Modelica Code Generation with Polymorphic Arrays and Records Used in Wind Turbine Modeling

Roland Samlaus[1]   Peter Fritzson[2]   Adam Zuga[1]
Michael Strobel[1]   Claudio Hillmann[1]
Fraunhofer Institute for Wind Energy and Energy System Technology IWES[1]
Linköpings universitet, Dept. of Computer and Information Science[2]

At Fraunhofer Institute for Wind Energy and Energy System Technology IWES a simulation software for offshore wind farms is being developed, concentrating on the ability to define physical models at different levels of detail. Therefore parameterizable models representing parts of wind turbines are defined that can be transformed for various purposes like simulation with Finite Element Method (FEM) tools or Modelica solvers.

This paper describes the concepts of purely parametric physical models and code generation. It is elucidated how models of different complexity can be transformed into each other by model driven development techniques. Thereby the focus is set on the generation of Modelica code and it is explained how the use of Modelica libraries simplifies the generation of simulatable code.

During the development of generators for Modelica, issues arose regarding type compatibility of arrays with different sizes when using polymorphism. These issues are explained by an example and possible enhancements for the Modelica language are suggested.

Keywords: model transformation; polymorphism; code generation; wind turbine modeling