SEMINAR NOTICE

Department of Electrical and Systems Engineering

Bio-Inspired Encoding Of Images with Spatiotemporal Cortical Activity Waves And Information Recovery via Dynamical Modeling

by

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Extracellular recordings and experiments with voltage sensitive dyes have established the fact that the visual cortex of freshwater turtles produces waves of activity as a result of an input pattern of visual activity. A large-scale model of the turtle visual cortex has been constructed that has the ability to simulate waves with the same qualitative features as the cortical waves seen in experimental preparations. Thus far, model stimulus has been restricted to either stationary or moving flashes of light. The contribution of this work is in two areas.

First, we extend the model of the turtle visual pathway to include a two-dimensional version of the lateral geniculate nucleus (LGN) which enables the use of natural scenes as input stimuli. A lower-dimensional representation of a scene is projected onto a given LGN architecture in which the cells are viewed as sensing devices. We sample the input based on the cell distribution and represent the sampled image using principal components analysis. This yields coefficients that are representative of the sampled image and these coefficients serve as input to the model cortex. We examine the effect of the LGN on the encoding and scene reconstruction.

Second, we seek to determine the extent to which information concerning target class and location is contained in the dynamics of the cortical wave. We discretize the visual space and use an algorithm to preferentially encode those parts of the scene deemed interesting. Through the use of dynamic models, we reconstruct a version of the input that, though coarse, is sufficient for discrimination. We show that dynamic models can be used to decode the wave to determine target location.

DATE:	Thursday, March 9, 2006
TIME:	11:00 a.m.
PLACE:	Bryan Hall, Room 305

Thesis advisor:
Bijoy K. Ghosh

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