The Field Robotics Center

Seminar Series

Monday, 11th July

NSH 1507 1:00 – 2:00pm

Lunch will be served

Samuel Yim

M.S. Student

Robotics Institute

Rover Localization in Sparsely-Featured

Abstract: Autonomous outdoor localization is a challenging but important task for rovers. This is especially true in desert-like environments such as those on Mars, where features can be difficult to distinguish and GPS is not available. This work describes a localization system called MeshSLAM, which requires only stereo images as inputs. MeshSLAM uses the spatial geometry of rocks as landmarks in a GraphSLAM algorithm. These landmarks are termed “constellations,” and this work will present and compare methods of generating, describing and matching constellations. Motion is estimated through visual odometry.

This work will also discusses two new methods of detecting rocks in an image — one that uses superpixel clustering and ground plane fitting, and another that uses a convolutional neural network. The analysis of feature descriptors and descriptor matching that follows will show that accurate landmark matching can be achieved by systematically building convex hull boundary descriptors in each image, and rejecting outliers using RANSAC and motion-invariant rock features.

Several hundred images were collected by the rover Zoë from the Atacama desert in Chile. These images, as well as a set of synthetic data, are used to validate the system.

Speaker Bio: Samuel Yim is an M.S. student in the Robotics Institute advised by David Wettergreen. He received a B.S. in Engineering from Harvey Mudd College in 2014. His current research focuses on robustly detecting and describing features for SLAM applications.

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