**Continuous Speech Recognition  
Using Linear Dynamic Models1**

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*Abstract*— Hidden Markov models (HMMs) with Gaussian mixture distributions rely on an assumption that speech features are temporally uncorrelated, and often assume a diagonal covariance matrix where correlations between feature vectors for adjacent frames are ignored. A Linear Dynamic Model (LDM) is a Markovian state-space model that also relies on hidden state modeling, but explicitly models the evolution of these hidden states using an autoregressive process. An LDM is capable of modeling higher order statistics and can exploit correlations of features in an efficient and parsimonious manner. In this paper, we present a hybrid LDM/HMM decoder architecture that postprocesses segmentations derived from the first pass of an HMM-based recognition. This smoothed trajectory model is complementary to existing HMM systems. An Expectation-Maximization (EM) approach for parameter estimation is presented. We demonstrate a 13% relative WER reduction on the Aurora-4 clean evaluation set, and a 13% relative WER reduction on the babble noise condition.

*Keywords*— Linear dynamic models, nonlinear statistical modeling, speech recognition, acoustic modeling

Manuscript submitted February 1, 2013. Revised May 20, 2013.

1. This material is based upon work supported by the National Science Foundation under Grant No. IIS-0414450. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
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