

# Viewpoint-based Test Analysis For On-board Dependable Flight Software

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**Abstract**—As one of the JAXA's software independent verification and validation(IV&V) activities, test analysis has been done for dependable flight softwares. The aim of it is to establish the methodology to identify "what to test" efficiently. The analysis is based on "Viewpoint of Testing" which means various aspects or conditions to be tested. This paper introduces our experience in viewpoint-based test analysis of some dependable flight softwares and discuss the results.

## I. OBJECTIVES OR GOALS OF THE WORK

The purpose of this activity is to establish the methodology to identify "what to test" efficiently for spacecraft on-board software. To identify "what to test" is very important because the chance of revealing software faults depends on it.

Because of this background, we introduce the concept of "Viewpoint of Testing", which involves various aspects or conditions to be tested; these aspects and conditions include quality characteristics, software functions, input data, hardware characteristics, environmental condition, etc.

In this work, we analyzed two flight software applications and a real-time operating system.

We analyzed them based on the concept of Viewpoint of Testing, identified "what to test", and organized them as Test Viewpoint Models. The model have been used for evaluating existing test cases. Through this activity, we learn the point of test analysis for spacecraft on-board software and make model which includes there points.

## II. DESCRIPTION OF THE RESEARCH, ENGINEERING, OR OPERATIONS APPROACH

The test analyze consists of three steps.

(1) Analyze and model design informations which include requirement, function, behavior, structure of system and software, and identify cause-effect relationship between them.

(2) Identify Viewpoint of Testing from the result of (1), and organize them as a Test Viewpoint Model using NGT.

After these steps, we evaluated existing test cases by comparing them and our models.

## III. RESULTS

As a result of this activity, we organized Test Viewpoint Models for three softwares. The models are based on their characteristics. Some domain-specific Viewpoint of Testing for flight softwares have been identified. The sample model of the real-time operating system(RTOS) is shown as follows. The model can be reused to make Test Viewpoint Model of another RTOS.

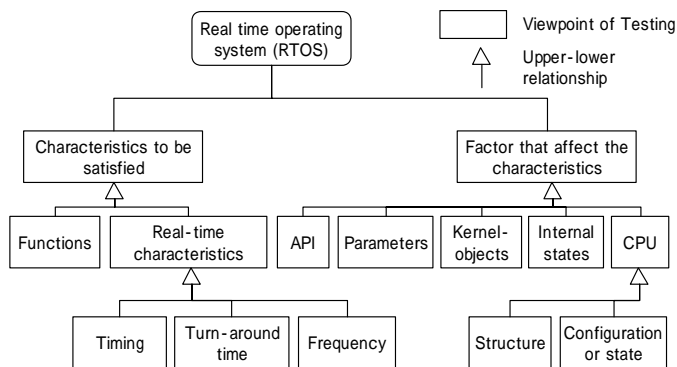


Fig.1 Test Viewpoint Model for real-time operating system.

## IV. DISCUSS THE IMPACT / BENEFITS FOR SPACE SYSTEMS

Through the activity, the method of test analysis have been established for flight software. The method and Viewpoints enables us to design testing and its evaluation systematically. For example, sufficiency of test cases or veridity of verification subjects for flight software have been evaluated in IV&V. Our method provide the way to evaluate sufficiency of test cases or validity of verification items using Test Viewpoint Model systematically.

## REFERENCES

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