

FORMAL FRAMEWORK FOR THE DEVS-DRIVEN MODELING LANGUAGE

Ufuoma Bright Ighoroje ^(a), Oumar Maïga ^(b), Mamadou Kaba Traoré ^(c)

^(a)African University of Science and Technology, Abuja, Nigeria

^(b)University of Bamako, Mali

^(c)Blaise Pascal University, Clermont-Ferrand 2, France

^(a)uighoroje@aust.edu.ng, ^(b)maigabababa78@yahoo.fr, ^(c)traore@isima.fr

ABSTRACT

The DEVS-Driven Modeling Language (DDML) is a graphical modeling language that is based on Discrete Event System Specification (DEVS). Models built with DDML are highly expressive and communicable and validation of model properties can be done by simulating these models following the DEVS simulator protocol. We can take advantage of the usefulness of formal methods and apply symbolic manipulation and reasoning to deduce properties of models that cannot be derived from simulation. Since DDML focuses on three levels of abstraction in the hierarchy of system specification, we propose to do formal reasoning at each level of abstraction by applying a semantic mapping function to formal methods that can capture the properties of the model at each level. We do this because we can gain more insight about a model by observing different perspectives. This formal framework for DDML is the focus of this paper.

Keywords: DEVS, Formal Methods, DDML

REFERENCES

- Cristia, M. 2007. A TLA+ encoding of DEVS models. *International Modeling and Simulation Multiconference*, Buenos Aires (Argentina), pp. 17–22.
- Ernesto, P. 2008. *Modeling and simulation of dynamic structure discrete-event systems*. Thesis (Ph.D). McGill University.
- Hernandez, A., and Giambiasi, N. 2005. State Reachability for DEVS Models. *Proceedings of Argentine Symposium on Software Engineering*.
- Hoare, C.A.R. 1985. *Communicating Sequential Processes*. Prentice Hall International Series in Computer Science. Prentice Hall.
- Hong, J., Song, H., Kim, T., and Park, K. 1997. A Real-time discrete-event system specification formalism for seamless real-time software development. *Discrete Event Systems: Theory and Applications*, vol. 7, pp. 355–375.
- Hong, K.J., and Kim, T. G. 2005. Timed I/O Test Sequences for Discrete Event Model Verification. AIS 2004, LNAI 3397, pp. 275–284.
- Hwang, M.H., and Zeigler, B. P. 2009. Reachability Graph of Finite and Deterministic DEVS Networks. *IEEE Transactions on Automation Science And Engineering*, 6 (3).
- Magee J., Kramer J. 2006. “*Concurrency: State Models and Java Programs*”. 2nd Edition.
- Saadawi, H., Wainer, G. 2010. From DEVS to RTA-DEVS. *IEEE/ACM 14th International Symposium on Distributed Simulation and Real Time Applications*, 2010 pp.207-210.
- Saadawi, H., Wainer, G. 2009. Verification of Real-Time DEVS Models, *Proceedings of SpringSim Multi Simulation Conference*, San Diego, CA March 2009.
- Weisel, E.W., Petty, M.D., Mielke, R.R. 2005. A Comparison DEVS Semantic Composability Theory. *Proceedings of the Spring 2005 Simulation Interoperability Workshop*
- Zeigler, B., Praehofer, H., Kim, T. 2000. *Theory of Modeling and Simulation*. 2nd Edition. Academic Press.