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TRON TOOL: REPRESENTING A MOON LANDING SCENARIO IN TRON

Abstract

Over the years, the interest towards new Moon missions is growing in significant way. If Apollo program opened a new frontier in terms of space exploration, in future ever more countries will look at the Moon as scientific goal of new missions. JAXA, ISRO and ESA foresee manned missions over the next 15 years and several US missions are now under development. By the way, given the costs of these missions, it is of course of vital importance to be able to test extensively the technology that will be used during the real missions in a testbed as close as possible to the in-flight conditions. For this reason, DLR TRON (Testbed for Robotic Optical Navigation) represents a valid choice to prepare and test such a similar technology. The testbed, sizing approximately 13x3.5x4 m3, and consisting of a 400W 2DOF lamp mounted on a three-DOF gantry, a KUKA robot with 7 DOF able to move until to 2 m/s, and a dSPACE station for their control, is able to effectively simulate several mission scenarios, with a strong emphasis on the Moon scenarios. To do this, a dedicated Simulink library for the proper conversion of the moon landing trajectories has been developed, and a matlab-based tool has been created to automatize and make more intuitive the conversion process from a generic moon landing trajectory into its corresponding scaled TRON trajectory and the signal commands to be transmitted to the labs key elements. In this paper, a brief description of the hardware and its use will be provided, the Simulink library and its mathematical development for the trajectory conversion will be shown and the hardware commands derivation will be explained. Moreover, some results deriving from the preliminary results of simulations of lunar trajectories expressed in DCA and MCMF reference frames, in TRON laboratory coordinated, and finally the effective commands for the hardware will be illustrated.