

Equivalence notions for concurrent systems and refinement of actions

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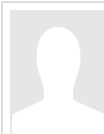
Abstract

We investigate equivalence notions for concurrent systems. We consider “linear time” approaches where the system behaviour is characterised as the set of possible runs as well as “branching time” approaches where the conflict structure of systems is taken into account. We show that the usual interleaving equivalences, and also the equivalences based on *steps* (multisets of concurrently executed actions) are not preserved by refinement of atomic actions. We prove that “linear time” partial order semantics, where causality in runs is explicit, is invariant under refinement. Finally, we consider various bisimulation equivalences based on partial orders and show that the strong... one of them is preserved by refinement whereas the others are not.

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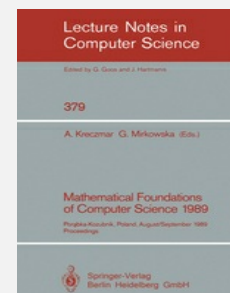
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execution, the system may always choose the same action while neglecting the alternatives. Fairness assumptions are incorporated to overcome such an unfair treatment of actions. Thereupon, according notions of fair system languages are defined. The following definition is inspired by the notion of fairness as introduced by Reisig [17].

Definition 11 (Strong Fairness). Given an equivalence relation R on a set S , we define the equivalence class containing an element x of S by: $[x]_R = \{y \in S \mid x R y\}$. If S is a set with an equivalence relation R , then it is easy to see that the equivalence classes of R form a partition of the set S . More interesting is the fact that the converse of this statement is true. Theorem 3.6 : Let F be any partition of the set S . Define a relation on S by $x R y$ iff there is a set in F which contains both x and y . Then R is an equivalence relation and the equivalence classes of R are the sets of F . Theorem 3.6. Let F be any partition of the set S . Define a relation on S by $x R y$ iff there is a set in F which contains both x and y . Then R is an equivalence relation a polynomial flow event structures. Bisimulation Equivalence. Variables refinement. Properties.

Conclusion. In this section, we will consider some equivalence notions for investigating them are preserved or not under the variables refinement. Fig. 1: The corresponding polynomial flow event structure of the program. Renement of actions and equivalence notions for concurrent systems, Acta Inform, 37, 229-327 (2001).

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