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RESEARCH ON AUTONOMOUS TASK SCHEDULING OF FORMATION FLYING SATELLITES FOR EARTH OBSERVATION

Abstract

This paper addresses the problem of autonomous task scheduling of formation flying satellites for Earth Observation. With the expansion of space task requirements and the development of space technology, small satellites formation has become a research hotspot in the field of aerospace. Formation satellites are widely used, and it is important to make use of specific formation configuration for earth observation. In order to improve the real-time performance of satellite formation's mission planning and improve the overall performance of formation satellites, it is necessary to study the autonomous mission planning of formation satellites on orbit. The satellite autonomous task scheduling arranges the task requests submitted by users by the various resource constraints. As satellite autonomous task scheduling needs to satisfy many complex constraints, including time window constraints, storage capacity constraints, energy constraints and so on, so it is a combinatorial optimization problem, which has NP-hard character. In this paper we build a single-objective and multi-constraints model of satellite autonomous task scheduling problem and design an improved genetic algorithm to optimize the algorithm from the various parts of the genetic operation. Firstly, the constraint model of autonomous mission planning of serial formation satellites is described. A multi-objective function for autonomous mission planning of serial formation satellites is designed. The mission planning model of serial formation satellites is build. An improved genetic algorithm is designed to solve the mission planning model. Secondly, we design simulation experiments for the above two mission planning algorithms to verify the effectiveness of the algorithms. The experimental results show that the improved genetic algorithm proposed is more effective and has a better convergence compared with the traditional algorithm.