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SPACE OPERATIONS SYMPOSIUM (B6)
Mission Operations, Validation, Simulation and Training (3)

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SHORT TERM PLANNING OF THE SPACE STATION OPERATION MISSION

Abstract

A space station operation mission is complicated because many submissions, such as logistics and maintenance, items supply, crew rotation, and on-orbit experiment and utilization, are involved in the space station's whole life time and have quite different characteristics. The planning of the space station operation mission is actually important and challenging, and can be divided into two levels: the long term planning and the short term planning. The short term planning determines the everyday activities of the space station in the scale of one month and the start and ending times of these activities, and is by its nature a constrained nonlinear scheduling problem. The purpose of this study is to build a short term planning model for the space station operation mission and then solve it using an intelligent algorithm. First, the space station operation mission is introduced, and the models of the basic factors involved in the short term planning are presented, including the activity, resource and constraint. Second, the short term planning model is built. The start times of activities are used as design variables, the objective function is composed by the number of submissions successfully scheduled and the mission priority, and the constraints from the requirements of the orbit, resource, power, thermal and astronaut are taken into account. Third, the short term planning flow is presented: (1) read submissions in a month; (2) arrange these submissions in different weeks and schedule initial start time of activities; (3) if there are conflicts, try to amend conflicts by moving, deleting or adding submissions; (4) if there are still conflicts, try to amend conflicts by moving, deleting or adding activities; (5) obtain the start and ending times of activities. The planning results consist of the Gantt chart and timeline of activities, the consumption of resources, the work schedule of astronauts, etc. Finally, a numerical problem is used to validate the presented short term planning model and the proposed solving approach.