**Abstract**

Most of the speech recognition systems are designed based on the sub-word unit phoneme which is the basic sound unit of a language. In the proposed work, a novel hierarchical approach based phoneme classification task has been carried out to reduce time complexity and search space. Hierarchical classification of set of Tamil phonemes has been done in three levels. Phoneme boundaries of the given speech utterance are identified using Spectral Transition Measure (STM) and phonemes are separated. Mel-Frequency Cepstral Coefficients (MFCC) are extracted for each phoneme represented by 9 frames including the contextual frames of corresponding phoneme. In each hierarchical level, different number of models is built using Support Vector Machine (SVM) for classifying each phoneme group/phoneme. It is observed from the results that in hierarchical approach phoneme group recognition rate at level 1 and 2 has greatly improved compared to flat classification model. Complexity of search space is significantly reduced at level 2 and level 3 contrasts to flat phoneme classification model. Hierarchical phoneme classifier can be very well employed in phoneme recognition task which is useful in applications such as spoken term detection, out-ofvocabulary detection, named entity recognition, spoken document retrieval.