SYSTEMA: An Open Framework for Engineering Applications

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Space system design requires more and more use of engineering tools in order to support the trade-off between different configurations and to evaluate the performances of the system. In order to support this crucial need, ASTRIUM has developed for more than 20 years an engineering tools family called SYSTEMA. This tools suite gathers in the same environment several engineering applications covering most of the disciplines involved in the spacecraft design. It also provides flexibility to use third party tools by using and promoting standardized interfaces.

SYSTEMA relies on two key concepts:
„« An open and evolutionary framework adapted to support the needs from the early design to the detailed design phases. This framework has been designed to allow plug-and-play integration of engineering applications. All the parameters related to the description of the applications (run parameters, analysis properties, description of the computation modules) are described through XML files.
„« Standardisation of the input/output data in order to allow easy exchange of models between disciplines. It involves the spacecraft geometry, the trajectory definition, kinematics, mission scenario description, and results of analysis. This approach optimises the engineering analysis process and support a concurrent engineering approach. In order to fulfil these objectives, the SYSTEMA framework is widely interfaced towards the other tools involved in the space engineering: like STEP AP203 format for CAD or STEP-TAS for thermal analysis.
SYSTEMA relies on a common framework gathering in a highly interactive graphical user interface the common basic blocks of SYSTEMA:
„« An interactive modeller interfaced with the CAD models. It allows the user to build the spacecraft model from the CAD and to define its characteristics (material, surface properties¡K).
„« A module to define the spacecraft trajectory. It handles simple keplerian orbits or complex trajectories around any planets of the solar system.
„« A module to describe the spacecraft kinematics. The approach based on a tree of moving bodies allows a generic description of the spacecraft kinematics.
„« A module to define the mission scenario of the analysis, in particular to organise the sequences of kinematics and spacecraft modes along a timeline.
„« A module to specify the analysis to be performed in terms of computation modules chaining, run parameters definition.

All these modules are designed in order to offer a high level of user interaction and up-to-date animation performances.

This approach has been successfully implemented with the development of THERMICA V4 for thermal analysis, SYSTEMA / Dosrad V4 for radiation analysis and SYSTEMA light for early design phase¡¦s analysis. The developments will be carried on with the integration of new applications and with the developments of basic blocks like a schematic editor to support functional analysis like power or propulsion performances.