

SEMINAR NOTICE

Department of Electrical and Systems Engineering

Hidden Markov Models for Heart Rate Variability with Biometric Applications

MS Dissertation Defense

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Abstract: The utility of hidden Markov models (HMM) for modeling individual heart rate variability (HRV) is presented. Starting with a physiologically based statistical model for HRV from the literature, we justify use of HMMs and present methods for parameterizing the model. The forward-backward algorithm and expectation-maximization algorithm are used to estimate the model and the hidden states for a given observation sequence of inter-beat intervals. Multiple initialization techniques are presented to avoid local maxima. Model order is determined from the data sequence using the Bayesian information criterion. Models are trained on twelve hour recordings. The models are then used to discriminate the identity of an individual using data from a separate set of testing data. For database from 52 individuals, true identity was verified with an equal error rate of roughly 0.36. While initial results do not demonstrate strong performance as a biometric, HMMs are able to capture some individuality in the HRV signal. Consistency in HRV over twelve hour time scales is also demonstrated.

DATE: Wednesday, April 27, 2011
TIME: 9:00 a.m.
PLACE: Bryan Hall, Room 305

Research Advisor:
Professor Joseph O'Sullivan

This seminar is in partial fulfillment
of the Masters Degree