Communicating Process Architectures 2015 & 2016
K. Chalmers et al. (Eds.)
IOS Press, 2018

doi:10.3233/978-1-61499-886-0-289

Dealing with (Real-)Time in Real-World Hybrid Systems

Workshop Position Paper

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Abstract. One of the issues that has been bothering embedded systems engineers is how to deal with time. Some approaches have attempted to make time part of the modelling language, other approaches turn it in a partial order of events, while most programmers ignore it completely equating QoS with real-time (most of the time but not guaranteed). While in the discrete domain, time is considered to be progressing as a number of clock cycles, in the continuous domain time has an infinitesimal granularity. If we now want to proof the correctness of a hybrid system, people traditionally use time dependent partial ordinary differential equations in the continuous domain and model checkers or provers for the discrete domain.

How can we combine the two? Following the *Keynote* [1] theme, we remember to separate the concerns. Hence we need time-independent models that, when executed on a given platform or in a given system context, result in specific time properties (like meeting a deadline or stability). In the discrete domain, this can be achieved by using priority as a scheduling parameter. In the continuous domain, engineers routinely transform the model into the frequency domain to prove desired properties using *Nyquist* or *Laplace*. The workshop will look for answers on how such hybrid models can be formally verified (as opposed to simulation and testing only). Slides used introducing this workshop can be downloaded from [2].

Keywords. embedded systems, QoS, continuous time, discrete time, hybrid systems, priority, frequency, correctness

References

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