

Optimized traverse planning to support a lunar polar rover mission for Shackleton Crater, Haworth Crater, Shoemaker Crater and Cabeus Crater

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There are a large number of permanent shadow regions (PSRs) at the south pole of the moon which are expected to host large quantities of volatiles including water-ice. Understanding the distribution, quantity and nature of these volatiles is of great scientific and engineering significance. In the near future, many entities plan to send rovers to the south pole of the moon which can analyze and sample volatiles at the surface and shallow surface. In order to make the rover safe and efficient, there is a compromise between scientific significance and engineering difficulty. We developed a path planning tool called Best Path (BP), which is based on models of lunar topography and terramechanics model. Using 5-meter resolution lunar DEM data, we identified multiple paths for four hotspots at the lunar south pole(Shackleton Crater, Haworth Crater, Shoemaker Crater and Cabeus Crater). These paths are ranked according to surface/subsurface volatiles, topography, direct view to Earth for communication and illumination conditions, which can provide a reference for future lunar South Pole missions.

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