

Software Engineering

A Timed Extension of the pi-Calculus and Application for Real-Time System Development

KUWABARA Hiroaki
Dept. of Information Engineering
Graduate School of Information Science

Problems

- The correctness of timed systems depends
 - on the results it produces, and
 - on the time at which the results are available.
- Concurrent/Reactive Components need an overall abstract behavioral model with timing constraints.

A timed extension enables to describe timed behavior directly.

E.g. $input(x).P + t[10].\tau.Q$

- waits *input* for 10 sec.
- timeout occurs and involves to Q if input does not occurs within 10 sec.

Bisimulation: shows behavioral equivalence.

Delay Time Pre-Order: shows the implementation satisfies given deadline specification.

Our solution

A Timed Extension of the pi-Calculus
as basis of formal model of real-time systems

The pi-calculus

- is an algebraic model of communicating processes, and
- has many useful algebraic techniques (e.g. model checking).

A formal description of real-time OO Language

- gives the strict semantics of language, and
- enables to analyze and verify the behavioral properties.

