

Model-based Approach for Systems Control Design

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Abstract

This talk will provide a model-based approach for control systems design and show some examples. Model-based systems engineering approach is very suitable for control systems design and I will talk about how this approach is applied using SysML (Systems Modeling Language). First, we need to analyze a system of interest and clarify the issue of the system. In this process, from an operational view we can capture the use case scenario of the system. Also if necessary, a control-related solution and the suitable dynamical model should be derived. Normally, orders of the model should be reduced to easily design a control system in consideration with the implementation of the control system. On system level consideration, the control system designed is verified in a nominal case and validated in some off-nominal cases to ensure the robustness of the control system.

In this talk, some examples of “Rider Assist Control to Stabilize A Motorcycle”, “Protective Control for Occupant’s Lower Legs”, and “Operator Assist Control for Tower Cranes” will be showed. The dynamical modeling method of the multi body dynamics was applied to model a motorcycle, and modal analysis and frequency response analysis of the model derived were performed. Also, in this case, the model-based approach using SysML was applied from the high system level. Based on the use case scenario considered in the operational view, the control system designed was validated with a rider operation model to simulate the rider’s action in the unexpected disturbance.