The Mobile Agents 2005 Field Test at MDRS: Planning for Exploration

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The Mars Society's Desert Research Station (MDRS) Rotation 38, April 3-17, 2005, was dedicated to field tests of NASA's Mobile Agents EVA communications system. MDRS provided an excellent, cost-effective venue for bringing together eighteen scientists and engineers from NASA Ames and Johnson Space Center, in an intensive two weeks of system integration and experiments.

The Mobile Agents architecture and collaborative engineering methodology provides a flexible toolkit for configuring extravehicular activity (EVA) components, visualizing and formalizing EVA plans, and automating key supervisory functions:

1) An EVA plan is created by the crew in collaboration with a remote science team, using visualization tools that promote reuse of previous plans and automatically translate to computer-readable form.

2) The plan specifies players (people, robots, devices, software agents), roles, activities, locations, durations, alert thresholds.

3) The plan is dynamically interpreted by agent software to monitor the EVA, direct robots, and interpret telemetry —for the purposes of *alerting* (e.g., schedule limits, system health), *advising* crew (e.g., indicating next activity and how to get there), and *recording data* (e.g., indexed by time, location, activity, person)

4) The crew (either EVA members or in the habitat) can modify the plan during the EVA by voice command to change location or duration of an activity, repeat or skip activities.

5) The RST receives emails tracking key events and alerts during the EVA, providing URLs to science and other telemetry data (stored in database in habitat mirrored to earth).

6) Plans can be specific to robots and individual crew members or shared to specify joint work

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(e.g., robot assistance is context-specific: following vs. repositioning to maintain network service vs. keeping station with tracking video).

7) Robots and devices can be controlled by a mix of voice commanding, tele-operation, or "autonomous" plans, allowing interruption and resuming of EVA plans.

Graphics and video from EVAs carried out during MDRS38 will illustrate these ideas. Innovations this year include: A Tropos-based mesh WLAN providing greater coverage and better dynamic routing; automatic mapping of EVA data on TerraServer maps; and use of an ATV simulating a robotic relay to investigate concepts of operations for human-robot teams.