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RESEARCH ON DIGITAL MODELING AND VERIFICATION OF SPACECRAFT BASED ON MBSE

Abstract

Abstract Spacecraft is a typical complex system, due to the technical complexity, involving a wide range and high precision. As an important part in the development of spacecraft, integration testing can not be fully verified due to the limitations of physical testing. In addition, when establish the simulation of spacecraft modeling, the project is huge, the management is complex. In order to ensure that the model is a true simulation of spacecraft behavior, how to validate the model is essential to establish a simulation model. Based on this problems, this paper involves the digital modeling method and theory of spacecraft based on universal simulation platform are studied, and the model management and integration of spacecraft based on unified data source are supported. The simulation capability of digital model is analyzed and validated. Theory and method to detect and verify the effectiveness of spacecraft modeling. Based on the data model and the process model, the static structure and dynamic behavior of the tested system are described by object-oriented modeling method. The state transition sequence is used to characterize the overall design of the spacecraft system level behavior. So as to lay a formal model foundation for digital modeling and verification of spacecraft based on virtual test. Establish the Static Structure of Spacecraft System by UML shown in Fig1.

Fig.1 Static Structure of Spacecraft The up-window tree model and the down-window tree model of spacecraft information flow are respectively established by window tree model, as shown in Fig2 and Fig.3.

Fig.2 The up-window tree model of spacecraft information flow

Fig.3 The down-window tree model of spacecraft information flow Based on the above-mentioned digital model of spacecraft, the model detection theory can be applied effectively to support the validation and testing of system-level behavior of spacecraft. To this end, the use of model-based automatic detection mechanism has become a key means. Specific authentication mechanism shown in Figure 4.

Fig.4 The model-based automatic detection mechanism Key words Spacecraft Virtual test Digital model Simulation and verification MBSE