

## DISCRETE EVENT SIMULATION OF AN ONBOARD ACTIVE SYSTEM OF GOAL-ORIENTED EFFICIENCY SUPPORT FOR A ROCKET

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The aim of this paper is to elaborate a discrete event approach to the development of a methodology for the design of an onboard active system of goal-oriented efficiency support (OASGOES) for a rocket. Materials and methods: OASGOES discrete event models. Results and discussion. A typical model problem is formulated concerning active support of rocket goal-oriented efficiency, which provides for the detection and localization of failures (unforeseen malfunctions) of rocket systems and assemblies. The OASGOES must: (1) detect and localize failures with a required accuracy and as early as possible (before the failures pose major problems for the rocket operation), (2) alter the algorithm of the rocket flight control system, i. e., adapt the algorithm to the rocket operation under failure conditions so that the flight control system may continue to accomplish the control objectives and, as far as possible, provide optimal control, and (3) implement supervisory control by generating an optimal sequence of active control actions that restrict the behavior of the rocket and thus continuously keep it within the admissible state region. The paper discusses possibilities of OASGOES design with the use of discrete event simulation (DES) algorithms, which rely on the notions of observability, diagnosability, and supervisory control in discrete event systems. The proposed approach is illustrated by solving, with the use of methods of the algebraic dioid theory, the model problem of organization of a cyclic inspection of two rocket assemblies taking into account the required synchronous operation of the relevant blocks of the structural health monitoring system. Conclusions. It is expedient to use the discrete event approach in the development of a methodology for OASGOES design. The DES basic advantage is freedom from a detail simulation of the system under consideration.

**Keywords:** *active control system, algebraic dioid theory, failure detection and localization, discrete event simulation, diagnosability, rocket, goal-oriented efficiency support, supervisory control.*

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