Monotonic Semantic Path Orderings

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Due to it simplicity the Recursive Path Ordering (RPO) [Der82] has been extensively used in (semi-)automatic termination proof. Unfortunately, RPO can only be used to prove termination of a particular class of term rewriting systems (TRS), namely the *simply terminating* TRS's.

A way to avoid this restriction is given in the Semantic Path Ordering (SPO) [KL80] in which the *precedence* on function symbols is replaced by any (well-founded) underlying (quasi-)ordering involving the whole term. The SPO is too general to be automated, but, even if we restrict the kind of underlying orderings allowed, it still has an important weakness: it is not monotonic in general.

With the aim of using SPO in (semi-)automatic proofs of termination we have defined a *monotonic* version of SPO, which is obtained by restricting the use of arguments in the first comparison. Then by considering only some classes of underlying orderings we can automate the SPO for proving termination. In particular, we can capture many termination proof methods based on transformations.

Additionally we define some original variations of the RPO, which combined with some simple transformations on terms, turn out to be suitable candidates as underlying ordering in the SPO. Using these orderings we can fully automate the termination proof of several non-simply terminating TRS's, some of them including mutual recursion.

Finally we have adapted the monotonic semantic path ordering to prove termination of rewriting modulo asociativity and commutativity (AC), by combining our results with the recent results for RPO modulo AC in [Rub98].

References

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