

**Thesis Topic**

## Cyber-Physical Simulation Platform

**Motivation**

Cyber-Physical Systems (CPS) are integrations of computation, networking, and physical processes. Simulating complex and heterogeneous cyber-physical systems bears several needs for integrating models that originates from different sources and for different purposes: models of the physical components and models of the communication and control infrastructure. Physical subsystem modeling deals with the characteristics of real world objects (e.g., power grids), which are specified through specific modeling languages. On the other hand, cyber subsystem modeling deals with the characteristics of the computational infrastructure. In communication and computer network research, this is usually realized through network simulation.

CYPHEF framework provides: (i) a Domain Specific Environment (DSE) for specifying a desired control architecture by means of a catalog of ready to use decentralized control patterns to realize self-adaptation in CPS and, (ii) a Cyber-Physical Simulation Platform for simulating the designed self-adaptive CPS as a whole, and producing simulation results.

**Tasks**

The Cyber-Physical Simulation Platform allows for co-simulating the Physical Model and the Cyber Model. The idea of Co-Simulation is to simultaneously execute different models, allowing information to be shared among them.

Currently our platform allows for the co-simulation of a single physical model and a single cyber model. The idea is to improve the platform by allowing for the co-simulation of multiple entities, each one defined as a cyber-physical entity and characterized by its own cyber and physical model. Such modularization would greatly improve the architecture our framework and, thanks to this extension, it would be possible to plug different components at run-time during the simulation.

[See <http://ieeexplore.ieee.org/document/8064089/> ]

**Prerequisites \***

- Excellent skill in Java, Active problem-solving attitude, Interest in working in contact with the research group and the ability to solve complex tasks

**Time frame**

**Supervisor(s)**

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\* All the course codes, like e.g. 1DV101, refer to courses here at DFM. Similar documented experience from other places will do just as well.