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AUTOMATED MODEL-DRIVEN OPERATION APPROACH USING OPEN-SOURCE SCRIPT

Abstract

Efficient verification and operation methods are required for the assembly inspection, launch, and flight operations of space systems. The traditional manual operation method has system inefficiency problem because the required resources such as operators, costs and time increase. To optimize efficiency, an automation method using a procedural language kernel and space system model was proposed. Representative examples are the ECSS-E-ST-70-31 and 32, and there are several other examples such as OMG Satellite Operation Language Meta-model and the Command Interface Language. Because this method requires the use of a specific procedural language kernel and model, it is generally difficult to utilize due to issues such as license and security policy. In this paper, we would like to propose an automation method that can be approached more universally using open-source script and model techniques. The script method has the advantage of not requiring compilation and having a relatively simple syntax, and the MIT License distribution. The model technique has the advantage of detecting design problems and easily responding to changes in requirements, and re-usability. In this paper, the space system model is defined by dividing it into high-level declarations and low-level implementation parts, and the interface is managed in XML format. The declarations and implementation scripts are defined as a mapping structure. The implementation part contains actual execution statements using script syntax. The main software structure for the proposed method consists of a model scenario editor and a scenario control processor. The model scenario editor defines the model in XML format and uses the declaration part to perform the function of scenario editing, and distributes them to the scenario processor. The scenario processor loads the deployed scenario and model files, and proceeds with the scenario on its own. It controls the scenario flow and generates commands according to the predefined conditions. The declaration part of the generated automatic command is mapped to the implementation part and executed as an executable statement. The proposed method enables automated operation by generalizing a specified procedural language kernel and model based on open-source architecture. By using the proposed method in the assembly inspection and launch operation of the Nuri launch vehicle, the human and material resources of the ground control system were able to be optimized and efficient. In this paper, we will describe the software architecture of the automated operation method using open-source scripts and modeling techniques, and the results of the Nuri launch operation.