

Application of Requirements Analysis Methodology and Automatic Code Generation Using SysML and L&L with Assurance

Michihide Nitta¹, Hiroki Umeda², Masafumi Katahira³

¹Japan Aerospace Exploration Agency, Tsukuba, Ibaraki, Japan, nitta.michihide@jaxa.jp

²Japan Aerospace Exploration Agency, Tsukuba, Ibaraki, Japan, umeda.hiroki@jaxa.jp

³Japan Aerospace Exploration Agency, Tsukuba, Ibaraki, Japan, katahira.masafumi@jaxa.jp

In order to elicit software requirements without missing requirements of critical functions, it is important to clarify constraints at the system level.

The constraints from the perspective of stakeholder needs and the interaction between the external system and the external environment can easily be missed at the system level. In particular, when defining interfaces and allocating requirement specifications, the lack of time and space constraints increases.

A combination of operational aspects and physical constraints must be considered in cases where multiple controllers exist. Specifically, consideration is given to which controller is main in the same phase and how the controller switching conditions for each phase are designed when there are physical constraints. Constraints in the off-nominal state of the space system exist longitudinally from the upper layer to the lower layer of the architecture. Therefore the constraints are likely to be missed for software requirements.

We focus on constraints because there has a risk of satellite loss due to the lack of consideration of constraints such as the external environment.

To address the above issues, we will present two examples of how we have extended SysML through our previous activities.

When requirements are correctly identified and modeled, auto-code generation can be introduced from the requirements to the design and coding processes. JAXA has developed auto-code generation processes in JAXA software development standard to be applied to development work in actual projects which have already introduced them. An overview of this process is also presented here.