

A New Approach to Autonomous Onboard Mission Replanning using Orthogonal Array Design

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Abstract—This paper proposes an algorithm of onboard mission replanning using the orthogonal array experiment design approach to solve the problem of repairing of the original mission plan without human operator interventions. The orthogonal array plays an important role to create a group of tentative plans more efficiently than heuristics that is commonly used in standard onboard planning applications. The key idea to implement the proposing mission replanning software is the expression of an operational plan by a “script”. Most spacecraft mission plans are defined as a sequence of system-built-in

commands, whereas this “script” contains not only the usual plans but also “logic” type commands. The logic type command is expressed in a form of a program fragment such as “IF A THEN DO B”. To make a further discussion on the proposing idea, this paper also shows a result of an experiment using an autonomous underwater vehicle. The onboard software is based on the proposing software architecture and the replanning algorithm to demonstrate its feasibility in an actual circumstance.

Keywords—onboard planning; orthogonal array design; self-update capability; script engine; onboard autonomy