Directed unfolding of Petri nets.


Summary: The key to efficient on-the-fly reachability analysis based on unfolding is to focus the expansion of the finite prefix towards the desired marking. However, current unfolding strategies typically equate to blind (breadth-first) search. They do not exploit the knowledge of the marking that is sought, merely entertaining the hope that the road to it will be short. This paper investigates directed unfolding, which exploits problemspecific information in the form of a heuristic function to guide the unfolding towards the desired marking. In the unfolding context, heuristic values are estimates of the distance between configurations. We show that suitable heuristics can be automatically extracted from the original net. We prove that unfolding can rely on heuristic search strategies while preserving the finiteness and completeness of the generated prefix, and in some cases, the optimality of the firing sequence produced. We also establish that the size of the prefix obtained with a useful class of heuristics is never worse than that obtained by blind unfolding. Experimental results demonstrate that directed unfolding scales up to problems that were previously out of reach of the unfolding technique.

doi:10.1007/978-3-540-89287-8_11