TECHNISCHE UNIVERSITÄT DRESDEN

Colloquium

Within the seminar of the Research Focus, the Ph.D. programme "Specification of discrete processes and systems of processes by operational models and logics" presents a talk by

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about

"Shape Preserving Tree Transducers"

Abstract: Trees are well formed terms over a ranked alphabet and a tree transducer M is a finite state machine which reads a tree s, called input tree, over the input ranked alphabet Σ and computes a finite set $\tau_M(s)$ of trees, called output trees, over the output ranked alphabet Δ. If the input tree s is processed from its root towards its leaves, then M is a top-down tree transducer. If s is processed on the other way round, i.e., from its leaves towards its root, then M is a bottom-up tree transducer.

The tree transformation τ_M computed by M, i.e., the semantics of M, is the set of pairs (s, t) such that $s \in T_\Sigma$ and $t \in \tau_M(s)$, where T_Σ denotes the set of trees over Σ. Two trees s and t have the same shape if they differ only in the labels of their nodes. The tree transducer M is shape preserving if, for every $(s, t) \in \tau_M$, s and t have the same shape. For example a (finite state) relabeling tree transducer, which, scanning an input symbol $\sigma \in \Sigma$ writes out exactly one output symbol $\delta \in \Delta$ such that σ and δ have the same arity, is a shape preserving tree transducer. On the other hand, it is easy to give a shape preserving tree transducer which is not a finite state relabeling.

The shape preserving property of a tree transducer M is a property of the tree transformation τ_M computed by M, hence it is a dynamical property. On the other hand, the property of being relabeling is a statical property of M because it says that the rewriting rules of M may have only a rather restricted form. As mentioned, the statical property that M is a relabeling tree transducer implies the dynamical property that τ_M is shape preserving.

In this talk we show that the converse also holds in the folowing sense: given a shape preserving tree transducer M, then a relabeling tree transducer M' can be (effectively) constructed such that $\tau_M = \tau_{M'}$ holds. This clearly implies that shape preserving tree transducers and relabeling tree transducers induce the same tree transformation class. We note that, for strings, the shape preserving property reduces to the length preserving property and that, for string transducers, which both bottom-up tree transducers and top-down tree transducers generalize, the analogous result was already shown in (Eilenberg, 1974) and also in (Leguy, 1981).

Finally, we also show that it is decidable whether a given tree transducer (either top-down or bottom-up) is shape preserving or not.

Date:	20.12.2005
Place and time:	Hans-Grundig-Str., Room: GRU 151, 1.15 pm

All interested persons are invited to attend!

Prof. Dr.-Ing. habil. Heiko Vogler