SPACE EXPLORATION SYMPOSIUM (A3)
Solar System Exploration (5)

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PSO BASED SIMULATION OPTIMIZATION FOR RANGE OF ENCELADUS EXPLORING

Abstract

EnEx-RANGE, Robust autonomous Acoustic Navigation in Glacial icE for Enceladus Exploring, is a future space mission of DLR, Deutsches Zentrum fuer Luft-und Raumfahrt, to explore the extraterrestrial life in solar system. Nonetheless,subglacial local conditions of Enceladus can hardly be explored in advance of the astrobiological mission. Therefore, the simulation of autonomous navigation process with the configuration optimization of acoustic pinger units for probe under ice may play a significant role in this mission. Simulation optimization with swarm intelligence can be a very effective and powerful tool to solve optimization problems arising in a wide variety of complex real systems, and its main goal is to determine optimal parameter values of systems that result in the best performance measures. In this paper, an acoustic navigation simulation system with the simulation model is proposed for the subglacial moving,communication and localing process of the exploring probe in various local conditions, such as the encounter of stones or a crevasse. Furthermore, a particle swarm optimization algorithm is developed for the configuration arrangement of acoustic sensors to understand more about the subglacial conditions which the exploring probe called IceMole may encounter in the subglacial environment of Enceladus. In addition, simulation experiments and results are presented to expound the significance and effectiveness of the proposed model and algorithm, which means this research offers an important assistance to the future interstellar exploration mission.