Virtual Platforms and Model-based Design for Early Analyses of Extra-functional Properties in Mixed Criticality Systems

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Figure 1: Quadro-copter

The demo shows the usage of virtual platforms and model-based design to perform early analyses of extra-functional properties in a mixed-critical scenario. The application shown is a quadro-copter equipped with a camera system (Figure 1). The copter's flight controller is safety critical; the video processing is less critical. Both parts of the system are implemented in a single chip, a Xilinx ZNQ SoC. The video processing is implemented in the ARM dual-core, the flight controller is realized in the FPGA part and based on two MicroBlaze cores. This platform has been modelled as an OVP-based virtual platform, which is extended by more fine-grained timing models as well as power models. Furthermore, a model of the quadro-copter physics and environment realized in iXtronics CamelView. The visualization view of the model is shown in Figure 2 together with a console window showing the log output of the virtual platform.
This setup allows running the real binary of the quad-copter software in a fully virtual system simulating realistic scenarios. In addition, to pure functional simulations the extensions to the virtual platform allow analysing the timing, power, and temperature behaviour of the system (Figure 3). Beyond the behaviour of the individual parts, we are able to analyse the interference between the high- and low-critical parts with respect to these properties as well as the effects of power/temperature management techniques.

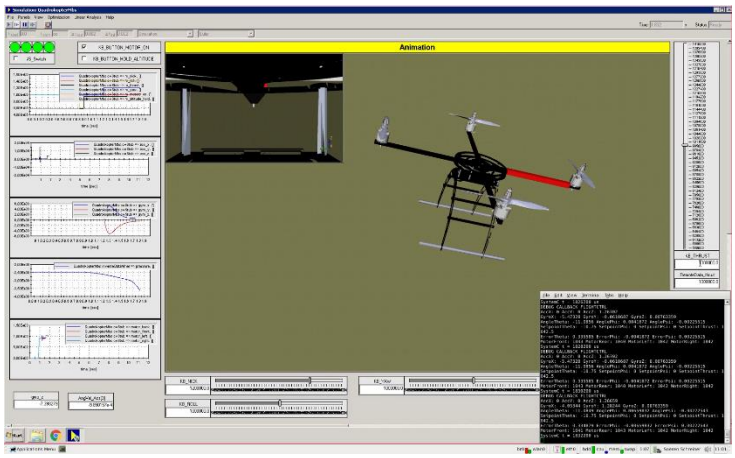

Figure 2: CAMeL-View/OVP co-simulation

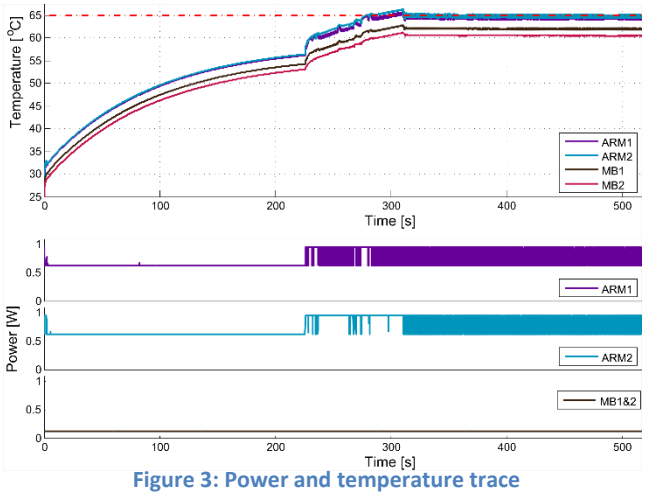

Figure 3: Power and temperature trace