

Conceptual Modeling and Simulation of Autonomous Ground Systems

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Abstract

A modeling and simulating methodology for autonomous systems is in great demand. We present a project aimed at demonstrating modeling and simulating of a ground autonomous system conceptual design. Object Process Methodology (OPM) and its supporting software OPCAT provide a platform to be connected with existing software tools such as Simulink and vivid simulation applications.

The demonstration case study is TALOS, an EU 7th Framework Program project, whose objective is to develop and field-test a mobile, modular, scalable, autonomous and adaptive border protection system. A simulated conceptual model of the autonomous system is of critical value, as it enables understanding and validating the complex relationships between the needs and the designed autonomous system solution. Moreover, the large number of stakeholders involved in projects of this nature and its inherent multidisciplinary nature call for a common language as means for improving communication and mutual understanding of the system-to-be. OPM is most suitable for this task due to its formal, yet intuitive, single-diagram type graphic representation and its auto-generated textual counterpart. Using OPCAT, the entire modeling process is performed hierarchically top-down using the same methodology and language. At each stage, validation of the model can be performed using the built in animated simulation. We are in the process of (1) developing a vivid animation module that is driven by the conceptual simulation and (2) connecting the OPM conceptual model to a quantitative simulation module, Simulink, for achieving a computational capability that will be integrated into the conceptual model.