M2 Internship: History-Deterministic Timed Automata

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Topics of the proposal: timed automata and games, determinizability.
Location of the internship: team Sumo, IRISA, University of Rennes

History-determinism is a weak form of determinism for automata which has been introduced some 10-15 years ago [4, 6, 7] in order to extend things which could previously only be done with deterministic models to some form of non-determinism. For example, history-deterministic *finite* automata can be exponentially more distinct than deterministic ones, and history-deterministic *pushdown* automata are more general than deterministic pushdown automata but retain some of their good properties.

History-deterministic *timed* automata were introduced very recently [5], where it is shown that for example language inclusion, which is decidable for deterministic timed automata but undecidable for non-deterministic ones, is decidable (in exponential time) for history-deterministic timed automata.

The purpose of this project is to better understand the boundary between deterministic, history-deterministic and non-deterministic timed automata. For example, it is known that some types of history-deterministic timed automata are determinizable, but other types are not [3]. It is also not known whether it is generally decidable whether a timed automaton is history-deterministic.

An important tool for history-determinism are certain types of two-player *games*, so-called letter games and token games [1, 2]. We believe that similar *timed* games should be available for characterizing history-deterministic timed automata; checking whether this is true will be one of the first venues to explore in the project.

References

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