

Modelling Concurrent Systems: Generation of Labelled Transition Systems of Pi-Calculus Models through the Use of Fresh-Register Automata

Seng Leung

Supervisor: Dr. Vasileios Koutavas

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University of Dublin, Trinity College
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Abstract

Concurrent systems are formally modelled by using process calculi, such as the pi-calculus. All possible interactions of a concurrent system with its environment are considered by generating the model's state space, which consists of a set of states and a set of communication transitions called the labelled transition system (LTS). The number of states in an LTS can grow very rapidly and may be infinite, and so ordinary LTS representations are unsatisfactory. Using the paradigm of fresh-register automata, many supposedly infinite-state models can be represented finitely.

This dissertation investigates the generation of LTS's from pi-calculus models through the use of fresh-register automata and implements a tool which does this. From the LTS generated, simple model checking can be performed, which includes verifying if a certain state can be reached. The LTS generated also lays the groundwork for further verification techniques like bisimulation and modal logic assertions.