

## ***A model based approach to SW quality metrics : an AOCS SW experience***

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### **Abstract**

Model-based development is a development methodology by which more and more suppliers and manufacturers are responding to increased and fast demands on the software development. The model-based model representation of the requirements or the design of a system has a lot of advantages. It is possible to directly derive several useful information from the modeled system automatically. This paper presents an experience of application / tailoring of a SW Quality Model fitting with the peculiarities of the automatic code generation with the support of the existing reference guidelines and a Simulink auto coding didactic experience.

### **Introduction**

In space industry according to ECSS-E-ST-40 the trend in software (and system) engineering is to move from a document centric development towards a model centric development. The Software engineering must include the same concepts (specification, design, implementation, testing) but the interpretation of the Standards must evolve with the appearance of models. Which is the approach on Software quality Standards? In ECSS-Q-ST-80 there is a dedicated section for the automatic code generation, in particular the clause 6.3.4 highlights the importance of the verification of the coding standards through the application of specific software quality objectives . Currently the characteristics used to specify the quality models (basis for the identification of process metrics) are the same both for classic code development and automatic code development. This point raises important questions. Are all these classic metrics suitable for assessing also the quality of the automatically generated code quality? Which are of the existing classic code metrics that can do already cope with such quality evaluation? Can we evaluate the automatic code generated quality? Is it necessary to define new quality properties that ensure the expected quality of the generated code? Is it necessary to define some models quality metrics that combined with the code metrics for the quality evaluation? The goal is identify a tailoring of a metrication program following the steps described in ECSS-Q-HB-80-04.The research methodology is based on the support provided by TASI AOCS team and their previous experiences, the reference guidelines and a SIMULINK auto coding didactic experience.

### **SIMULINK AUTOCODING didactic experience**

For the auto coding process and the metric calculation we used a didactic and free online Simulink model.

The auto coding process can be applied to a single subsystem or to the whole system.

Which are the output of the model necessary for the SWPA metric calculation?

Using Matlab-tools we easily generated the following reports that can be directly shared between different teams.

1.Coverage report

2.Model Architecture in a readable format

3.Requirements report

4.Model metric and complexity report

5.Auto generated code: to evaluate code metrics and traceability metrics

All of them are applicable to the entire system or subsystem in order to evaluate their qualities.

### **Software quality models and metrication program**

The identified metrics are product level ones related to the model and applicable mainly during SW requirements and architecture engineering, SW design and implementation engineering processes. A set of Auto code coverage metrics have also been identified .An important aspect has to be considered for comparing model metrics relevant to complexity and code since we deem it could be necessary to identify two different thresholds.

### **Conclusions and future improvements**

This paper intends to be a starting point on common metrication program in order to evaluate SW auto generated code quality and a little step forward for standards evolution. As specified in ECSS-ST- 40: the trend in SW ENG is to move from a document centric development towards a model centric development and the interpretation of the standards has to evolve with the appearance of the model. A well-defined and thoughtful approach to Software Quality Assurance is necessary to allow auto coding to become a trusted solution. There are a lot of open points about this topic who require a very focused area of study.