Hybrid Synchronous Languages

Vijay Saraswat [1]

IBM TJ Watson Research Center
P.O. Box 704,
Yorktown Heights
NY 10598, USA

Abstract

One of the grand challenges for the next decade is to design high-level modeling languages that enable geneticists and biologists to construct and run sophisticated models of complex biological phenomena at varying levels of granularity. In 1995, Radha Jagadeesan, Vineet Gupta and I designed the Hybrid Concurrent Constraint (HCC) languages, based on extending the Synchronicity Principle to continuous time. An implementation designed by Vineet Gupta, Bjorn Carlsson and others has seen significant use in the context of modeling physical and biological systems.

In this talk we review HCC, DCML (a recent implementation from Toshiba), the language Charon and the Symbolic Analysis Laboratory (SAL) being built at SRI. We contrast the features available in these languages with the demands of several biological applications, particularly those being expressed in the Systems Biology Markup Language (SBML). We discuss the design of a new Hybrid Concurrent Constraint programming system, HCC2, we are currently building at IBM. Besides support for the standard HCC constructs, HCC2 is designed to fit within the Java framework and supports lightweight classes and true multidimensional arrays. We conclude with a discussion of the many open challenges in representing and reasoning about hybrid synchronous systems.

Key words: Hybrid programming, synchronous programming, concurrent constraint programming

[1] Email:vijay@saraswat.org

This is a preliminary version. The final version will be published in Electronic Notes in Theoretical Computer Science
URL: www.elsevier.nl/locate/entcs