JPL Day at CMU
Thursday, September 29, 2016
Program of Events

What Drives Curiosity?
Robotics Technologies on the Mars Science Laboratory
Presenter: Mark Maimone (BS MCS ’87, Ph.D. SCS ’96)
10:00 AM – 11:00 AM
Newell-Simon Hall, Room 3305

NASA’s Curiosity rover has successfully explored the surface of Mars since August 2012, its mission of scientific exploration enabled by advanced robotics technologies originally developed at research institutions. As of September 2016 Curiosity has driven over 14 km using capabilities like Autonomous Hazard Detection and Avoidance, Visual Odometry and Visual Target Tracking. Curiosity’s arm, turret, and science instruments have brushed, drilled, scooped, imaged, sampled and analyzed the Martian surface. Come hear about Curiosity’s onboard mobility, manipulation and vision robotic capabilities and some of the challenges encountered (and solutions found!) while operating on the surface of Mars.

Dr. Mark Maimone is a Navigation and Machine Vision researcher at JPL. Mark designed and developed the autonomous vision and navigation software that lets the rovers associated with the Mars Exploration Rover (MER) and Mars Science Laboratory (MSL) missions drive themselves safely. He additionally wrote ground software that automates the analysis of mobility and arm operations on MER and MSL. Mark is now the Flight Software Lead and Rover Driver Deputy Lead for Curiosity (MSL), and he continues to develop and enhance the onboard autonomous vision and navigation software for these and future rovers. Mark earned his Ph.D. in Computer Science at Carnegie Mellon University in 1996, and completed a postdoc there in 1997 as Navigation and Software Lead for the 1997 Atacama Desert Trek.

Exploring Space with Augmented Reality
Presenter: Parker Abercrombie
11:00 AM – 12:00 PM
Newell-Simon Hall, Room 3305

JPL is using virtual and augmented reality to explore space and our own planet in ways that were never before possible. Scientists are planning activities for the Curiosity Mars rover while walking on a 3D reconstruction of Martian surface. Mechanical engineers can preview full-scale holographic models of spacecraft before any parts are built. Astronauts aboard the International Space Station receive virtual assistance from experts on the ground. These are only some of the projects in AR and VR that are going on right now at JPL. This talk will present recent projects that leverage immersive technology, and discuss why these technologies are a good solution for some visualization challenges.

Parker Abercrombie is a software engineer at NASA’s Jet Propulsion Laboratory, where he builds software to support Mars science missions. He has a special interest in geographic information systems and has worked with teams at NASA and the U.S. Department of Energy on systems for geographic visualization and data management. Parker holds an M.A. in Geography from Boston University and a B.S. in Creative Studies with emphasis in Computer Science (which he swears is more technical than it
Protecting Space in Cyber Space: When the Aliens are Hackers
Presenter: Suzanne Stathatos
1:00 PM – 2:00 PM
Newell-Simon Hall, Room 3305

The role of cyber defense in our space program is gaining in prominence, in part due to the exponential growth of adversarial activities in this area. We will describe the endeavors of the cyber defense team and their focus on ensuring the continued success of JPL’s efforts in space exploration. In doing so, we will shed light on the importance of the Computer Science discipline and the role of software in key areas within our efforts to explore space. The unique challenges of securing and defending JPL’s mission infrastructure, as well as the spectrum of activities in the area of cyber defense ranging from NASA funded projects to non-NASA funded research, will be presented.

Suzanne Stathatos is a Cyber Defense Engineer in the Cyber Defense Engineering and Research group at NASA's Jet Propulsion Laboratory. She and her group work on reducing risk and improving the resilience of mission systems toward cyber attacks. Suzanne has contributed toward building and analyzing graph structures of computer control systems for JPL missions as well as for SCADA systems operated by an Oil and Gas industry leader. Her work includes assessing how natural language processing can be leveraged to help analyze cyber risks, and applying machine learning techniques to analyze anomalies in Mars Science Lab telemetry data.

Prior to joining JPL, Suzanne received her B.A. in History and M.S. in Computer Science from Stanford University. As a masters student, she concentrated on building and analyzing reliable, robust, scalable computer systems and protocols. As a history student, she focused on telecommunication technologies that arose from military endeavors, specifically focusing on the Claude Chappe semaphore.

Technology Developments Enabling Future NASA Missions
Presenter: Gregory Davis
2:00 PM – 3:00 PM
Newell-Simon Hall, Room 3305

This talk will focus on describing technology trends and applied research developments that are required to enable next generation NASA missions. After providing a brief “snapshot” summarizing several exciting developments with current JPL missions, this talk will concentrate on discerning future technology trends in next generation spacecraft and describing how JPL’s institutional technology portfolio attempts to address these new needs.

Dr. Gregory Davis has worked for the past 27 years as a member of the technical staff at JPL, where he is currently the Chief Technologist for the Mechanical Systems Division and Planetary Protection Architect for the Europa Lander Mission. Greg has also been a Lecturer in Aerospace Engineering at Caltech for the past 10 years. He has worked on Juno—now orbiting Jupiter—and 3 Mars landers: Sojourner, Spirit, and Opportunity. Before arriving at JPL, Greg worked as an exploration geophysicist in Houston, Texas and as a physics teacher in Stow, Ohio, both for five years. Greg holds a Ph.D. in Mechanical Engineering
from Rice University, B. S. and M.S. degrees in Physics from the University of Akron, and received his EMBA from the Drucker School of Business at Claremont Graduate University in May 2012.