SPACE SYSTEMS SYMPOSIUM (D1)
System Engineering - Methods, Processes and Tools (2) (6)

Author: Mr. Bálint Sódor
Hungarian Academy of Sciences, the Wigner Research Centre for Physics (Wigner RCP), Hungary, sodor.balint@wigner.mta.hu

Mr. Gabor Troznai
Wigner Research Centre for Physics, Hungarian Academy of Sciences, Hungary, troznai.gabor@wigner.mta.hu
Mr. Andras Balazs
SGF Ltd, Hungary, balazsa@rmki.kfki.hu
Dr. Sandor Szalai
SGF Ltd, Hungary, szalai@sgf.hu

MODEL-BASED APPROACH TO VERIFY THE BEHAVIOUR OF A DISTRIBUTED AUTONOMOUS ON-BOARD SYSTEM

Abstract

Applying formalized behavioural models for interface level simulation of distributed and autonomous aerospace systems during the whole development life-cycle may play a key role in increasing robustness and decreasing costs. In system engineering and development the cost of correcting failures is increasing heavily as the development progress. Modelling and simulation are essential tools for unfolding either design or implementation failures in the early phase of the development even when the components of the on-board system are not available. Utilizing formal methods in modelling and simulation provides mathematically based techniques for the specification, development and verification of on-board systems. Especially in large scale space missions the on-board data handling and processing logic is often implemented by a number of autonomous embedded modules. In general these on-board modules are developed and implemented in parallel by a number of different teams. To reduce development cost and increase the robustness of the whole on-board system the behaviour of it should be evaluated long before the integration phase of the system development. In later phases the formalized models of the system modules serves as a basis of hardware-in-the-loop simulation for validation and verification. In the Hungarian Academy of Sciences, the Wigner Research Centre for Physics (Wigner RCP – earlier KFKI-RMKI) and the Space and Ground Facilities Ltd. we have spent decades developing – along many other on-board systems – Electrical Ground Support Equipments (EGSEs) simulating on-board electrical interfaces for different space missions. For the European Space Agency's (ESA) Rosetta mission we have implemented the simulator of the Philae lander's on-board system (called Lander Software Simulator - LSS). This simulator uses a dedicated modelling framework and a special hardware module to perform signal level simulation of the on-board equipments. This paper presents our work on elaborating formalized models for interface level behavioural simulation of on-board modules in aerospace systems. A case study on the elaborated modelling and simulation tools is presented within the LSS.