SEMINAR NOTICE

Preston M. Green Department of Electrical and Systems Engineering

INFORMATION PROCESSING FOR BIOLOGICAL SIGNALS: APPLICATION TO LASER DOPPLER VIBROMETRY

DISSERTATION DEFENSE
by

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Abstract: A Laser Doppler Vibrometer (LDV) is targeted on the neck overlying the carotid artery. Vibrations and movements from within the carotid are transmitted to the surface of the skin, where they are sensed by the LDV. Changes in the size of the carotid due to variations in blood pressure are sensed at the skin surface. Pressure wave physics in elastic tubes is presented to explore the underlying physics of blood flow in the carotid. Mechanical movements of the carotid walls are related to the underlying pressure, and therefore the cardiovascular activity of subject.

Graphical models are used to represent the hidden internal dynamics that generate the observed data. These models are motivated by the underlying physiology and physics, and are capable of expressing a wide range of signal variability. Under the resting condition, these dynamics correspond to respiration effects. Model parameters are interpreted in terms of the underlying physiology.

The models are applied to the problem of identity verification using the LDV signal. Identity verification is an important problem in which the claimed identity is either accepted or rejected by an automated system. The system design that is used is based on a loglikelihood ratio test using models that are trained during an enrollment phase. A score is computed and compared to a threshold. Performance is given in the form of False Nonmatch and False Match empirical error rates as a function of the threshold. Confidence intervals are computed that take into account correlations between the system decisions.

DATE: Monday, April 25, 2011
TIME: 10:00 a.m.
PLACE: Bryan Hall, Room 305

Dissertation advisor:
Dr. Joseph O'Sullivan

This seminar is in partial fulfillment
of the Doctor of Philosophy degree

Washington University in St. Louis
SCHOOL OF ENGINEERING & APPLIED SCIENCE