Mars Exploration (3)
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RESEARCH ON COOPERATIVE NAVIGATION FOR THE LONG-RANGE ROVER LOCALIZATION ON MARS

Abstract

Mars probing has very important scientific value, so the exploration of Mars is an significant part of universe exploration. Mars rover is a kind of mobile robot , while it also can travel on the Mars and carry out exploration mission. For the independent navigation system is a very major part of Mars. This article we studied the independent navigation for the long-range rover localization on Mars. At first, we built the fidelity LIDAR model, then we introduce a method that through coordinate transformation of the original terrain data, re-sampling and bilinear interpolation to build a uniform grid elevation map. When gridding nearest neighbor interpolation is used and features can be detected using morphological dilation. At last features detected from the global and local maps are matched based on the DARCES (Data-Aligned Rigidity-Constrained Exhaustive Search). Secondly, we have presented a stereo vision based motion estimation technique for Mars rover autonomous navigation. With these techniques, the Mars rover can estimate the position and atititude accurately, also can estimate the motion initially and obtain the maxis of the neighboring state of motion. Finally, initialized with pose estimates and knowing correspondences between orbital elevation and local features, the algorithm refines the rover'poses. Odometry and orientation measurements can be introduced into MOGA(Multi-frame Odometry-compensated Global Alignment) to further refine the alignment. Then the algorithm can be accurately and autonomously localized a Mars rover over long-range traverses.