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一种基于时间自动机的实时系统测试方法

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Abstract

This paper provides an approach to test real-time systems modeled by timed input/output automata (TSIOA), which is a variant of TA (timed automata). This method consists of three steps. Firstly, system model depicted by TSIOA is transformed into an USTGSS (untimed stable label transition graph of symbolic state) which does not contain abstract time delay transitions. Then, the testing methods based on LTS (labeled transition system) are used to the generate transition sequences from USTGSS according to structural coverage criteria. Finally, a process of constructing and executing the test cases is given, in which object functions of time delay variables are imported, and time delay variables used in the transition sequences are solved dynamically by linear programming techniques.

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摘要

基于时间自动机(timed automata,简称TA)的一种变体——时间安全输入/输出自动机(timed safety input/output automata,简称TSIOA),提出了一种实时系统测试方法.该方法首先将时间安全输入/输出自动机描述的系统模型转换为不含抽象时间延迟迁移的稳定符号状态迁移图(untimed stable transition graph of symbolic state,简称USTGSS);然后采用基于标号迁移系统(labeled transition system,简称LTS)的测试方法来静态生成满足各种结构覆盖标准的包含时间延迟变量迁移动作序列;最后,给出了一个根据迁移动作序列构造和执行测试用例的过程,该过程引入了时间延迟变量目标函数,并采用线性约束求解方法动态求解迁移动作序列中的时间延迟变量.

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