

COLLOQUIUM

Department of Computer Science and Engineering
University of South Carolina

Algorithmic Robotics: Enabling Autonomy in Challenging Environments

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Date: **March 28, 2013**

Time: **2:00pm-3:30pm**

Place: **Faculty Lounge, Swearingen 1A03**

Abstract

The last few years, robots have moved from the pages of science fiction books into our everyday reality. Currently, robots are used in scientific exploration, manufacturing, entertainment, and household maintenance. While the above advances were made possible by recent improvements in sensors, actuators, and computing elements, the research of today is focused on the computational aspects of robotics. In particular, methodologies for utilizing the vast volumes of data that can be generated by a robotic mission, together with techniques that would allow a robot to respond adequately in unforeseeable circumstances are the challenges of tomorrow. This talk presents an overview of algorithmic problems related to robotics, with the particular focus on increasing the autonomy of robotic systems in challenging environments. Cooperative Localization Mapping and Exploration employs teams of robots in order to construct accurate representations of the environment and of the robot's pose. The problem of coverage has found applications ranging from vacuum cleaning to humanitarian mine removal. A family of algorithms will be presented that solve the coverage problem efficiently in terms of distance travelled. Interestingly, the planetary and underwater exploration share many challenges when viewed from an algorithmic point of view. An a priori unknown environment and limited communications are among the most obvious. I would present recent results from a multi-robot experiment employing a UAV, a USV, and a AUV operating in sync with a remote marine biologist located thousands of kilometers away.

Ioannis Rekleitis is an Adjunct Professor at the School of Computer Science, McGill University, Montreal, Canada. Between 2004 and 2007 he was a visiting fellow at the Canadian Space Agency. During 2004 he was at McGill University as a Research Associate in the Centre for Intelligent Machines with Professor Gregory Dudek in the Mobile Robotics Lab (MRL). Between 2002 and 2003, he was a Postdoctoral Fellow at the Carnegie Mellon University in the Sensor Based Planning Lab with Professor Howie Choset. He was granted his Ph.D. from the School of Computer Science, McGill University in 2002 under the supervision of Professors Gregory Dudek and Evangelos Milios. Thesis title: "Cooperative Localization and Multi-Robot Exploration." His Research has focused on mobile robotics and in particular in the area of cooperating intelligent agents with application to multi-robot cooperative localization, mapping, exploration and coverage. His interests extend to computer vision and sensor networks. He has worked with underwater, terrestrial, aerial, and space robots. Ioannis Rekleitis has published more than sixty journal and conference papers. His work can be found online at: <http://www.cim.mcgill.ca/~yiannis/>.