

**Priced Timed Games and Infinite Diagnostic**

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**Introduction**

Due to the increasing use of computers in potentially dangerous or highly consuming tools, the analysis of such systems is a hot topic. In particular it allows one to address the problems of optimisation of the cost of such systems and the detection of the occurrence of faults within them. In order to tackle those issues this ARPE focused on the two following problems:

- the synthesis of controllers for timed systems;
- the diagnosis/prediction of probabilistic infinite-state systems.

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**Diagnosis of Infinite Systems**

Diagnosis is a critical task in monitoring systems and it has recently led to theoretical developments related to its complexity w.r.t. both its decision problems and the synthesis of diagnosers.

Pushdown automata are automata where transitions can read the top of a stack, replace it, remove it or add another letter on the stack. Adding probabilities decide which transitions is taken. When a transition is taken, the controller does not necessarily knows it. A visibly probabilistic pushdown automaton warns when the height of the stack changes. We wish to detect a particular transition called the fault.

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**Context**

- Priced Timed Games (PTG) were mostly studied with positive prices only and an EXPTIME algorithm was given for One-Clock PTG. With negative prices only one subclass (where only two prices among -1,0 and 1 are possible) was solved with a corner abstraction method.
- Diagnosis/prediction of probabilistic systems was studied for finite systems where PSPACE/NLOGSPACE algorithms where given. Infinite state systems were studied through pushdown automata but without probabilities.

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**Priced Timed Games**

PTG are two-player zero-sum games played on priced timed automata (whose locations and transitions are labeled by weights modeling the costs of spending time in a state and executing an action, respectively). The goals of the players are to minimise and maximise the cost to reach a target location, respectively.

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**References**

