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SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Space Transportation Solutions for Deep Space Missions (8-A5.4)

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AGENT-BASED MODELING AND EVALUATION OF MANNED LUNAR EXPLORATION MISSION

Abstract

The modeling and evaluation of manned lunar exploration mission will dramatically reduce the overall costs and achieve sustainable development of manned lunar exploration. In order to model the complexity and its underlying uncertainties, agent based modeling approach is employed to model and evaluate the overall mission. After analyzed the structure and function of agent, the research framework of manned lunar exploration system is presented. The rocket agent, lunar module descent stage agent, lunar module ascent stage agent, command module agent, service module agent and transfer vehicle agent are established using agent based modeling approach. The decision-making process of agent is described and the interactions among agents can autonomously evolve the process of manned lunar exploration mission. The performance calculation model of agent and comprehensive evaluation method are described. Three manned lunar exploration modes, direct lunar exploration based on lunar orbit rendezvous(LOR), lunar exploration based on earth orbit rendezvous (EOR) and lunar orbit rendezvous (LOR), lunar exploration based on Earth-Moon Lagrangian point L1 (EML1) rendezvous, are designed and analyzed. After designed the evaluation index of safety, reliability, economy, operability and extensibility, three mission modes are comprehensively evaluated using entire-array-polygon illustration method. The results show the effectiveness and feasibility of proposed method.