A Study of High-Order Hidden Markov Models for Speech Recognition

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ABSTRACT

In order to improve the flaw of traditional first order Hidden Markov Models, we propose high-order hidden Markov models (HO-HMM) to improve speech recognition systems. In the proposed model, both the state transition and output probability depend not only on the current state but also several previous states. Therefore, the HO-HMM can precisely capture the state duration and speech dynamic trajectory. We developed an extended Viterbi algorithm for HO-HMM to train the model and recognize input utterance. We conducted experiments on speaker independent Mandarin digits recognition to investigate the performance of HO-HMM. Experimental results show that the performance of HO-HMM system with both high-order state transition and output observation dependencies is superior to that of first order HMM. We also found that as the order of HO-HMM increases, the error rate of recognition reduced. Experimental results also show that the HO-HMM system is more robust against environmental noise.

Keywords: speech recognition; high-order hidden Markov models; dynamic trajectory; extended Viterbi algorithm

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