The following classification changes will be effected by this order:

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<th>Class</th>
<th>Subclass</th>
<th>Art Unit</th>
<th>Ex'r Search Room No.</th>
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<td>704</td>
<td>256.1-256.8</td>
<td>2654</td>
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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

MARCH 1, 2005

Project No. E-6725

Project Leader: Tuan D. Nguyen
Examiner(s): Michael Opsasnick
Editor: James E. Doyle, Jr.
Linguistics

- Translation machine
- Having particular Input/Output device
- Based on phrase, clause, or idiom
- For partial translation
- Punctuation
- Storage or retrieval of data
- Multilingual or national language support
- Natural language
- Dictionary building, modification, or prioritization

Speech Signal Processing

- Psychoacoustic
  - For storage or transmission
  - Neural network
  - Transformation
  - Orthogonal functions
  - Frequency
  - Specialized information
  - Pitch
  - Voiced or unvoiced
  - Formant
  - Silence decision
  - Time
  - Pulse code modulation (PCM)
  - Zero crossing
  - Voiced or unvoiced
  - Silence decision
  - Correlation function
  - Autocorrelation
  - Cross-correlation
  - Linear prediction
  - Analysis by synthesis
  - Pattern matching vocoders
  - Vector quantization
  - Excitation patterns
  - Normalizing
  - Gain control
  - Noise
  - Pretransmission
  - Post-transmission
  - Adaptive bit allocation
  - Quantization
  - Recognition
  - Neural network
  - Detect speech in noise
  - Normalizing
  - Speech to image
  - Specialized equations or comparisons
  - Correlation
  - Distance
  - Similarity
  - Probability
  - Dynamic time warping
  - Viterbi trellis
  - Creating patterns for matching
  - Update patterns
  - Clustering
  - Voice recognition
  - Preliminary matching
  - Endpoint detection

Audio Signal Bandwidth Compression or Expansion

- With content reduction encoding
- Delay line
- Audio signal time compression or expansion (E.G., run length coding)

Foreign Art Collection

Class-related foreign documents
### C. CHANGES TO THE U.S. - I.P.C. CONCORDANCE

<table>
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<th>I.P.C. Subclass</th>
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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 15/14M1).

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 15/14M).

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).