

SPACE SYSTEMS SYMPOSIUM (D1)
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Author: Mr. Bálint Sódor

KFKI Research Institute for Particle and Nuclear Physics, 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. Attila Baksa

KFKI Research Institute for Particle and Nuclear Physics, Hungary, (*email is not specified*)

Mr. Andras Balazs

SGF Ltd, Hungary, balazsa@rmki.kfki.hu

Dr. Sandor Szalai

SGF Ltd, Hungary, szalai@sgf.hu

NEW APPROACH TO MODELLING SPACECRAFT MODULES

Abstract

The Lander Software Simulator (LSS) was created for ground simulation of the Rosetta Lander (Philae). The Lander consists of 15 units, subsystems and scientific experiment modules. The main goal of the software simulation is to examine the behaviour of the lander especially in non-nominal states where the ground reference model can not be used, because serious damage can be done on the hardware. During the design time of LSS the most important aspect was the high level of flexibility. Using the realized solutions it is possible to implement simulation of other complex systems. The LSS system consists of five personal computers and eight Real-Time Message Handler embedded processor cards. The simulation of the on-board modules is realized using Extensible Markup Language (XML) syntax based simulation modelling language. Albeit the modelling language was designed to meet the expectations such as human readability and easy editable, the complexity of the field requires a higher level modelling language. The high level modelling language has to aid the description of models and parameters in a graphical interface using diagrams. Although the Unified Modelling Language (UML) has a powerful model description capability and can be useful at the first sight, the contradictions in the semantic definitions of the UML diagrams effects that it is better idea to find another way for the modelling of special, high-reliable, mission critical systems. The other way is to use Domain Specific Modelling Language (DSML). The design of a DSML based modelling language means the description of the metamodel of the models. The metamodel is defining the syntactic and semantic properties of the model. It defines the entities and elements which can be used in the model. The relation between the metamodel and model is analogue to the well known class-object relationship from the field of object oriented programming. The implementation of the metamodel based upon the Eclipse Modelling Framework while the implementation of the graphical modelling software based upon Eclipse Graphical Modelling Framework. This paper describes the implementation process of a DSML language used for modelling high-reliable spacecraft-units and subsystems for the purpose of software simulation. The paper will cover the main questions and decisions revealed in the implementation of the DSML. The benefits and drawbacks of the new approach will also be discussed.