

Probabilistic guidance for scheduling Mars rover traverses

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The problem of optimizing the use of a rover on Mars for science and mobility is very similar to running a search for a missing person on Earth. In both cases, there are limited resources available, a search area that can be defined, and environmental factors. The Search and Rescue community has over the years developed strategies for making decisions in such an environment.

Recent practice exercises in Arizona for operation of a rover geologist on Mars have concentrated largely on identifying rocks and features very close to the landing site. In review of these exercises, staying close to the lander was due largely to two reasons. First there is a concern that no science target be overlooked, and second, there is a concern that the rover has a limited lifetime and may fail during the traverse to a more distant location (e.g. local science is better than no science). These concerns in tandem drive the scientist to examine a small local area thoroughly.

By assigning probabilities to several parameters such as the probability of a feature existing in a certain area, the probability of finding that feature if the rover visits the area, and the probability of breakdown during the traverse, it is possible to optimize a system of equations to maximize the probability of success. This can in turn be used to guide the scheduling committee when making plans for the rover.

We compare the plans developed for two recent rover exercises executed both with and without probabilistic guidance as described above.

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