Joint ECE and CS Seminar

Time and Location: Friday Mar. 8, 2013 at 11am in CSB 130

Title: Randomized Motion Planning: From Intelligent CAD to Computer Animation to Protein Folding

Speakers: Nancy Amato
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Abstract: Motion planning arises in many application domains such as computer animation (digital actors), mixed reality systems and intelligent CAD (virtual prototyping and training), and even computational biology and chemistry (protein folding and drug design). Surprisingly, a single class of planners, called probabilistic roadmap methods (PRMs), have proven effective on problems from all these domains. Strengths of PRMs, in addition to versatility, are simplicity and efficiency, even in high-dimensional configuration spaces.

In this talk, we describe the PRM framework and give an overview of several PRM variants developed in our group. We describe in more detail our work related to virtual prototyping, computer animation, and protein folding. For virtual prototyping, we show that in some cases a hybrid system incorporating both an automatic planner and haptic user input leads to superior results. For computation animation, we describe new PRM-based techniques for planning sophisticated group behaviors such as flocking and herding. Finally, we describe our application of PRMs to simulate molecular motions, such as protein and RNA folding.

More information regarding our work, including movies, can be found at
http://parasol.tamu.edu/~amato/

Brief Bio: Nancy M. Amato is a professor of computer science and engineering at Texas A&M University where she co-directs the Parasol Lab, is a Deputy Director of the Institute for Applied Math and Computational Science (IAMCS), is an Associate Director of the Center for Large-Scale Scientific Simulations (CLASS), is chair of the university-level Alliance for Bioinformatics, Computational Biology, and Systems Biology (ABCS), and was chair of the Council of Principle Investigators (CPI) (2009-2010). She received undergraduate degrees in Mathematical Sciences and Economics from Stanford University, and M.S. and Ph.D. degrees in Computer Science from UC Berkeley and the University of Illinois at Urbana-Champaign. She was an AT&T Bell Laboratories PhD Scholar, she is a recipient of a CAREER Award from the National Science Foundation, she serves as a Distinguished Speaker for the ACM Distinguished Speakers Program, she was a Distinguished Lecturer for the IEEE Robotics and Automation Society (2006-2007), and she has received numerous awards recognizing her contributions in research, teaching and service. She is an IEEE Fellow.

She regularly serves on editorial boards, including the IEEE Robotics and Automation Society Conference Editorial Board (2006-2010), IEEE Transactions on Robotics and Automation (2001-2004), IEEE Transactions on Parallel and Distributed Systems (2002-2005), Journal of Information Science and Engineering (2005-2011), International Journal of Computational Geometry and Applications (since 2008), Theory of Computing Systems (since 2009), and on review panels for NSF and NIH, and several European countries. She is an elected member of the IEEE Robotics and Automation Society Administrative Committee (AdCom), she was a co-Chair the NCWIT Academic Alliance (2009-2011), she is a member of the Computing Research Association's Committee on the Status of Women in Computing Research (CRA-W) and of the ACM, IEEE, and CRA sponsored Coalition to Diversity Computing (CDC); she co-directs the CDC/CRA-W Distributed Research Experiences for Undergraduates (DREU) program (known as the DMP from 1994-2008) and she co-directs the CDC/CRA-W Distinguished Lecture Series (DLS).

Her main areas of research focus are motion planning and robotics, computational biology and geometry, and parallel and distributed computing. Current representative projects include the development of a new technique for modeling molecular motions (e.g., protein folding), investigation of new strategies for crowd control and simulation, and STAPL, a parallel C++ library enabling the development of efficient, portable parallel programs.