PNlib - An Advanced Petri Net Library for Hybrid Process Modeling

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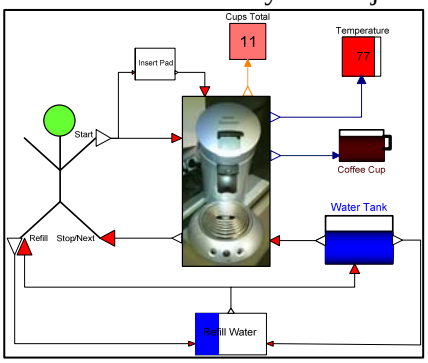
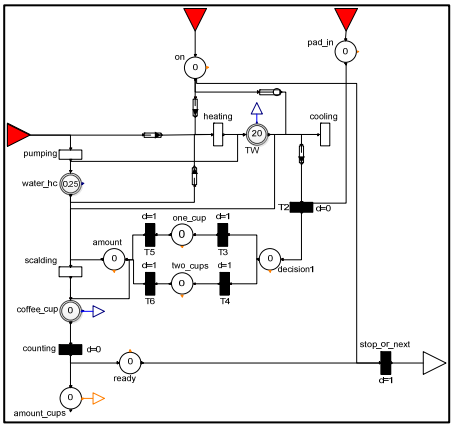
We present a new Petri net library, called PNlib, to enable graphical hierarchical modeling, hybrid simulation, and animation of processes in life sciences, technical applications, among others. In order to model these most different processes, a new powerful and universally usable mathematical modeling concept – xHPN (extended Hybrid Petri Net) – has been established. This specification is used for the PNlib realized by the object-oriented modeling language Modelica.



The xHPN modeling concept provides an intuitive and generally comprehensible way to represent and communicate processes in nearly all degrees of abstraction and it is easy to understand for researchers from different disciplines. It supports the qualitative modeling approach as well as the quantitative one. Furthermore, the processes can be modeled discretely as well as continuously and, in addition, discrete and continuous processes can also be combined within a hybrid Petri net model [1]. Furthermore, Petri nets allow hierarchical structuring of models and, therefore, offer the possibility of different detailed views for every observer of the model.



The PNlib is an ideal all-round-tool for modeling and simulation of nearly all kinds of processes, such as business processes, production processes, logistic processes, work flows, traffic flows, data flows, multi-processor systems, communication protocols, and functional principals. The present paper serves as guide for using the PNlib. The huge application field of the new library is shown by three selected examples. The first example demonstrates the representation of functional principles by a model of a Senseo coffee machine and the second one is a model of a printing production process. The third example presents the applicability of modeling business processes. All models are provided as application cases in the library. Additionally, the application of the PNlib for modeling biological processes has been already shown, for example, in [2].

References

[1] David R., Alla H. On Hybrid Petri Nets. Discrete Event Dynamic Systems: Theory and Applications(11): 9–40, 2001.

[2] Proß S., Bachmann B. Hybrid Modelling and Process Optimization of Biological Systems, MATHMOD Conference, Wien, Austria, 2012.