

The Center for In Situ Exploration and Sample Return (CISSR)
Speaker Series

presents

Speaker: Mark Maimone

Topic: Mars Exploration Rover (MER) Autonomous Surface
Navigation Capabilities

Date: Friday, February 22, 2002

Time: 1:30 - 3:00 p.m.

Location: JPL Bldg. 306-302

Abstract:

NASA will send two rovers to the surface of Mars in the Summer of 2003. To ensure that they collect data on sufficiently geologically diverse rocks and soil, these rovers must be capable of traversing up to 100 meters of terrain each Martian day. Since human operators can typically plan courses no longer than 20 or 30 meters using rover-based imagery, an onboard autonomous navigation system is being implemented to achieve this capability.

The MER rovers will be capable of driving themselves safely toward any goal location, avoiding obstacles along the way. Pairs of stereo cameras enable the rover to estimate the traversability of nearby terrain, by automatically computing the shape of that terrain and looking for hazards in it. Unlike Sojourner's stereo system, which required projection of a laser pattern and produced only 25 measurements per step, MER's system relies passively on light from the Sun and will typically produce around 5,000 range measurements at each step. Traversability information derived from these measurements is maintained onboard in a local map, which allows the rover to choose its next move intelligently, avoiding obstacles while trying to reach its next goal.

During this talk, Mark Maimone will discuss some of the technologies

being used to implement the autonomous navigation capability on MER. He will also present preliminary results from development tests using prototype (pre-MER) vehicles like the Athena Software Development model Rover.

Related Information:

"Stereo Vision and Rover Navigation Software for Planetary Exploration," by Goldberg, Maimone, and Matthies. To appear in the 2002 IEEE Aerospace Conference Proceedings, Big Sky, Montana, March 2002. Available online at: <http://robotics.jpl.nasa.gov/people/mwm/visnavsw/>

Additional papers at: <http://robotics.jpl.nasa.gov/people/mwm/pubs.html>

Biography:

Dr. Mark Maimone is a Machine Vision researcher at JPL. In 1989 he completed the International Space University's summer program, in which he participated in the design of a lunar polar orbiter. He earned his Ph.D. in Computer Science at Carnegie Mellon University in 1996, with a dissertation that addressed problems that have plagued stereo vision systems for decades. He was then a Post-doctoral Research Associate for Carnegie Mellon's Robotics Institute, supervising the 1996 Lunar Rover field trials and serving as Navigation and Software Lead for the 1997 Atacama Desert Trek. Mark has delivered 3-D vision systems for autonomous robotic control and mapping projects, including the Long Range Science Rover, Planetary Dexterous Manipulator, and Pioneer Vision System for Chernobyl Inspection tasks. Mark is a member of the Mars Exploration Rover flight software team, and is helping to develop the vision and navigation subsystems for the robots that NASA will send to Mars in 2003. His research interests include robotic navigational autonomy, stereo vision, camera calibration, and software environments.

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