM laminated engineering materials, like lom but first cut, then stack
2219/49025 . . . By positioning plurality of rods, pins to form together a mold, maquette
2219/49026 . . . SDM shape deposition manufacturing for multimaterial layers
2219/49027 . . . SALD selective area laser deposition, vapor solidifies on surface
2219/49028 . . . Rapid freeze prototyping, selectively deposit and rapidly freeze water layer by layer
2219/49029 . . . Virtual rapid prototyping, create a virtual prototype, simulate rapid prototyping process
2219/49031 . . . Project particles, laser beam to point using two, more jets, beams, ballistic particle
2219/49032 . . . Bond layers with glue, solder, welding, brazing in LOM
2219/49033 . . . Blanks or taken from roll of metal sheet
2219/49034 . . . Changing design, use same prototype, add reinforcements where needed
2219/49035 . . . Reconstruct boundary volume from stack of layer contours, sections
2219/49036 . . . Use quality measures, build time, strength of material, surface approximation
2219/49037 . . . Electro rheological fluid to build support for overhanging parts, particle jet
G05B

2219/49038 . . . Support help, grid between support and prototype, separate easily
2219/49039 . . . Build layer of different, weaker material between support and prototype
2219/49041 . . . Workpiece is surrounded by softer support material during machining
2219/49042 . . . Remove chips from probe, tool by blowing them away
2219/49043 . . . Control of lubrication
2219/49044 . . . Control preload of spindle bearing
2219/49045 . . . Relieve stress of workpiece after machining by vibration table
2219/49046 . . . Control flatness of deformable workpiece table
2219/49047 . . . Remove chips by tool up down movement, pecking
2219/49048 . . . Control of damping of vibration of machine base
2219/49049 . . . Coolant serves as lubrication and also to take away swarf, chips
2219/49051 . . . Heat treatment of workpiece, tempering
2219/49052 . . . Accessory, coolant
2219/49053 . . . Break chips, spiral chips, interrupt momentarily in feed during two or more rotations
2219/49054 . . . Active damping of tool vibration
2219/49055 . . . Remove chips from probe, tool by vibration
2219/49056 . . . Control of flow of fluid or temperature as function of speed for uniform coating
2219/49057 . . . Controlling temperature of workpiece, tool, probe holder
2219/49058 . . . Division algorithm, calculate inverse ratio of cutting process from parameters
2219/49059 . . . Machine with constant volume in time
2219/49061 . . . Calculate optimum operating, machining conditions and adjust, adapt them
2219/49062 . . . Adaptive control AC
2219/49063 . . . Adaptive control constraint ACC
2219/49064 . . . Fuzzy adaptive control
2219/49065 . . . Execute learning mode first for determining adaptive control parameters
2219/49066 . . . Geometric adaptive control
2219/49067 . . . Find optimum between production rate and quality, number of points and speed
2219/49068 . . . Minimum cost adaptive
2219/49069 . . . Adaptive control optimisation ACO
2219/49071 . . . Cycle time reduction
2219/49072 . . . Action, withdraw, stop feed tool to prevent breakage or lower load
2219/49073 . . . Adapt machining parameters so as to keep temperature constant
2219/49074 . . . Control cutting speed
2219/49075 . . . Control depth of cut
2219/49076 . . . Reduce cutting speed if feed force below minimum level
2219/49077 . . . Control of feed and spindle, cutting speed
2219/49078 . . . Control of feed only
2219/49079 . . . Control cutting torque, force
2219/49081 . . . If obstruction, bad joint, move head aside and retry operation
2219/49082 . . . Maintain constant material removal rate
2219/49083 . . . If number of feed retractions exceeds a limit, repeat same instruction block
2219/49084 . . . Control roughness of surface
2219/49085 . . . CMP end point analysis, measure parameters on points to detect end of polishing process
2219/49086 . . . Adjust feeding speed or rotational speed of main spindle when load out of range
2219/49087 . . . Adjust parameter to compensate path deviation
2219/49088 . . . As a function of, regulate feed as function of material, tool
2219/49089 . . . Control feed as function of detected number of tools engaging simultaneously workpiece
2219/49091 . . . Control feed as function of detected diameter, cross section of workpiece
2219/49092 . . . Vary, change controlled parameter as function of detected power
2219/49093 . . . Adapt cutting speed as function of depth of cutting
2219/49094 . . . Feed as function of deviation of real from programmed position at fixed time intervals
2219/49095 . . . Of rigidity of workpiece
2219/49096 . . . Deviation of compliant mounted tool
2219/49097 . . . Material type of each layer to be drilled, to be joined
2219/49098 . . . As a function of machine operating speed and tool
2219/49099 . . . Cutting force, torque
2219/49101 . . . As function of tool speed
2219/49102 . . . Tool temperature
2219/49103 . . . Speed and feed
2219/49104 . . . Chip thickness
2219/49105 . . . Emitted noise of tool
2219/49106 . . . Feed as function of lateral movement of saw blade
2219/49107 . . . Optimize spindle speed as function of calculated motion error
2219/49108 . . . Spindle speed
2219/49109 . . . Control cutting speed as function of tool wire wear, measure diameter of wire
2219/49111 . . . Cutting speed as function of contour, path, curve
2219/49112 . . . Compensation alignment of cylindrical workpiece
2219/49113 . . . Align elements like hole and drill, centering tool, probe, workpiece
2219/49114 . . . Go to coarse programmed reference, detector for fine alignment
2219/49115 . . . Alignment by taking into account asymmetries in signal, for small offsets
2219/49116 . . . Align tool head with fixed line by actuating actuators along tool head slideways
2219/49117 . . . Alignment of surfaces to get them parallel
2219/49118 . . . Machine end face, control C-axis and X-axis
2219/49119 . . . Machine arc of circumference, as groove, cylindrical interpolation
2219/49121 . . . C-axis for turning, fifth axis for milling
2219/49122 . . . Multiclamping, to reduce dead times
2219/49123 . . . Simulation of clamping workpiece, modeling fixture and workpiece
2219/49124 . . . Determine clamping position from equipment specification and machining shape
2219/49125 . . . Open clamp if tool approaches clamp zone, close again afterwards
2219/49126 . . . Clamp piece to pallet using connectable power source
Variable clamping force as function of movement, force on workpiece
Determine maximum clamping force as function of allowable displacement workpiece
Clamps are movable along rod to desired positions
High force clamping along periphery
Control fixed clamping force
Variable chuck clamping force as function of speed
Clamp, keep positioned slide, workpiece stationary during machining
Active clamping, use servo to keep in position
Vacuum pads hold workpiece during machining
Store working envelop, limit, allowed zone
Adapt working envelop, limit, allowed zone to speed of tool
Alarm if outside zone
 Shut off power, stop if outside working zone
Obstacle, collision avoiding control, move so that no collision occurs
Limit movement on an axis by setting limits
Spheres replace object, check first collision for large spheres, then small
Tool changing registers geometry of tool to avoid collision
Retract on collision with moving object, tool follows, yields to object
Adapt working envelop, limit to size workpiece
Ball end cutter interference, caused by tool shape, overcut part surface
Axis related interference, remove hidden surfaces
Feedhold, stop motion if machine door is open, if operator in forbidden zone
Avoid collision, interference between tools moving along same axis
Detect position of slide to change hover height of tool to avoid collision
On collision, reverse motor after certain angle, then stop to avoid bending
On collision, cut off motor, delay, again motor on, repeat to avoid bending
Limitation, collision, interference, forbidden zones, avoid obstacles
On near collision reduce speed
Avoid pinching of persons between moving and fixed part
Near end of position, lower power or speed of motor to safe value, at end normal
On collision, obstruction reverse drive, accelerate, cancel inertia
Stop, dwell in corner edge, allow for cooling, go on machining, better surface
Corner, making corner
Compensation relative movement between two commonly driven slides
Compensation for measured deviation of tool path, as function of length of path
Execute compensation only if workhead, module is connected
Compensate feed as function of measured values and manual introduced values
Compensation for temperature, bending of tool
Compensate for dressing amount
Compensate slide position as function of indexed workpiece spindle position error
Compensation for sidewise deviation of machined workpiece
Compensate position by use of separate cmm
Compensate for errors in cmm, especially mirror errors, not flat enough
Compensation of vibration of machine base due to slide movement
Runout, eccentricity, unbalance of tool or workpiece
Compensation of tool position as function of square of rotating speed of spindle
Compensation for reluctance of axis motors causing surface undulation
Calculation, estimation, creation of error model using measured error values
Tapping, overshoot after reversal, elasticity compensation
Compensation height of tool as function of horizontal position of spindle head, bending
Compensation for bending of workpiece, flexible workpiece
Position error compensation as function of position of slide, control bearing pressure
Deflection, bending of tool
Control position of steady rest to compensate bending
Proportional compensation from middle to end of elongated workpiece
Bending of driven table, lag between real and commanded position
Bending, tilt spindle in bearings to compensate for bending
Create optical reference axis always kept parallel to reference optical block
Orthogonality of axis, deviation from 90-degree correction
Structure error, in slide or screw
Slide, guideway, robot arm deviation
Screw
Gear
Using lookup table, map, position and corresponding quasi static error
For non linear interpolation movement
Variable load, slide friction, irregular machine guides
For point to point positioning
For linear movement
Control of heat to compensate for dilatation, thermal displacement
Compensate with stored values as function of machining time
Compensation temperature, thermal displacement, use measured temperature
Compensate thermal displacement using measured distance
Preheat spindle by powering polyphase motor with monophase
High speed AC, induction spindle motor

Two spindle drives for common workpiece

Dressing as function of load of grinding wheel

Correct surface is too long

Dressing started if sparking out time to get machined

Binder in layer, new powder

3-D printing, layer of powder, add drops of 2-5-D pocket machining

6-D

z, repeat

2-5-D lace cutting, work in xy and increment in z, repeat

4-D

5-D

6-D

2-5-D pocket machining

3-D printing, layer of powder, add drops of binder in layer, new powder

Dressing started after number of workpieces machined

Dressing started if sparking out time to get correct surface is too long

Dressing as function of load of grinding wheel

Dress by conductive fluid between conductive grindstone and electrode

Two spindle drives for common workpiece

Position in space by controlling length of two, more cables, wires

High speed AC, induction spindle motor

Gear meshing, synchronize both with relative phase, then shift

Epicyclic movement of tool

Six or more linear drives to position x y z table

Two y axis to control also rotation

Endless belt with coupling, position tools simultaneously in both directions

Direct drive, without gear

Two drives at both sides of long tool

Separate, auxiliary indexing motor

Several x-y slides on single surface

X motor moves x and y axis, y motor only y axis

Two xy tables, on top and below workpiece, in between a cutting wire

Three linear actuators to position vertically and rotate horizontally

Four bar mechanism

Single motor for different drives, switch, change gears

Air bearing slide, hydraulic, electromagnetic bearing

Electromagnetic bearing also used as feed in one axis or positioning in two axis

Switch between continuous drive and index or stop mode

Four linear actuators to position x y table

Linear actuators on x y to position x y table, ballscrew drive on y to rotate

Floating, air, magnetic suspension xy table, sawyer motor, xenetics

Oscillating, swinging feed drive, for grinding

Parallel link mechanism

Nanometric xy table

X y table positioned by vibration

Same control for double drive or slide

Frictionless rolling element

Two cascaded slides, large range sits on small range, piggyback

Linear control rotating movement kept constant

Two rotations gives cartesian coordinates, compact construction

Motor drives cam for very fine linear displacement, movement

Three linear actuators to position x y table

Large transmission ratio

Torque, moment, drive power amplifier, movement follower

Harmonic gear, transmission, strain wave gear

Switch between dual, double slide or double spindle mode

Motor and brake actuated together

Drive spindle motor at maximum, limit torque for rapid machining time

Identification workpiece by dimension, height, resistance value, but no code

Identification workpiece in multisindle station

Probe identification

Identify workpiece and align, center workpiece

Identify material to be used, select between at the same time

Identify workpiece by dimension, height, for rapid machining time

Drive spindle motor at maximum, limit torque for rapid machining time

Identification workpiece by dimension, height, resistance value, but no code

Identification workpiece in multisindle station

Probe identification

Identify workpiece and align, center workpiece at the same time

Identify material to be used, select between several

Part, workpiece, code, tool identification
2219/49303 . . . Tool identification and tool offset, compensation data together
2219/49304 . . . Tool identification, code
2219/49305 . . . Store, memory on tool with control and maintenance data
2219/49306 . . . Derive kind of cutter from null load
2219/49307 . . . Learn, learn operational zone, feed, speed to avoid tool breakage
2219/49308 . . . Fuzzy classification of tool wear states
2219/49309 . . . Main and secondary machining area, main spindle and satellite spindle
2219/49311 . . . Select machining portion of workpiece, pivoting workpiece as function of correction needed
2219/49312 . . . Fixture free machining
2219/49313 . . . Machining about eccentric center different from rotational center of workpiece
2219/49314 . . . Machine with oscillating workpiece, no full rotation
2219/49315 . . . Machine first contour slowly, then remaining surface quickly, fast
2219/49316 . . . Back-off grinding, during wheel retract, by deflection workpiece, after plunge
2219/49317 . . . Traverse grinding, move along workpiece
2219/49318 . . . Grind and simultaneous gauging, dwell, measure and final feed without gauging
2219/49319 . . . Centerless machining, grinding, cutting
2219/49321 . . . Reverse movement of tool to deburr
2219/49322 . . . Cool to solidify material before machining it
2219/49323 . . . Machine long, slender workpiece
2219/49324 . . . Different starting point for each machining pass, to prevent dent formation
2219/49325 . . . Combine punching and laser machining
2219/49326 . . . Drill on laser machine, transfer to edm for operation on hole, adjust position
2219/49327 . . . Combine punch and marker, engraving for workpiece
2219/49328 . . . Laser machining and milling combined
2219/49329 . . . Combine edm and milling
2219/49331 . . . Laser drilling followed by laser cutting
2219/49332 . . . First saw rough contours in workpiece then mill rest
2219/49333 . . . Drilling and thread cutting by same machine
2219/49334 . . . Combine turning, milling, grinding or other in one setup
2219/49335 . . . Part, workpiece, inner, internal outer, external machining
2219/49336 . . . Machine two mating, matching parts, at opposite ends of spindle, simultaneously
2219/49337 . . . Machine holes in spherical nodes
2219/49338 . . . Micromachining, workpieces small, around 1-mm or less
2219/49339 . . . Machine simultaneous left and right, mirror part
2219/49341 . . . Manual pocket machining, multipasses
2219/49342 . . . Select between concentric and eccentric regions of a workpiece
2219/49343 . . . Machining point symmetrical surfaces, revolving surfaces
2219/49344 . . . Surface, 5-axis surface machining
2219/49345 . . . Smooth and polish surface at the same time
2219/49346 . . . 3-Axis surface machining
2219/49347 . . . Machine cover, first scan surface on which cover is to be placed
2219/49348 . . . Mill surface from underneath workpiece, easy chips, cutout material evacuation
2219/49349 . . . Drill both sides of workpiece at the same time, under and over workpiece
2219/49351 . . . 4-Axis surface machining
2219/49352 . . . 7-Axis surface machining
2219/49353 . . . Control of output power of tool, laser beam
2219/49354 . . . High speed cutting
2219/49355 . . . Machine flat surface on rotating workpiece, rotate tool inverse direction
2219/49356 . . . Tool with constant force against workpiece during machining
2219/49357 . . . Tool perpendicular to surface with varying force
2219/49358 . . . Facing milling, tool perpendicular to surface
2219/49359 . . . Cylindrical or side milling, tool tangential to surface
2219/49361 . . . Workpiece and tool have each own rotation speed
2219/49362 . . . Tool, probe at constant height to surface during machining
2219/49363 . . . Minimize time for tool movement between different positions, holes
2219/49364 . . . Minimize number of punch strokes
2219/49365 . . . Minimise noncutting area, tool travel, eliminate air cutting
2219/49366 . . . Machine several small pieces on one sheet, break off pieces
2219/49367 . . . Group machines into cells to minimise intercellular travel
2219/49368 . . . Vision calculates errors while table already moves, result corrects movement
2219/49369 . . . Minimize machining time by maximizing feed, speed
2219/49371 . . . Variable laser spot width, small for boundary, large for rest
2219/49372 . . . Optimize toolpath pattern for a given cutting layer, mounting sequence
2219/49373 . . . Flying operation, while tool and workpiece have same speed
2219/49374 . . . Speed up each conveyor between two stations, at stations synchronize in phase
2219/49375 . . . Minimalizing machining time, number of tool change
2219/49376 . . . Select two machining types, milling or turning, complete machining with one tool
2219/49377 . . . Eliminate double cutting
2219/49378 . . . Tool path finding, select minimal distance
2219/49379 . . . Key input path, move one axis manually, other axis slave controlled by program
2219/49381 . . . Raster, line servo, area machining, cutting, facing
2219/49382 . . . Movement reciprocating
2219/49383 . . . Using pick feed with non reciprocating machining direction
2219/49384 . . . Control of oscillatory movement like filling a weld, weaving
2219/49385 . . . Using pick feed when machining a surface
2219/49386 . . . Automatic seam, weld line, finding
2219/49387 . . . Limiting scanning region
2219/49388 . . . Computer controlled movement of plotter is transferred to tool by pantograph
2219/49389 . . . Machine alternative both sides of rib, net machining, against deformation
2219/49391 . . . Adapt number of passes as function of tool wear
2219/49392 . . . Multipart passes, segmentation of cut, paraxial cutting
2219/49393 . . . Machining step, fixing smallest step nibble machine, planer
2219/49394 . . . Stop in one point, execute other operation and return back to first point
2219/49395 . . . Repeating same operations for other coordinates
2219/49396 . . . Stepwise milling, mill by advancing larger step then retract smaller step, repeat
2219/49397 . . . Control of dwell time
2219/49398 . . . Repeat same operations on machined part until machining reaches its finishing
2219/50 . . . Machine tool, machine tool null till machine tool work handling
2219/50001 . . . Multislides, multispindles with multitool turret for each
2219/50002 . . . Drill more holes simultaneously, adapt distance tools as function of detected image
2219/50003 . . . Machine simultaneously two workpieces
2219/50004 . . . Multitool at the same time, priority for one tool as function of machining parameter
2219/50005 . . . Multiple chuck machining, chuck position change after each partial machining
2219/50006 . . . Two parallel spindles, bi-spindle and two tool blocks sliding on same axis
2219/50007 . . . Multiple polishing heads, oscillating and rotating
2219/50008 . . . Multiple, multi tool head, parallel machining
2219/50009 . . . Revolver head
2219/50011 . . . Two spindles drive single large tool, cooperation of spindles
2219/50012 . . . Multi slide and indexable multi workpiece spindles
2219/50013 . . . Two spindles on same line, one for workpiece, other for tool, second tool on slide
2219/50014 . . . Several, multi workpieces
2219/50015 . . . Multi cutting, twin tools contact at same time workpiece, balance cutting
2219/50016 . . . Turret with multiple workpiece holders, spindles, multiple fixed tools around it
2219/50017 . . . Two programs, two slides, data second slide related to moving origin of first
2219/50018 . . . Zero point floating
2219/50019 . . . Zero, null offset
2219/50021 . . . Configuration, null point on tool relative to null point on workpiece
2219/50022 . . . Null point on tool relative to null point of toolholder, rotationcenter
2219/50023 . . . Measure different null points, references of tool and store in memory
2219/50024 . . . Go to reference, switches and dog to decelerate and to detect origin
2219/50025 . . . Go to reference, switches and dog detect origin, combine with pulse from encoder
2219/50026 . . . Go to reference plane, cube
2219/50027 . . . Go to workpiece surface plane and store position
2219/50028 . . . Beam detects x, y deviation on surface, compensates beam of position scanner
2219/50029 . . . Go to pivotable, rotatable reference plane
2219/50031 . . . Zero setting, go to reference with gauge
2219/50032 . . . On one axis only, derive from inclined surface offsets for other axis
2219/50033 . . . Align tool, tip with a calibration mark
2219/50034 . . . Set search range about origin, select between different overlapping ranges
2219/50035 . . . Go to reference point and measure a preset force, pressure, store position
2219/50036 . . . Find center of circular mark, groove
2219/50037 . . . Use either upper or lower limit for home control
2219/50038 . . . Go to mechanical limit with low speed, until blocking of drive
2219/50039 . . . Two probe, one on turret, serves also to calibrate second probe on bed
2219/50041 . . . Measuring intensity of tool vibration
2219/50042 . . . Return to origin, reference point, zero point, homing
2219/50043 . . . Near zero detection
2219/50044 . . . For speed
2219/50045 . . . Combined axis jogging, following programmed shape instead of single axis
2219/50046 . . . Control of level, horizontal, inclination of workholder, slide
2219/50047 . . . Positioning, indexing
2219/50048 . . . Jogging
2219/50049 . . . Control machine as function of position, angle of workpiece
2219/50051 . . . Turn workpiece axis perpendicular to turn axis of lathe
2219/50052 . . . Orienting workpiece relative to tool
2219/50053 . . . Machine non circular, non-round cross section, hexagonal, rectangular
2219/50054 . . . Drill on skew surface
2219/50055 . . . Make hollow workpiece with uniform wall thickness
2219/50056 . . . Profile, for operation on I-, T-profiles or other elongated profiles
2219/50057 . . . Compensation error by probing test, machined piece, post or pre process
2219/50058 . . . During machining, measure previous part to compensate errors
2219/50059 . . . Record profile error, used for next machining pass
2219/50061 . . . Compensation of measuring errors due to machine with footprint
2219/50062 . . . Measure deviation of workpiece under working conditions, machine correction
2219/50063 . . . Probe, measure, verify workpiece, feedback measured values
2219/50064 . . . Camera inspects workpiece for errors, correction of workpiece at desired position
2219/50065 . . . Estimate trends from past measured values, correct before really out of tolerance
2219/50066 . . . Fit base pattern into detected geometrical workpiece data, create whole program
2219/50067 . . . Measure surface for thickness and store map in memory, machine surface
2219/50068 . . . Test valve, object, store parameters, machine object to get wanted performance
2219/50069 . . . Reject workpiece if not machinable, material to be machined too large
2219/50071 . . . Store actual surface in memory before machining, compare with reference surface
2219/50072 . . . Machine workpiece again to correct previous errors
2219/50073 . . . Signature analysis, store forces during test, compare with real ones during assembly
2219/50074 . . . Purpose, workpiece measurement to control, adapt feed of tool
2219/50075 . . . To adapt, control force level at which machining will be considered as finished
2219/50076 . . . To derive from state of surface, the need to change used, worn tool
2219/50077 . . . Keep position by switching over to auxiliary power supply for resolver, encoder
2219/50078 . . . Single battery backup for all axis, encoders, resolvers
2219/50079 . . . Battery backup switch over data, signal lines, to save cable
2219/50081 . . . On power loss, shut down axis using generated power from one braked axis
2219/50082 . . . UPS, no break to power actuator and move into safe condition
2219/50083 . . . Power loss, measures again loss of power
2219/50084 . . . Keep position, setup parameters in memory
2219/50085 . . . Realignment, search reference to reestablish position
2219/50086 . . . Microprocessor
2219/50087 . . . Rough, coarse and finish, fine machining
2219/50088 . . . Rough and finish machining simultaneously
2219/50089 . . . Finish allowance equals offset rough finish tool and bending work under rough
2219/50091 . . . Rough machining
2219/50092 . . . Sculptured part rough machining with the offset approach
2219/50093 . . . Sculptured rough machining with the contour map approach, make slices
2219/50094 . . . Optimize number of layers to be cut for contour map approach
2219/50095 . . . On tool breakage return to a reference then follow already machined path
2219/50096 . . . After interrupt, use tool path display to bring tool back on path
2219/50097 . . . After repair, dry run program until block before restart is detected
2219/50098 . . . After interrupt, interpolate with suitable startpoint different from stoppoint
2219/50099 . . . Before restart change jig, fixture with workpieces
2219/50101 . . . For fine machining, select tool and offset, block and restart midway
2219/50102 . . . Store history of operation, after power failure, restart from history, journal
2219/50103 . . . Restart, reverse, return along machined path, stop
2219/50104 . . . Before restarting program, restore machine status existing at stop time
2219/50105 . . . Display instructions to operator on how to restart machine
2219/50106 . . . Before allowing restart, check that machine condition is optimal
2219/50107 . . . Retract tool if end of drilling is detected
2219/50108 . . . Retract tool stepwise, same path, until safe boundary reached, then quick retract
2219/50109 . . . Soft approach, engage, retract, escape, withdraw path for tool to workpiece
2219/50110 . . . Retract tool along path, reengage along same path
2219/50112 . . . Retract tool to a point
2219/50113 . . . Short stroke, retract tool, safe distance from workpiece surface, hover height
2219/50114 . . . Select approach path as function of zone for tool slide
2219/50115 . . . Select complicated, combined approach path
2219/50116 . . . Select approach path out of plurality
2219/50117 . . . Select approach path as function of machining time
2219/50118 . . . Select as function of position of tool during cycle, optimum path
2219/50119 . . . Select between set of paths as function of interrupt nature
2219/50120 . . . Machining several workpieces with one or more tools in one setup
2219/50122 . . . Workpiece holder, chuck jaws, fixture setup
2219/50123 . . . Setup, automatic setup
2219/50124 . . . Automatic new setup when new program selected
2219/50125 . . . Configurable fixture, jig
2219/50126 . . . Position clamp, fixture by machining head itself
2219/50127 . . . Modular fixture, use of clamps and locators, the latter also for positioning
2219/50128 . . . Reference free part encapsulation, fixture using molten filler and cube
2219/50129 . . . Setup machines as function of process model, control strategy for optimum use of machines
2219/50131 . . . Setup as function of tool position in manufacturing center
2219/50132 . . . Jig, fixture
2219/50133 . . . With optical beam, tool crosses beam
2219/50134 . . . Tool pushes reference plane, or vice versa, reverse motion until again zero
2219/50135 . . . Tool touches box, sensor to give a contact signal
2219/50136 . . . With sensor, potentiometer to measure relative displacement
2219/50137 . . . Contact in probe, touch probe to detect contact, touch trigger
2219/50138 . . . During setup display is red, after setup display is green colour
2219/50139 . . . Calibration, setting tool after measurement on tool
2219/50141 . . . Setup tool, preset
2219/50142 . . . Measure parallelism of tool with respect to plane and correct
2219/50143 . . . Tool set up integrated, automatically transferred into control system
2219/50144 . . . Offline setup by simulation of process, during machining, forming of other piece
2219/50145 . . . Tool setup manual, preset of the machine
2219/50146 . . . Machine construction error compensation using ann
2219/50147 . . . Calibrate tool heads based on calibration of first tool head
2219/50148 . . . Workpiece, setup of component, workpiece
Find orientation workpiece which maximizes number of faces machined in one setup

Orient, translate, align workpiece to fit position assumed in program

Align axis cylinder, tube with rotation axis machine

Mount machining unit on workpiece, move unit on it

Milling center

Swivel spindle head horizontally

Tilttable rotary table

Universal swivel spindle head, swivel in all directions

Modular structure

Steady rest

Reverse engineering, cloning

Stewart platform, hexapod construction

Machine stations and control modules build as a unity to be connected in line

Select a structure to make programming of free curved surface easier

Axis nc machine cooperates with two axis rotary table

Extended range, machine a workpiece over a long distance

Adapting to copying

Retrofitting

Double stewart platform

Machine, machining centre, center

Tool holder is transparent

Machine tool hang and move on rail above workpiece

Machine tool y-1, y-2, z, A-axis, table x, c-axis

6-Dof manipulator associated with 1-DOF workpiece holder

Table, general, for machine tool

Protection for operator during operation, machining

Clamp, brake gravity axis on power loss to clamp tool in position

Dynamic tolerance, limit values as function of speed, type of command

After stopping apply additionally a brake

Skip over pieces between machining and measuring station, on tool changing

Detect correct clamping of workpiece, chucks grip properly workpiece

Stop feed if relative movement between drive and tool

Monitoring, detect failures, control of efficiency of machine, tool life

Diagnostic of spindle bearing

Stop drive motor if clutch refuses, remains active, if emergency

If operation, feed movement not done after maximum allowable time, emergency stop

Compare position of slide with positioning, tape data

Against noise

If braking fails due to controller or amplifier fault, separate delayed braking

Safety in general

Before restarting machine, enter allowable, maximum speed corresponding to tool

Emergency stop stops drives and spindle, stored program remains in memory

Monitor clutch or belt drive

Signature analysis, store working conditions, compare with actual

Emergency stop

Tool, nozzle is covered for protection in home position, if needed also heated

Tool loses contact with workpiece, alarm if no cut through operation

During movement of tool towards workpiece, shut down rotation, welding gun

Tool, monitor condition tool

Tool replacement point, tool change position without damage, clearance plane

On tool breakage stop machine

Tool monitoring integrated in nc control

Surface finish

Retrace, remachining machine of path, locus to remove start discontinuities

Surface treatment, roughing surface

Finish machining, spark out, rough out

Giving a texture, structure to surface, like leather, wood appearance

Grooving of different forms or parallel to each other, grooving cycle

Refurbish, refinish, reprofile, recondition, restore, rebuild profile

Move synchronously tool and anvil at both sides of plate

Synchronize speed and position of several axis, spindles

Synchronize, control phase angle of two spindles by auxiliary index motor

Synchronize groups of axis, spindles

Slave spindle is driven at half the torque of main spindle for synchronism

Switch speed reference from speed to position loop of both spindles to synchronize

Stop machines, actuators until others reach common synchronization point

Loose synchronisation, can shift within time interval

Synchronize feed and spindle speed during slow down, stopping

Synchronize feed and spindle speed as function of pitch of screw, thread

Synchronize feed and spindle speed in forward and reverse feed

Synchronize two axis by correcting for measured pitch errors

Synchronize two slides, portal gantry, raising, moving

Synchronize axis by simulating several virtual axis to control real axis

Synchronize engage, disengage groups of axis as function of position of simulate

Synchronize change of feed and spindle speed when overriding feed speed

Synchronize time-dependent with electronic cam data
Synchronize two spindles, axis, electronic transmission, line shafting
Select tools, slides, spindles to work synchronized, independent
Tool editor for actual used tools and needed next, missing, unused tools
Detect wear by comparing coded value on tool with real value, grind tool
Search empty place in changer to place tool
Select tool manual from tool store, with permission from NC to deblock tool
Chuck, gripper, spindle changer
Tool changer and revolver fixed on spindle
Small buffer tool magazine, ordered tools, filled from large magazine, change time
Machine integrated tool cassette
Change tools, like laser head and drill having different driving needs
Workpiece exchange
Change to finer, more adapted tools to machine complex surface
Control position of coolant nozzle as function of selected tool
Tool, probe, pen changer
Mobile tool magazine to replace spare or rarely used tool
Replace, change tool with tracer head, probe, feeler
Selection tool
Change feeler or tool on different curvature of workpiece, model
Tool selection sets speed machining, kind of cooling, other parameter
Orienting selected tool with respect to workpiece
Kind of revolver magazine
Chain magazine
Flat bed magazine
Two tool holders to eliminate tool change time, replace and search simultaneously
Change tool at minimum distance from workpiece
Standby tool, tool ready for next machining step, change tool while machining
Change tool during positioning movement
If tool life over, continue machining only actual block, workability, then stop
During tool change, workpiece immobile, then execute backward operation sequence
Change tool and workpiece simultaneously, except if collision possible
Measure diameter only if new tool has been inserted
Minimize tool change by selecting appropriate fixture
Select second tool if first tool cannot machine workpiece without moving it
Change spare, used tool during machining, minimize machining time
Before motor start of spindle with new tool, detect if old tool back in storage
Measure new tool inserted by operator, compare with diameter needed to accept

Safety, verify correct code of chosen tool, probe
Detect wear or defect tool, breakage and change tool
Detection tool presence in tool holder, spindle before starting motor
Send offset values from tool changer before machining
Adjust displacement amount of tracer as function of rough, finish machining
Adjust tool for tool offset by using an axis parallel to feed axis
Tool offset as function of cutting depth
Tool offset for two different diameters, smoothing
Tool nose correction
Tool geometry compensation, keep contact of tool on desired curve
Fine adjustment tool head, adjustment with respect to toolholder
Tool offset as function of diameter of saw, for begin and end point of path
Compensate tool offset as function of speed, needed when tool is not mounted correctly in spindle
Tool offset general
Multi-tool, several tools
Tool offset based on two cutter contact points, admitting some overcut
Radial setting of tool
Tool offset length by going to a reference and recording distance
Tool offset by manual input by switches
Tool offset by verifying piece and registering errors
Compensation of positioning error due to a-axis, b-axis tool rotation
Trace with feelers of different diameter, from the two loci calculate offset
Correction data stored in memory attached to tool or tool holder
Correction stored on tape, together with tool identification
Remachine same workpiece with same tool but diminished tool offset
Resolver
Correction from tape, file
For every diameter a tape
Tool height, axial displacement from center of circular workpiece, surface
Correction by probing dimension of machined workpiece
Estimate wear from machining data and conditions
Correction of wear as function of dressing
Compensate tool wear by grinding tool to a known position
Compensation of tool wear by adapting program to profile of tool
Tool offset, tool wear
Search for reference, go to reference
Selfcorrecting by measurement during machining
2219/50316 . . . Calculate as function of empirical calculated values from used tools
2219/50317 . . . As function of number of workpieces
2219/50318 . . . As function of number of cutting edges of saw, mill
2219/50319 . . . As function of tool geometry and machining data
2219/50321 . . . As function of machined volume per time unit
2219/50322 . . . As function of effective machining time
2219/50323 . . . As function of tool type
2219/50324 . . . As function of coolant
2219/50325 . . . As function of measured vibrations
2219/50326 . . . As function of feed forces
2219/50327 . . . As function of cutting forces
2219/50328 . . . As function of motor spindle load, current
2219/50329 . . . Tool offset for pockets, area machining avoiding interference with wall
2219/50331 . . . Electrode, wire gap compensation in edm, wire cutting
2219/50332 . . . Tool offset for 3-D surfaces normal to surface
2219/50333 . . . Temperature
2219/50334 . . . Tool offset, diameter correction
2219/50335 . . . Tool offset for straight lines
2219/50336 . . . Tool, probe offset for curves, surfaces, contouring
2219/50337 . . . Tool offset for point
2219/50338 . . . Tool with rom chip
2219/50339 . . . Select machining portion of tool according to surface of work
2219/50341 . . . Tool with right and left nose value, different radius
2219/50342 . . . Use two tools with different diameter
2219/50343 . . . Ball end tool, end is spherical
2219/50344 . . . Flat end tool, end is flat
2219/50345 . . . Bull nose tool, end is practical flat with rounded corners
2219/50346 . . . Ion ray
2219/50347 . . . Tool sends via electromagnetic waves actual working condition
2219/50348 . . . Deform tool to adapt to workpiece, bow tool with pressure
2219/50349 . . . Obtain normal vector of two points on surface, interpolate in between
2219/50351 . . . Rotate cutting tool to vary cutting tool geometry
2219/50352 . . . Inclination of tool as function of diameter of workpiece
2219/50353 . . . Tool, probe inclination, orientation to surface, posture, attitude
2219/50354 . . . If tool looses contact, change angle of tool with 90-degrees
2219/50355 . . . Tool perpendicular to a 2-D curve
2219/50356 . . . Tool perpendicular, normal to 3-D surface
2219/50357 . . . Tool tangential to path or surface
2219/50358 . . . Work handling, automatic load unload workpiece
2219/50359 . . . Rotate workpiece pallet, workpieces on it, machine and load simultaneous
2219/50361 . . . Translatory workpiece pallet, translate between two stations
2219/50362 . . . Load unload with robot
2219/50363 . . . Load unload with two robots, one to load, other to unload

2219/50364 . . . Buffer for workpieces, pallets, trays with articles
2219/50365 . . . Convey workpiece downwards on pallet, to machine rotate upwards
2219/50366 . . . Work handling with changeable hands
2219/50367 . . . Several workpiece holders in a single cell
2219/50368 . . . Pallet with autonomous control unit
2219/50369 . . . Display empty supply or discharge pallet
2219/50371 . . . Index table holds same number of load and unload cups, alternative
2219/50372 . . . Load pallets manually, with visual instruction assistance
2219/50373 . . . If pallet is not loaded conforming to instruction, warning
2219/50374 . . . Cylindrical workpiece holder, for each workpiece a separate tool slide
2219/50375 . . . Reject or reload workpiece if misaligned, excessive error in location
2219/50376 . . . Workholder receives also parts to be assembled with work
2219/50377 . . . Two robots with common workbase slides in unison along pallets
2219/50378 . . . Control height gripper as function of thickness of workpiece and height of pallet
2219/50379 . . . Workpiece detector, sensor
2219/50381 . . . Load, unload workpiece while machining other one, dual table machine
2219/50382 . . . Position claws of first chuck relative to second chuck, to grip small workpiece
2219/50383 . . . Bar feeder applies torque to compensate bending of workpiece during machining
2219/50384 . . . Modular, exchangeable parts feeder
2219/50385 . . . Fast forward in idle time
2219/50386 . . . Feeder, feeding of workpiece, bar
2219/50387 . . . Two chucks, grippers, feeder bar, transfer workpiece from one to other
2219/50388 . . . Integrated loader, shuttle transfer
2219/50389 . . . Gantry loader
2219/50391 . . . Robot
2219/50392 . . . Overhead conveyor
2219/50393 . . . Floor conveyor, AGV automatic guided vehicle
2219/50394 . . . Bulk hopper
2219/50395 . . . Pallet magazines, transport dollies
2219/50396 . . . Gantry loader with two grippers, one always empty
2219/50397 . . . Two conveyors transporting together a workpiece to station
2219/50398 . . . For a single machine
2219/50399 . . . Between machines
2219/50401 . . . In line work storage system

2223/00 . . . Indexing scheme associated with group
2223/02 . . . Indirect monitoring, e.g. monitoring production to detect faults of a system
2223/04 . . . Detection of intermittent failure
2223/06 . . . Remote monitoring