

State Machines in Modelica

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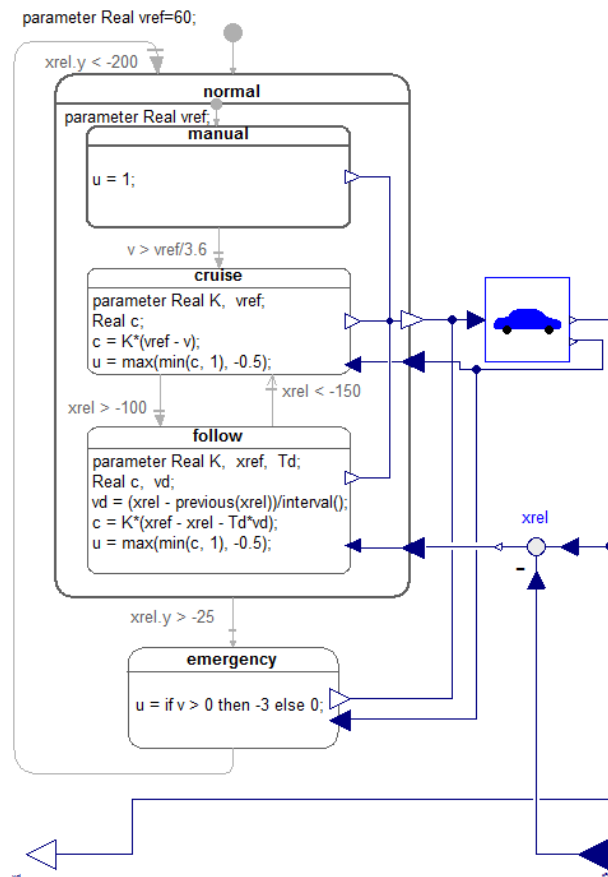
The scope of Modelica [2] has been extended from a language primarily intended for physical systems modeling to modeling of complete systems by allowing the modeling of control systems including state machines and enabling automatic code generation for embedded systems.

This paper presents state machines in Modelica. A companion paper [1] describes the fundamental synchronous language primitives introduced for increased correctness of control systems implementation since many more checks can be done at compile time.

The paper describes language elements to define state machines. Any block without continuous-time equations or algorithms can be a state of a state machine. Transitions between such blocks are represented by a new kind of connections associated with transition conditions.

The semantics of the state machines in Modelica is inspired by mode automata and basically the same as Lucid Sychrone 3.0 [3].

The paper gives the details for building state machines and includes several examples, such as a simple adaptive cruise controller shown to the right. In addition, the complete semantics is described using only 13 Modelica equations.



References

- [1] Elmqvist H., Otter M., and Mattsson S.E. (2012): **Fundamentals of Synchronous Control in Modelica**. Proceedings of 9th International Modelica Conference, Munich, Germany, September 3-5.
- [2] Modelica Association (2012): **Modelica Language Specification Version 3.3**. <https://www.modelica.org/documents/ModelicaSpec33.pdf>.
- [3] Pouzet M. (2006): **Lucid Sychrone, Version 3.0, Tutorial and Reference Manual**. <http://www.di.ens.fr/~pouzet/lucid-sychrone/>