STEVENS INSTITUTE of TECHNOLOGY
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University Seminar Series

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Decoherence Control in Open Quantum Systems via Internal Model of the Environment

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ABSTRACT

Quantum Information and Quantum Computation hold the key to faster information processing and reliable communication. Quantum information processing devices are also the promising alternative to digital systems due to the reduction in feature size of silicon based technology. However, decoherence caused by environmental interaction and which leads to the collapse of quantum superposition is currently the biggest roadblock towards exploitation of quantum speedup in computation. Although the problem has received much attention over the past several years and some techniques are effective for small group of qubits, problems such as scability of error correction techniques and decoherence under arbitrary useful control pulses prevail. Here we investigate decoherence control for quantum systems with the help of a scalable ancillary qubit. The ancillary system is entangled with the system and the model of environmental interaction is used to counter the decohering interaction. The example of decoherence elimination in single qubit, and 2-qubit system is presented in order to demonstrate the efficacy of the technique, which preserves the action of useful control while eliminating only the effects of decohering interaction. This technique also leads us to the idea of Internal Model Principle analogue for quantum control systems which is first of its kind.

BIOGRAPHY

Narayan Ganesan joined Stevens as an Assistant Professor in the Department of Electrical and Computer Engineering in Fall 2011. Narayan received his Ph.D. in Electrical and Systems Engineering from Washington University in St. Louis in December 2006. From 2006-2007, he was a research associate at the Washington University School of Medicine, where he worked on mathematical modeling of neuronal systems and their response to visual and vestibular stimuli. From 2007-2009, he worked at the Department of Computer Science and Engineering at Washington University as a post-doctoral researcher and Adjunct faculty where his work focused on Hybrid Computing on heterogeneous platforms, such as FPGAs, Graphics Processing Units(GPUs) and multi-core processors. From 2010 to 2011 as a senior research scientist, he was the lead behind the development of an optimized Molecular Dynamics simulation package implemented on GPUs, at the University of Delaware. The study benefits several high-impact applications such as drug-design, protein-ligand interaction and multi-scale modeling.

EVENT DETAILS

DATE:
Wednesday Oct. 31, 2012

TIME:
11:00 AM

LOCATION:
Babbio Center, Room 122
Stevens Institute of Technology

ATTENDANCE:
This event is open to Stevens' Faculty, Students, Staff, and Invited Guests

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