SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 2 (2B)

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COMPARISON OF OPTICAL TERRAIN ABSOLUTE NAVIGATION TECHNIQUES FOR PINPOINT LUNAR LANDING

Abstract

Pin-point automated lunar landing is one of the big challenges that ESA has planned to achieve in the next years. It can only be achieved by developing precise Absolute Navigation systems, as vision-based terrain Relative Navigation sensors studied so far work typically in a relative frame without landing site recognition capabilities. Therefore, they will be initialized with a non-precise solution affected by previous cumulated divergence. Consequently, the possibility of reaching predetermined landing sites can be strongly affected. This is not the case in Absolute Navigation systems, where the system is able to estimate the position of the Lander given a database of some particular features. GMV and LAAS developed two different approaches that share interface and high level functionalities of the internal subsystem. In particular, GMV has developed a navigation technique based on the recognition of craters on the lunar landscape and LAAS has developed a navigation technique based on the recognition of geo-referenced landmarks. Both methods are able to provide absolute navigation solution when compared with previously on-board stored data. The paper describes both solutions emphasizing the commonalities and differences of the implemented techniques. The last section is dedicated to an extensive comparison of the Optical Terrain Absolute Navigation Techniques showing the performance at different altitude as well as the robustness to inputs and parameters errors. The study has been conducted in the frame of the ESA - ANTARES project with the purpose of bringing both techniques to Technology Readiness Level (TRL) 4.