HALMSTAD UNIVERSITY

Halmstad Colloquium talk by Kazunori Ueda
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A Hybrid Constraint Language HydLa and Its Implementation

Abstract:
We have been working on the design and implementation of HydLa, a high-level modeling language for hybrid systems. The principal feature of HydLa is that it employs a constraint-based formalism both in the modeling and reliable simulation of hybrid systems. The formalism is declarative and yet provides the language with control structures including synchronization and conditionals that are expressive enough to model hybrid systems. It also allows us to handle uncertainties or partial information in a smooth way.

A HydLa program is a set of constraints that describe the properties of systems using (among others) ordinary differential equations, implication, and a temporal operator. Constraints form hierarchies that define priorities between them. In determining the set of trajectories, a maximal consistent subset of the set of constraints is taken that satisfies the requirements of HydLa's declarative semantics. Modeling with constraint hierarchy provides us with a concise mechanism that makes trajectories well-defined without causing over- and under-constrainedness.

Our publicly available prototype implementation of HydLa features symbolic simulation of models with parameters, nondeterministic search based on automatic case analysis, and bounded model checking. The talk will describe an overview of the language with live demonstration of our implementation.

About:
Kazunori Ueda received his doctoral degree from the University of Tokyo in 1986. He was with NEC and the Institute for New Generation Computer Technology (ICOT) from 1983 to 1992, where he designed Guarded Horn Clauses (GHC), the basis of the Kernel Language of the Fifth Generation Computer Systems (FGCS) project. He joined Waseda University in 1993 and has been Professor since 1997. He was or has been Visiting Scientist/Professor at National University of Singapore, National Institute for Informatics, and Egypt-Japan University of Science and Technology.

His research interests include design and implementation of programming languages, concurrency and parallelism, high-performance verification, and hybrid systems. His recent projects include LMNtal, a programming and modeling language based on hierarchical (hyper)graph rewriting, and HydLa, a constraint-based modeling language for hybrid systems.

He acted as Area Editor of Theory and Practice of Logic Programming, Associate Editor of New Generation Computing, and Editor-In-Chief of Computer Software (Journal of Japan Society for Software Science and Technology). He is currently Co-Chair of Asian Association for Foundations of Software. He was awarded IBM Japan Science Prize (in Computer Science) for his research on concurrent logic programming languages.