Fakultät II *Informatik, Wirtschafts- und Rechtswissenschaften*
Department für Informatik

Internes Kolloquium

Am **Montag, den 03. August 2015,** um **16:15 Uhr** hält

Nils Erik Flick
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im Rahmen seiner beabsichtigten Dissertation einen Vortrag mit dem Titel

Correctness of Structure-Changing Systems under Adverse Conditions

Der Vortrag findet in Raum A02 2-222 (SCARE Raum) statt.

Abstract:
Many discrete, concurrent systems can be modelled with Petri nets. When the system structure is not fixed but subject to change, extended formalisms are required. Graph transformation systems are among those formalisms that extend Petri nets to allow the explicit representation of structured states, and dynamic connectivity. The intended operational behaviour (Sys) is described as a set of firing. Beyond that, adverse conditions by the action of the environment (Env) reflect the fault model. They can be modelled by structure changes in the net, and also represented as a set of rules. The goal of the proposed thesis is to provide a theoretically founded formalism for specifying properties of such systems subject to adverse conditions, and a proof-based approach to verifying these properties. To this aim, we extend existing work on the correctness of graph transformation systems and graph programs. Correctness here is understood with respect to specifications consisting of pre- and postconditions in the form of graph conditions. Graph conditions, which exist in several variants, are graphical / algebraic expressions akin to formulae of graph logics. An important part of the thesis will be dedicated to the examination of the expressivity of new kinds of spatio-temporal graph properties, and the decidability of classes of properties that are interesting from a modelling point of view, i.e. whether a given system model, under a set of assumptions (Asm), can be shown to satisfy (sat) a given specification (Spec) of correct system behaviour. There may be grades of correctness, and under certain adverse conditions it may be permissible to relax a specification. To address adverse conditions, it is further important to understand how to present an integrated view of the interplay of the environment and the system. It would not be reasonable to impose a sequentialisation or alternation on system operation and faults, as this does not do justice to the distributed functioning of large systems. Env and Sys can be understood as actors playing an asynchronous game. Both parts are composed in parallel and interact via a shared state. Case studies include data structures that are being concurrently modified by several processes, and where only consistent states, or such fulfilling some relaxed specification of consistency, should be reachable.

We have first investigated language-theoretic notions of correctness and restricted classes of structure-changing Petri nets, obtaining decidability as well as undecidability results. The following part consists in researching methods for reasoning about state assertions, especially under the assumption of intermittent faults. Thirdly, a new framework for situations involving the asynchronous interaction between Sys and Env looks to be promising, and we are aiming to provide decision procedures for some restricted situations.

Betreuer: Prof. Dr. Annegret Habel