

Model-Based Systems Engineering to Design An Onboard Surround Vision System for Cooperative Automated Vehicles

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Abstract—Cooperative automated vehicles have various electronic control units with multiple sensors running complex software algorithms to perceive and navigate their environment. Hence, there is a need to use advanced software engineering design methodology to reduce the software complexity and increase modularity. In this paper, we applied the SysCARS model-based systems engineering methodology to design an onboard surround vision system with a SysML modeling language using the IBM Rational Rhapsody modeling tool. The modeling methodology is described through various phases and steps with a modeling language to overcome the challenges. The modeling tool takes the information from the design model of the system and generates a skeletal code. The algorithm is written for each generated skeletal code, compiled with a C++ compiler on the host Desktop PC (Ubuntu 16.04 LTS), and deployed on the target Nvidia Drive PX2 embedded hardware platform. The designed solution fulfills the requirements of the onboard surround vision system.

Index Terms—Cooperative automated vehicle, deep neural networks, model-based systems engineering, surround vision system, system modeling language, unified modeling language.