

The Field Robotics Center

Seminar Series

Tuesday, 5th May

NSH 3305 2:00pm – 3:00pm

Food will be served



Erik Nelson

M.S. Student
Robotics Institute

Environment Model Compression for Autonomous Exploration

Abstract : This talk will focus on methods for increasing the speed at which a mobile robot is able to explore an unknown environment. Exploration is a useful capability for autonomous mobile robots that must operate outside of controlled factory or laboratory environments. Recent advances in exploration employ techniques that compute control actions by analyzing information-theoretic metrics on the robot's map. These metrics are generally computationally expensive to evaluate, limiting the speed at which a robot is able to explore. We develop information-theoretic strategies for compressing a robot's map, in turn allowing information-based reward to be evaluated more efficiently. To remain effective for exploration, these strategies must compress maps in a way that sacrifices a minimal amount of information about expected future sensor measurements. Adaptively compressing the robot's map to different resolutions in response to local environment complexity and propagating the efficiency gains through to planning frequency and velocity gives rise to intelligent behaviors such as speeding up in open expanses. Using these methods we demonstrate information-theoretic exploration through mazes and cluttered indoor environments at speeds of 3 m/s in simulation, and 1.6 m/s on a ground robot.

Speaker Bio : Erik Nelson is an M.S. student in the Robotics Institute at Carnegie Mellon University, advised by Dr. Nathan Michael. He received a B.S. in materials engineering from Cal Poly, San Luis Obispo in 2013. His research interests lie at the intersection of robotic mapping, perception, and exploration.



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