HARVEY MUDD COLLEGE

Engineering Seminar Program
Wednesday, March 23, 2011
Galileo McAlister 4:15 p.m.

Christopher Clark, Associate Professor (Cal Poly), Ph.D. (Stanford)

Dr. Christopher Clark received his M.S. in Mechanical Engineering at the University of Toronto, while investigating the use of Artificial Neural Networks in robotic manipulator control systems. After working as a Control Systems Designer at Sterner Automation, he completed his Ph.D. in Aeronautics & Astronautics and Computer Science at Stanford University, with a focus on multi-robot motion planning. During this time he also consulted for Kiva Systems to help develop an innovative solution to warehouse distribution using multi-robot systems. Dr. Clark served as an Assistant Professor at the University of Waterloo (Canada) from 2004 to 2007, before joining the Department of Computer Science at California Polytechnic State University, San Luis Obispo. At Cal Poly he directs the Laboratory for Autonomous and Intelligent Robotics (LAIR), where his areas of research include motion planning, multi-robot systems, intelligent transportation systems, modular and reconfigurable robots, and underwater robot systems. His work has resulted in over 50 peer-reviewed journal and conference publications, as well as several teaching and research awards including the California Faculty Association's Distinguished Educator Award.

Underwater Robotics: Field Explorations in Marine Biology, Oceanography, and Archeology

In environments that are typically too dangerous, difficult, or expensive for humans to explore, robots have been deployed to explore important and new frontiers. This seminar will examine Dr. Christopher Clark's research in the use of underwater robots for applications in marine biology, oceanography, and archeology. As part of this research, Dr. Clark has deployed robots in Canada, Norway, the Arctic Circle, Malta, the Mediterranean Sea, and the California coast. These expeditions, while driven by the needs of natural and social scientists, are made possible by recent developments in systems engineering and computer science.

The first part of this seminar will provide an overview of Dr. Clark's work with Autonomous Underwater Vehicle (AUV) planning in a regional ocean modeling system, Bayesian filtering for ice detection in AUV under-ice navigation, construction of four-dimensional Dissolved Oxygen maps with AUV sampling, estimation of shark behavioral modes, and underwater mapping algorithms for exploration of ancient tunnels and water systems.

The second part of the seminar will discuss one project in more depth - Distributed Multi-Robot Boundary Tracking. In this work, a decentralized control system was developed to coordinate the motion of multiple robots in sampling a boundary edge (e.g., the edge of an oil spill). The controller has proven stability in balancing the phase and workload of robots. Results from robot simulations and hardware experiments will be presented. Finally, future work regarding implementation with multiple AUVs will be discussed.