On the Expressive Power of Temporal Concurrent Constraint Programming Languages

(invited talk)

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Abstract

The tcc paradigm is a formalism for timed concurrent constraint programming. Several tcc languages differing in their way of expressing infinite behavior have been proposed in the literature. In this work we study the expressive power of some of these languages. In particular, we show that:
(1) recursive procedures with parameters can be encoded into parameterless recursive procedures with dynamic scoping, and vice versa. (2) replication can be encoded into parameterless recursive procedures with static scoping, and vice versa. (3) the languages from (1) are strictly more expressive than the languages from (2). Furthermore, we show that behavioral equivalence is undecidable for the languages from (1), but decidable for the languages from (2). The undecidability result holds even if the process variables take values from a fixed finite domain.

(Joint work with Mogens Nielsen and Frank D. Valencia)