SPACE SYSTEMS SYMPOSIUM (D1)
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MODEL ORGANIZATION: AN EFFECTIVE TECHNIQUE IN MODEL DRIVEN DEVELOPMENT OF ON-BOARD SOFTWARE FOR SPACECRAFT BUS MANAGEMENT UNIT

Abstract

Model driven software development has been quite popular in the recent years for commercial projects. However, the application of this methodology for safety critical embedded systems has been limited. This paper presents a methodology of model organization as an effective technique for modeling large complex embedded systems like the Spacecraft Bus Management Unit (BMU) On-board Software under the model driven approach. The BMU software of a spacecraft mainly consists of Attitude and Orbit Control System (AOCS) performing the major task of controlling spacecraft, which is aided by the Telecommand (TC), Telemetry (TM), Various Sensor and Actuator Systems. Additionally, it also includes the Thermal Control, Payload Control, and Data transfer from sensor to actuators using a standard communication bus like MIL-STD-1553B in a single framework. The paper presents the methodology that is applied to reduce complexity and simplify communication of information between teams, model based requirement management, tackling complexity of design and implementation, traceability of information for practical spacecraft system using Unified Modeling Language (UML) and Case tools. The paper contributes by showing how the approach can be used to tackle such a large complex system development with increased quality and with reduced time with suitable examples and cases of on-going satellite projects. Implementation and flight results are also presented to show the usefulness and applicability of the proposed approach for such large complex system.