SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 3 (2C)

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FIELD TESTING A MULTIPURPOSE 3D SENSOR FOR PLANETARY ROVER MISSIONS

Abstract

Planetary rover missions cover a wide variety of specific activities. Neptec's TriDAR sensor is a multipurpose space qualified 3D laser scanning system capable of addressing many of the perception tasks required to successfully complete these missions. Generally, planetary rover missions use an array of passive two dimensional (2D) cameras and often a stereo pair of cameras to provide three dimensional (3D) information. These passive sensors, however, are often difficult to use in the harsh lighting conditions, are not useful in areas where sunlight is not available, have limited accuracy, and limited range. Neptec's TriDAR contains both laser triangulation and laser time-of-flight technologies to provide capabilities for highly precise short-range inspection, medium-range navigation, and long-range survey. In addition, both of these active sensing technologies eliminate the lighting concerns of passive sensors.

In November 2008, TriDAR was field tested at a lunar analog testing facility on Mauna Kea, Hawaii as an obstacle avoidance, path planning, and drill site selection sensor (IAC-09.A3.2INT.15). In February 2010, TriDAR returned to Mauna Kea for additional field testing. This time, the sensor performed landing pad site selection, supervision of landing pad construction, rover tracking, and road following. In addition, TriDAR flew aboard the Space Shuttle in September 2009 for a test of its autonomous rendezvous and docking capabilities and is scheduled for additional space flight testing.

This paper focuses on the February 2010 testing. Landing pad site selection is similar to drill site selection but the scale is greatly increased and the geographical features of interest change. After landing pad site selection, the sensor provides periodic updates of the site's features to the rovers performing construction. In addition, the TriDAR was tested as a rover tracker so that the sensor providing site construction progress information can also provide precise rover positioning. Lastly, in a separate task, the TriDAR was installed on a regolith delivery rover and tested in a road following task simulating the delivery of regolith to a processing facility. Building on the successes of the 2008 field test, the 2010 field test further demonstrated the versatility of the TriDAR sensor for planetary rover missions.