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A Review on Speech Recognition with Hidden Markov Model

Patil Priyanka[1], Mrs. J. H. Patil[2]
PG Scholar, Dept.Of E&TC Engineering, PSGVPM's D.N.Patel COE, Shahada, Maharashtra, India[1]
Professor, Dept.Of E&TC Engineering, PSGVPM's D.N.Patel COE, Shahada, Maharashtra, India[2]

ABSTRACT- The concept of Recognition one phase of Speech Recognition Process utilizing Hidden Markov Model has been discussed in this paper Preprocessing , Feature extraction what's more, Recognition three steps and Hidden Markov Model (used in recognition phase) are used to complete Automatic Speech Recognition System. Today's life human can interact with computer hardware and related machines in their own language Research followers are attempting to develop a perfect ASR system because we have every one of these advancements in ASR and research in computerized sign al processing however computer machines are unable to match the performance of their human utterances in terms of exactness of coordinating and speed of response. In case of speech recognition the research followers are for the most part utilizing three different approaches namely Acoustic phonetic methodology, Knowledge based methodology what's more, Pattern recognition approach. This current paper's study is based on pattern recognition approach what's more, the third phase of speech recognition process "Recognition" and Hidden Markov Model is studied in details.

KEYWORDS **-** Automatic Speech Recognition (ASR),HMM model, human machine interface.

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I. INTRODUCTION

Recognizers is the third phase of speech recognition process deal with speech variability and record for learning the relationship between specific utterances and the corresponding word or words [1] . There has been steady

progress in the field of speech recognition over the recent yeas with two trends [2] . Initially is academic approach that is

achieved by enhancing technology mostly in the stochastic modeling, search and neural networks. Second is the

sober minded, include the technology, which provides the simple low- level interaction with machine, replacing with catches and switches. A second approach is useful at this point, while the former mostly make promises for the future. In the sober minded system emphasis has been on air conditioning curacy, robustness and on the computational efficiency permitting

real time performance with affordable hardware. Comprehensively speaking, there are three approaches to speech recognition.

(a) Acoustic - phonetic methodology: Acoustic - phonetic approach assumes that the phonetic units are extensively characterized by a set of features, for example, group frequency, voiced/unvoiced and pitch. These features are extracted from the speech flag and are used to segment and level the speech.

(b) Knowledge based methodology : Knowledge based approach attempts to mechanize the recognition procedure

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as per the way a person applies its intelligence in imagining, examining lastly settling on a decision on the measured acoustic features. Expert system is used widely in

this approach.

(c) Pattern recognition approach : Pattern recognition approach requires no explicit knowledge of speech. This approach has two steps

– namely, preparing of speech patterns based on some generic spectral parameter set and recognition of patterns by means of pattern correlation. The well known pattern recognition techniques include template coordinating, Hidden Markov Model

[5].

II. LITERATURE REVIEW

HMM is doubly stochastic process with an underlying stochastic process that is not observable, but rather must be observed through another set of stochastic processes that produce sequence of observed images. The fundamental theory behind the Hidden Markov Models (HMM) dates back to the late 1900s when Russian analyst Andrej Markov first presented Markov chains. Baum furthermore, his colleagues introduced the Hidden Markov Model as an extension to the initially - order stochastic Markov process and developed an efficient method for streamlining the HMM parameter estimation in the late 1960s and early 1970s. Baker at Carnegie Mellon University and Jelinek at IBM provided the main HMM implementations to speech processing applications in the 1970s [6]. Proper credit ought to likewise be given to Jank ferguson at the Institute for defense Analysis for explaining the theoretical aspects of three central problems associated with HMMs, which will be further iscussed in the accompanying sections [7]. The technique of Well has been comprehensively accepted in today's modern state- on the other hand - the craftsmanship ASR systems for the most part for two reasons: its capacity to model the non - linear dependencies of each speech unit on the adjacent units and a powerful set of scientific approaches provided for estimating model parameters.

III. PROBLEM DEFINITION

The Hidden Markov Model (HMM) is a variant of a finite state machine having a set of hidden states Q , an output alphabet (observations) O, transition probabilities A , output (emission) probabilities B , and initial state probabilities II. The current state is not observable. Instead, each state produces an output with a certain probability (B). Usually the states Q , and outputs O , are understood, so an HMM is said to be a triple (A, B, II).

IV. SYSTEM ARCHITECTURE

Fon the other hand the description figure 1 demonstrates an example of Hidden Markov Model, The model comprises of a number of states, appeared as the circles in f igure. At time t the model is in one of these states and yields an observation (A, B, C or D) At time t+1 the model moves to another state or stays in the same state and emits another observation. The move between states is probabilistic and is based on the move probabilities between states which are given in state j at time t+1 . Notice that in this case An is upper triangular. While in a general HMM moves may happen from may state to some other state, for speech recognition applications moves just happen from left to right i.e. the process can't go in reverse in time, effectively modelling the temporal ordering of speech sounds. Since at each time step there must dependably be a move from a state to a state each line of An absolute necessity whole to a likelihood of 1. The yield image at each time step is selected from a finite lexicon. This process is again probabilistic

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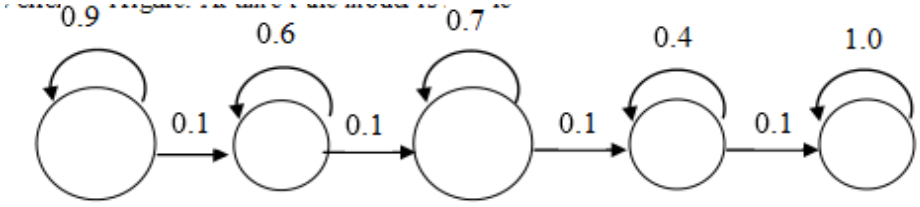
and is governed by the yield likelihood network B where B jk is the likelihood of being in state j and yielding symbol k. Again since there should dependably be a yield image at time t , the lines of B total to 1. At long last, the entry likelihood vector π, is used to described the likelihood of beginning in described by the parameter set λ = [π, A, B].



$$A = [a_{ij}] = \begin{bmatrix} 0.9 & 0.1 & 0 & 0 & 0 \\ 0 & 0.6 & 0.4 & 0 & 0 \\ 0 & 0 & 0.7 & 0.3 & 0 \\ 0 & 0 & 0 & 0.4 & 0.6 \\ 0 & 0 & 0 & 0 & 1.0 \end{bmatrix}$$

$$B = [b_{jk}] = \begin{bmatrix} 0.1 & 0.8 & 0.1 & 0.0 \\ 0.0 & 0.2 & 0.8 & 0.0 \\ 0.7 & 0.0 & 0.0 & 0.3 \\ 0.2 & 0.0 & 0.0 & 0.8 \\ 0.0 & 0.0 & 0.0 & 1.0 \end{bmatrix}$$

$$\pi = [0.4 \quad 0.6 \quad 0.0 \quad 0.0 \quad 0.0]$$

Fig.1 A Five State Left-Right, Discrete HMM for Four Output Symbols

V. APPLICATIONS

HMM can be used to model a unit of speech whether it is a phoneme, or a word, or a sentence. LPC analysis followed by the vector quantization of the unit of speech, gives a sequence of symbols (VQ indices). HMM is one of the ways to capture the structure in this sequence of symbols. In order to use HMMs in speech recognition, one should have some means to achieve the following:

Evaluation: Given the observation sequence O =(O_1,O_2,.....,O_T) and a HMM λ = (A,B, π) to choose a corresponding state sequence Q = q1, q2,...,qT which optimalin some meaningful sense, given the HMM.

Training: To adjust the HMM parameters λ = (A,B,π) to maximizeP(O | λ).

The following are some of the assumptions in the Hidden Markov Modeling for speech.

Successive observations (frames of speech) are independent and therefore the probability of sequence of observation P = (o1, o2, ...oT) can be written as a product of probabilities of individual observations, i.e. O = (o1,o2, ...oT)=TiioP1)

Markov assumption: The probability of being in a state at time t , depends only on the state at time t-1.

The problems associated with HMM are explained as follows:

(a) Evaluation: Evaluation is to find probability of generation of a given observation sequence by a given model. The recognition result will be the speech unit corresponding to the model that best matches among the different competing models. Now to find P(O | λ), the probability of observation sequence O = (o1, o2, ...,oT) given the model λ i.e.

P(O | λ).

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(b) Decoding: Decoding is to find the single best state sequence, Q =(q1, q2,...,qT), for the given observation sequence O = (o1,o2, ...,oT).

VI. CONCLUSION

The finish of this study of recognition and hidden markov model has been carried out to develop a voice based

user machine interface system. In different applications we can use this user machine system furthermore, can take advantages as

real interface, these applicatoion can be related with disable persons those are unable to operate computer through keyboard and mouse, these type of persons can use computer with the use of Automatic Speech Recognition system, with this system user can operate computer with

their own voice summons (in case of speaker dependent furthermore, trained with its own voice samples) Second application for those computer users which are not comfortable with English language and feel great to work with their native

language i.e. English, Punjabi, Hindi.

REFERENCES

[1] http://www2.acnielsen.com/reports/documents/2005_cc_onlineshopping.pdf, Mar. 2007.

[2] http://www.cardhub.com/edu/number-of-credit-cards/

[3] The Economic Times "http://articles.economictimes.indiatimes.com/2012-08-10/news/33137593_1_number-ofactive-credit-credit-card-cibil"

[4] http://www.cardbhai.com/credit-debit-card-data/india-credit-card-holders-information-bank-wise-2012

[5] Raghavendra Patidar, Lokesh Sharma "Credit Card Fraud Detection using Neural Network"

[6] Tej Paul Bhatla, Vikram Prabhu & Amit Dua "Understanding Credit Card Frauds"

[7] L.R. Rabiner, "A Tutorial on Hidden Markov Models and Selected Applications in Speech Recognition," Proc. IEEE, vol. 77, no. 2, pp. 257-286, 1989.

[8] Credit card fraud detection using Hidden Markov Model", Abhinav Srivastava, Amlan Kundu, Shamik Sural, Senior Member, IEEE, and Arun K. Majumdar, Senior Member, IEEE

[9] A. K. Jain, M. N. Murty, and P.J Flynn. Data clustering:a review. ACM comput. Surv.,31(3):263-323 September 1999

[10] "A gentle tutorial of the EM algorithm and its application to Parameter Estimation for gaussian mixture and Hidden Markov Models", J. A..

[11] Bilmes S.J. Stolfo, D.W. Fan, W. Lee, A. Prodromidis, and P.K. Chan, "Cost-Based Modeling for Fraud and Intrusion Detection: Results from the JAM Project," Proc. DARPA Information Survivability Conf. and Exposition, vol. 2, pp. 130-144, 2000.