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RECONFIGURABLE SOFTWARE DESIGN OF MODEL-BASED LAUNCH VEHICLE SIMULATOR FOR GROUND CONTROL SYSTEM

Abstract

With the advent of the new space era, various launch vehicles are being developed and are expected to be launched through various launch pads. In order to launch operation, launch vehicle must be designed to meet the interface specifications of Ground Control System under launch pad, and it is necessary to verify whether it can be operated in environments such as launch preparation and launch campaign before launch operation. In reality, it is difficult to transport a launch vehicle to launch pad for launch vehicle interface verification. Therefore, it is verified based on a simulator instead of a launch vehicle.

Launch vehicle simulator is configured with logic model software that simulates on-board computers inside launch vehicle and hardware that input/output of launch vehicle. However, launch vehicle technology have been developed by each country as a national security technology. In general, it was developed with a focus on the stability of launch operations rather than extensibility for various launch vehicles. Especially in terms of software, there are many difficulties with current simulators in adapting to different launch vehicles, Representative problems include the following:

1. Reconfigurability and extensibility are limited due to the fixed design of the target launch vehicle - Unable to reconfigure to different launch vehicles due to fixed logic models software/IO hardware of launch vehicle.
2. Dependent software design with mixed control functions - It doesn't provide independent modification of functions by the user.
3. Limited user access interface environment – It provides a limited access environment due to interface control code and compiler.

In other words, it's difficult to adapt to other launch vehicle due to fixed software design focusing on stability at the time of development. Accordingly, it is expected that a lot of money and time will be required due to new software development for each launch operation of a new launch vehicle.

Therefore, this paper proposed Reconfigurable software design of model-based launch vehicle simulator for ground control system. This paper includes the following contents:

1. Reconfigurable / Expandable model-based software system design
2. Independent software design with segmented control interface and logic models
3. Attachable user interface environment design

Through the above designs, launch vehicle simulator is designed as a reconfigurable model-based system, and describes a reusable software design for other launch vehicles.