

ABSTRACT:

Title: Driving on the surface of Mars with the Rover Control Workstation.

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On July 4, 1997 the Mars Pathfinder Spacecraft and Sojourner Microrover safely landed on the surface of Mars and began an ambitious mission of exploration. The Rover Control Workstation (RCW) is the software/hardware system for controlling Sojourner. It provides the only means of creating the daily sequences of commands used to control all rover activities. Now fifty-five days into the mission Sojourner has accomplished all project mission goals and continues to operate beyond expectations. It has performed numerous technology experiments and proved the concepts for future planetary robotic missions. It has also provided large science returns by accurately placing its primary instrument, the alpha proton x-ray spectrometer on numerous Martian rocks and soil, to determine their elemental compositions as well as taking many high resolution rover-eye-view images of the surface using three on-board ccd cameras.

Using the RCW system to control Sojourner's movement across the terrain, the Rover Uplink Operations team lead it to specific rocks and science targets. The RCW provides this team, consisting of the rover driver and sequence planner, the tools needed to create complex sequences of rover commands to accomplish the frequently changing daily science and technology goals. For mobility and articulation planning, it provides a unique interface consisting of mosaiced stereo windows displaying the panorama of Mars using camera images from both the lander and Sojourner.

The rover driver uses liquid crystal shuttered goggles to perceive stereo depth and a special six degree of freedom input device to move a stereo rover cursor on the screen. The system renders this rover "cad" model cursor in real time over the stereo image background, correctly simulating rover perspective, size, and appearance. The Uplink team uses the RCW to make decisions about where to safely send Sojourner and what to do when reaching the goal. It also provides a "virtual reality" type flying camera view of the surface using computer generated terrain models. This paper describes the design features of the RCW system and how it is used on a daily basis by the Uplink team. The author is the creator of the RCW system and is the primary rover driver for Mars Pathfinder.