U. S. DEPARTMENT OF COMMERCE
Patent and Trademark Office

CLASSIFICATION ORDER 1842

MARCH 1, 2005

Project No. E-6725

The following classification changes will be effected by this order:

	Class	Subclass	Art Unit	Ex'r Search Room No.
Established:	704	256.1-256.8	2654	None

The following classes are also impacted by this order.

Classes: None

This order includes the following:

A. CLASSIFICATION MANUAL CHANGES;

C. CHANGES TO THE U.S. - I.P.C. CONCORDANCE;

D. DEFINITION CHANGES AND NEW OR ADDITIONAL DEFINITIONS

CLASSIFICATION ORDER 1842

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Project No. E-6725

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CLASS 704 DATA PROCESSING: SPEECH SIGNAL PROCESSING, LINGUISTICS, LANGUAGE TRANSLATION, AND AUDIO COMPRESSION/DECOMPRESSION

MARCH 2005

1	LINGUISTICS
2	.Translation machine
3	..Having particular Input/Output device
4	..Based on phrase, clause, or idiom
5	..For partial translation
6	..Punctuation
7	..Storage or retrieval of data
8	.Multilingual or national language support
9	.Natural language
10	.Dictionary building, modification, or prioritization
200	SPEECH SIGNAL PROCESSING
200.1	.Psychoacoustic
201	.For storage or transmission
202	..Neural network
203	..Transformation
204	...Orthogonal functions
205	..Frequency
206	...Specialized information
207	....Pitch
208	.....Voiced or unvoiced
209	....Formant
210	....Silence decision
211	..Time
212	...Pulse code modulation (PCM)
213	...Zero crossing
214	...Voiced or unvoiced
215	...Silence decision
216	...Correlation function
217	....Autocorrelation
218	....Cross-correlation
219	..Linear prediction
220	..Analysis by synthesis
221	..Pattern matching vocoders
222	...Vector quantization
223	...Excitation patterns
224	..Normalizing
225	..Gain control
226	..Noise
227	...Pretransmission
228	...Post-transmission
229	..Adaptive bit allocation
230	..Quantization
231	.Recognition
232	..Neural network
233	..Detect speech in noise
234	..Normalizing
235	..Speech to image
236	..Specialized equations or comparisons
237	...Correlation
238	...Distance
239	...Similarity
240	...Probability
241	...Dynamic time warping
242	...Viterbi trellis
243	..Creating patterns for matching
244	...Update patterns
245	...Clustering
246	..Voice recognition
247	...Preliminary matching
248	...Endpoint detection
249	...Subportions
250	...Specialized models
251	..Word recognition
252	...Preliminary matching
253	...Endpoint detection
254	...Subportions
255	...Specialized models
256	....Markov
*256.1	.....Hidden Markov Model (HMM) (EPO)
*256.2	......Training of HMM (EPO)
*256.3	.......With insufficient amount of training data, e.g., state sharing, tying, deleted interpolation (EPO)
*256.4	......Duration modeling in HMM, e.g., semi HMM, segmental models, transition probabilities (EPO)
*256.5	......Hidden Markov (HM) network (EPO)
*256.6	......State emission probability (EPO)
*256.7	.......Continuous density, e.g, Gaussian distribution, Lapalce (EPO)
*256.8	.......Discrete density, e.g., Vector Quantization preprocessor, look up tables (EPO)
257	....Natural language
258	.Synthesis
259	..Neural network
260	..Image to speech
261	..Vocal tract model
262	..Linear prediction
263	..Correlation
264	..Excitation
265	..Interpolation
266	..Specialized model
267	..Time element
268	..Frequency element
269	..Transformation
270	.Application
270.1	..Speech assisted network
271	..Handicap aid
272	..Novelty item
273	..Security system
274	..Warning/alarm system
275	..Speech controlled system
276	..Pattern display
277	..Translation
278	..Sound editing
500	AUDIO SIGNAL BANDWIDTH COMPRESSION OR EXPANSION
501	.With content reduction encoding
502	.Delay line
503	AUDIO SIGNAL TIME COMPRESSION OR EXPANSION (E.G., RUN LENGTH CODING)
504	.With content reduction encoding
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	FOREIGN ART COLLECTION
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FOR 000	CLASS-RELATED FOREIGN DOCUMENTS

Title Change
* Newly Established Subclass

@ Indent Change
& Position Change

CLASSIFICATION ORDER 1842

MARCH 1, 2005

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C. CHANGES TO THE U.S. - I.P.C. CONCORDANCE

U.S. Class	Subclass	I.P.C. Subclass	Notation	ECLA Subclass	Notation
704	256.1	G10L	15/14	G10L	15/14M
	256.2	G10L	15/14	G10L	15/14M1
	256.3	G10L	15/14	G10L	15/14M1S
	256.4	G10L	15/14	G10L	15/14M2
	256.5	G10L	15/14	G10L	15/14M3
	256.6	G10L	15/14	G10L	15/14M4
	256.7	G10L	15/14	G10L	15/14M4C
	256.8	G10L	15/14	G10L	15/14M4D

CLASS 704 - DATA PROCESSING: SPEECH SIGNAL PROCESSING, LINGUISTICS, LANGUAGE TRANSLATION, AND AUDIO COMPRESSION/DECOMPRESSION

Definitions Established:

256.1 Hidden Markov Model (HMM) (EPO):
Subject matter under subclass 256 wherein a Markov chain used in the recognition process has un-observable (hidden) states.

(1) Note. The observation model itself is part of the stochastic process (Markov Chain) with an underlying stochastic process that is not directly observable, but can be observed through a set of stochastic processes that produce the sequence of observations.

(2) Note. The HMM has different elements, including the following – number of states, the number of distinct observations per state, state transition probability distribution, the observation symbol probability distribution, and the initial state distribution.

(3) Note. The manipulation of HMM's can be use in improving the probability of observation sequences, optimizing state sequences, or maximizing the probability of the state sequences.

(4) Note. Subcategories to the types of HMM's include finite state, discrete versus continuous, mixture densities, autoregressive, null transition, tied states, and state duration.

(5) Note. Included in this subclass are the foreign patent documents from ECLA (G10L 15/14M).

256.2 Training of HMM (EPO):
Subject matter under subclass 256.1 wherein the models include a learning process for recognizing speech data, e.g., the construction of a library of models for the words in a vocabulary, including the states.

(1) Note. Included in this subclass are the foreign patent documents from ECLA (G10L 15/14M1).

256.3 With insufficient amount of training data, e.g., state sharing, tying, and deleted interpolation (EPO):
Subject matter under 256.2 wherein intrinsic parameters of the HMM are modified to overcome lack of training data, and to simplify the model, e.g., state sharing, tying, and deleted interpolation.

(1) Note. State sharing involves combining two or more separately trained models, one of which is more reliably trained than the other. The scenario in which this can happen is the case when we use tied states which forces "different" states to

share an identical statistical characterization, effectively reducing the number of parameters in the model.

(2) Note. Parameter tying involves setting up an equivalence relation between HMM parameters in different states. In this manner the number of independent parameters in the model is reduced and the parameter estimation becomes somewhat simpler and in some cases more reliable. Parameter tying is used when the observation density, for example, is known to be the same in two or more states.

(3) Note. Deleted interpolation is a parameter method aimed to improve model reliability. The concept involves combining two or more separately trained models, one of which is more reliably trained than the other. The scenario in which this can happen is the case when we use tied states which forces "different" states to share an identical statistical characterization, effectively reducing the number of parameters in the model. The technique of deleted interpolation has been successfully applied to a number of problems in speech recognition, including the estimation of trigram word probabilities for language models, and the estimation of HMM output probabilities for trigram phone models.

(4) Note. Included in this subclass are the foreign patent documents from ECLA (G10L 15/14M1S).

256.4 Duration modeling in HMM, e.g., semi HMM, segmental models, transition probabilities (EPO):
Subject matter under 256.1 wherein the HMM includes a duration state model for speech recognition, e.g., semi HMM's, segmental models, and transition probabilities.

(1) Note. A semi- Markov HMM is like an HMM except each state can emit a sequence of observations.

(2) Note. Within a state segment models introduce dependency between frames via their common dependence on a trajectory. There may be only a single trajectory or a continuous mixture of trajectories. The probability distribution over the sequence of frames for a state, given the duration and trajectory, is then typically modeled as independent Gaussian distributions for each time step, centered on the trajectory.

(3) Note. Symbol emission probabilities are associated to the states and transition probabilities to the connections between them.

(4) Note. Included in this subclass are the foreign patent documents from ECLA (G10L 15/14M2).

256.5 Hidden Markov (HM) Network (EPO):
Subject matter under 256.1 including a HMM structure wherein subgroups of HMM types are used to perform speech recognition.

(1) Note. Each subgroup can vary by type of model, model size, and observation symbols.

(2) Note. Included in this subclass are the foreign patent documents from ECLA (G10L 15/14M3).

256.6 State Emission Probability (EPO):
Subject matter under 256.1 wherein the HMM contains probability density function such that an emission probability is calculated for each state within the model.

(1) Note. For each state *j*, and for each possible output, a probability that a particular output symbol *o* is observed in that state. This is represented by the function $b_j(o)$, which gives the probability that *o* is emitted in state *j*. This is called the emission probability.

(2) Note. Included in this subclass are the foreign patent documents from ECLA (G10L 15/14M4).

256.7 Continuous density, e.g., Gaussian distribution, Laplace (EPO):
Subject matter under 256.6 wherein the HMM contains continuous probability density observation models for the purpose of avoiding possible signal degradation inherent with discrete representations of signals.

(1) Note. Included in this subclass are the foreign patent documents from ECLA (G10L 15/14M4C).

256.8 Discrete density, e.g., Vector Quantization preprocessor, look up tables (EPO):
Subject matter under 256.6 wherein the HMM contains discrete probability density observation models which allows for the use of a discrete probability density within each state of the model.

(1) Note. Discrete probability density is used when the state of the model is discrete (e.g. representing a letter of the alphabet). Vector quantization is used to model its state.

(2) Note. Included in this subclass are the foreign patent documents from ECLA (G10L 15/14M4D).