A Robotic Vision

Christopher F. Thompson
Salt Lake Community College
Salt Lake City, Utah

Abstract

Within this paper you will find my vision for a future ***Robotics Mission to Mars***. The near decade of success achieved by NASA through the 2003 Mars Exploration Rover (MER) mission has proven that robotic rovers will be an integral part of the human exploration of Mars. With the physical and technological limitations placed on the frail human body, robots will be our right hand as we discover the unraveling mysteries of Mars.

The Mars Exploration Program Analysis Group (MEPAG) identified four goals for the scientific examination of Mars. The four exciting and fundamental goals set forth by MEPAG can be researched in further detail by locating the document: *[1]* ***'Mars Science Goals, Objectives, Investigations, and Priorities: 2010.'*** For this particular abstract, I will focus on the implementation of GOAL II which states the following:

> **GOAL II**: Understanding the Processes and History of Climate on Mars *[1]*

To be even more specific, GOAL II is divided into three objectives. Objective A will be the main driving force of this future robotic mission. Objective A states the following:

> **Objective A**: Characterize Mars' Atmosphere, Present Climate, and Climate Processes Under Current Orbital Configuration *[1 - page 21 thru 24]*

Currently NASA is in the process of selecting their next Space Launch System (SLS). The SLS that is most suitable for an unmanned payload delivery to Mars will come from designs based on a 'clean sheet' approach. According to a ***May 2011 SLS / MPCV Status Briefing*** *[2]*, a Large RP configuration (LOX/RP) will offer the greatest long term solution for this particular mission. The LOX/RP will contain an advanced liquid fuel engine capable of delivering between a 100 mT and 172 mT payload into Low Earth Orbit (LEO). From LEO the LOX/RP will separate and produce a module that will then continue beyond Earth orbit (BEO). The development of the LOX/RP will produce advancements in propulsion technology as well as create top-end performance for any future NASA endeavor *[2]*.

Rover technology has proven itself as a viable medium for the exploration of Mars. The robotics utilized for this mission will be very similar in architecture and functionality to the MER-A and MER-B rovers of the MER mission. The robotic rover, OSV-1, will be accompanied by four (4) fully autonomous Miniature Aerial Vehicles (MAV). OSV-1 will have a dual functionality. First, OSV-1 will behave and function as a mobile science laboratory; second, OSV-1 will act as a stationary forward operations base when the MAV's have been activated for service. In order to assure a fruitful mission, OSV-1 will employ a fully realized and integrated set of operational tools known as Ensemble *[3]*. This particular set of Ensemble tools have been optimized to provide a cutting edge human / computer interface capable of real time operational assistance for OSV-1 and the partner MAV's.

OSV-1 and the MAV's will perform multiple objectives once the main operational systems are on-line and functional; for this abstract I will discuss the top three (3).

1 – Utilize onboard atmospheric utilities to perform in situ measurements of the lower atmosphere in order to establish climate and processes *[1 – page 22]*

2 – Utilize the MAV's while in stationary operations to perform in situ measurements of the upper atmosphere to establish climate and processes *[1 – page 22]*

3 – Utilize the Ensemble tool set in conjunction with OSV-1 and the MAV's to begin mapping and deciphering the planetary boundary layer *[1 – page 22]*

In conclusion this abstract has only scratched the surface of my vision for a Robotics Mission to Mars.

References

[1] – ***"Mars Science Goals, Objectives, Investigations, and Priorities: 2010"*** – September 24, 2010
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[3] – ***"Planning Applications for Three Mars Missions with Ensemble"*** – Date: Unknown
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