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Author: Ms. An Lili
CASC, China

Dr. Niu Heming
CASC, China

# RESEARCH ON CONSTRUCTION AND VALIDATION OF TEST MODELS FOR ON-BOARD EMBEDDED SOFTWARE BASED ON MBSE

**Abstract**

As Model-Based Systems Engineering (MBSE) has matured and become more refined, the integrated development environment guided by MBSE, which encompasses requirements analysis, model construction, simulation, testing, and code generation, has been widely adopted across various industries. Within the aerospace sector, most research institutes and scientific organizations have transitioned from traditional software development methods to those based on MBSE, significantly enhancing project development efficiency. However, the research on "Construction and Validation of a Test Model for On-Board Embedded Software Based on MBSE" is still in its early stages, Current studies primarily focus on the application of MBSE methods but face significant challenges in developing specific test models. The absence of mature tools and comprehensive validation frameworks further hinders progress. The challenge lies in enabling testers to swiftly extract test points from models designed by designers, automatically generate test cases and scripts, while achieving high-quality and efficient test execution—a task that remains a focal point of research. This study begins with an analysis of the time constraints and resource limitations inherent to on-board embedded software, By integrating insights from MBSE-based automated test case generation research, we propose a methodology for constructing a testing model based on MBSE principles. This approach allows for rapid extraction of test points from existing models and facilitates automatic test case generation. Furthermore, utilizing SysML (Systems Modeling Language), we develop an MBSE-based testing model tailored for on-board embedded software. Finally, the model's efficacy is validated through simulation using publicly available datasets. The findings and methodologies presented in this paper aim to provide valuable references for optimizing and automating testing processes within the realm of model-based embedded software development.

KeyWords: MBSE; Embedded Software; Testing Model