

Integration of Modelica models into an existing simulation software using FMI for Co-Simulation

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The Functional Mock-up Interface (FMI) opens new opportunities for the development and extension of existing non-Modelica simulation programs with Modelica models. For the developer, this is a productive way to design and validate new complex simulation models with multi-domain modeling languages such as Modelica [1]. With the standardized Functional Mock-up Interface and the Functional Mock-up Unit (FMU) export it is possible to execute these models within other software tools, including information exchange during the simulation. However, there are some design requirements in Modelica, which have to be taken into account. In this paper, models for different HVAC (Heating, Ventilation and Air Conditioning) equipment configurations are integrated into existing software using the FMI. An interface extension plug-in is developed to pick a specific FMU. The existing software [2] calculates the hygrothermal behavior of buildings iteratively. Two different coupling algorithms are investigated: an iterative and a co-simulation approach. The iterative approach requires the option to reject and repeat time steps of the FMU. This option is not supported by the simulation environment, which was used to export the FMU [3]. Therefore, the iterative approach is not feasible for the described application. In the co-simulation approach the FMU is executed alongside the existing simulation process. Hence, the building model and the HVAC model calculate the steps alternately with a *ping-pong* method. However, this requires a decreased time step size compared to the time step size of the existing software program.

The existing whole building simulation software and the Modelica HVAC models are complex models with many variables and their own specialized solvers. Separately they are proven, validated and stable for many kinds of simulations. The described co-simulation approach seems to be a reasonable way to integrate Modelica models into the existing simulation software.

References

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