

UPPAAL (Reading)

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Overview

- Introduction
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- Future work

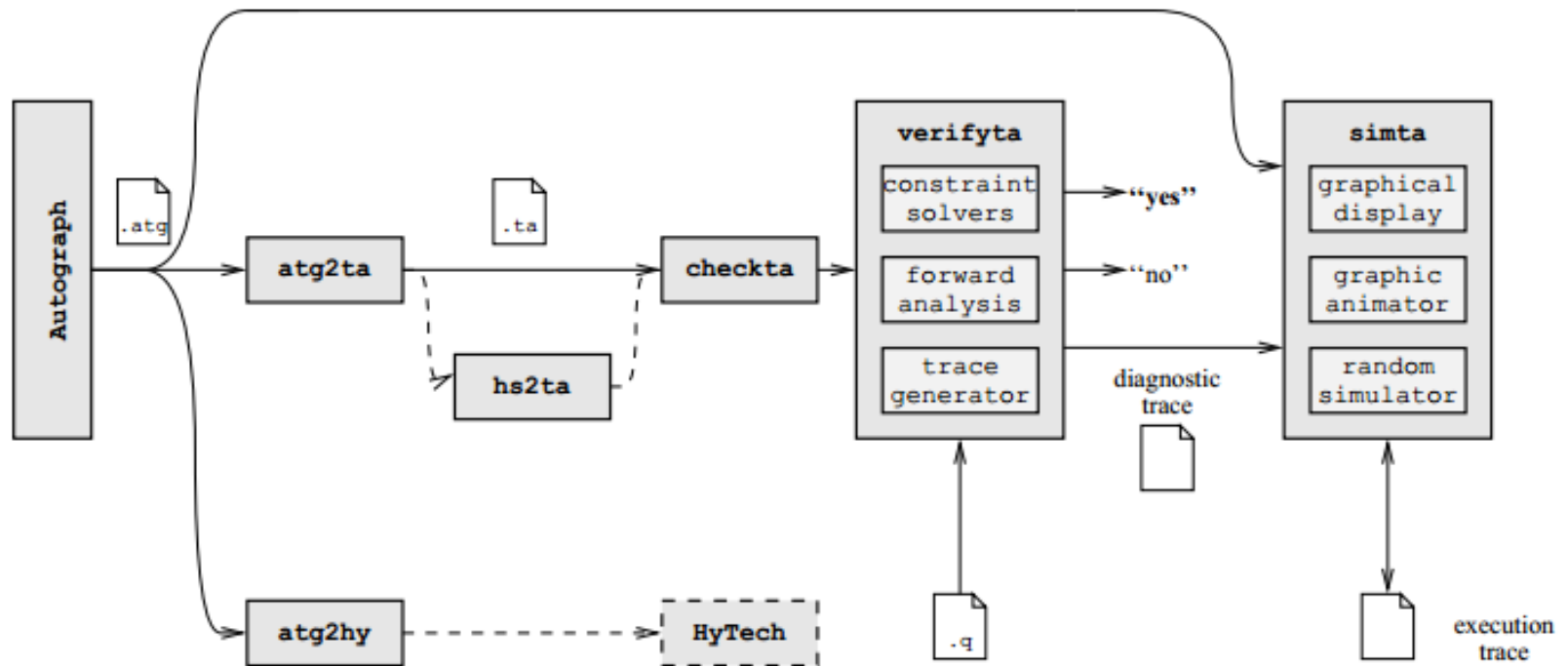


Introduction

- Universities of UPPsala (Sweden) and AALborg (Denmark)
- Modeling, simulation and verification
- Real-time systems
- (Timed) automata



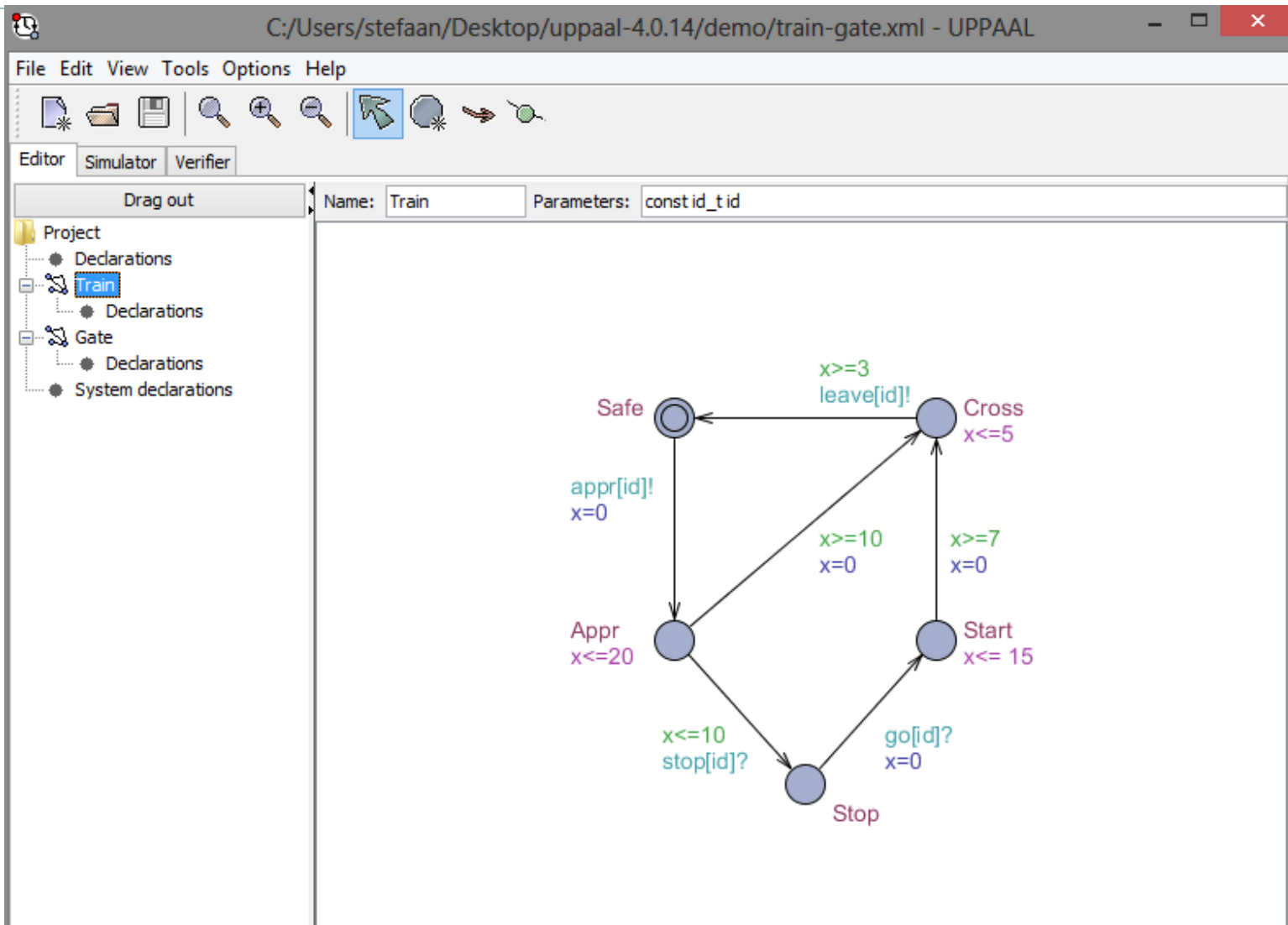
Structure



UPPAAL in 1995, Bengtsson et al.



User Interface (Editor)



User Interface (Simulator)

The screenshot displays the UPPAAL simulator interface. The window title is "C:/Users/stefaan/Desktop/uppaal-4.0.14/demo/train-gate.xml - UPPAAL". The interface is divided into several panels:

- File Edit View Tools Options Help**: Standard menu bar.
- Editor Simulator Verifier**: Tabbed interface, currently on the Simulator tab.
- Drag out**: A panel on the left containing a list of "Enabled Transitions". The transition `leave[0]: Train(0) --> Gate` is selected. Below the list are "Next" and "Reset" buttons.
- Simulation Trace**: A panel on the left showing a sequence of events: `(Appr, Safe, Safe, Safe, Safe, Safe, Occ)`, `Train(0)`, `(Cross, Safe, Safe, Safe, Safe, Safe, Occ)`, `appr[4]: Train(4) --> Gate`, `(Cross, Safe, Safe, Safe, Appr, Safe, -)`, `stop[tail0]: Gate --> Train(4)`, and `(Cross, Safe, Safe, Safe, Stop, Safe, Occ)`. Below the trace are buttons for "Prev", "Next", "Replay", "Open", "Save", and "Auto".
- Drag out**: A panel on the right showing a list of variables and their values: `Gate.list[0] = 0`, `Gate.list[1] = 4`, `Gate.list[2] = 0`, `Gate.list[3] = 0`, `Gate.list[4] = 0`, `Gate.list[5] = 0`, `Gate.list[6] = 0`, `Gate.len = 2`, `Train(0).x in [3,5]`, `Train(1).x >= 13`, `Train(2).x >= 13`, `Train(3).x >= 13`, `Train(4).x in [0,5]`, `Train(5).x >= 13`, `Train(0).x - Train(1).x <= -10`, `Train(1).x = Train(2).x`, `Train(2).x = Train(3).x`, `Train(3).x = Train(5).x`, `Train(4).x - Train(0).x in [-5,0]`, and `Train(5).x = Train(1).x`.
- State Transition Diagram**: A central diagram for `Train(0)` showing states: `Safe`, `Appr`, `Stop`, `Cross`, and `Start`. Transitions are labeled with guards and actions: `appr[0]! x=0`, `x >= 3 leave[0]!`, `x >= 10 x=0`, `x >= 7 x=0`, `x <= 10 stop[0]?`, and `go[0]? x=0`. The `Cross` state has a guard `x <= 5`.
- Timeline**: A bottom panel showing a sequence of events for `Train(0)` through `Train(5)`. The `Train(4)` trace shows `appr[4]` and `s` events.

User Interface (Verifier)

The screenshot displays the UPPAAL Verifier interface. The window title is "C:/Users/stefaan/Desktop/uppaal-4.0.14/demo/train-gate.xml - UPPAAL". The menu bar includes "File", "Edit", "View", "Tools", "Options", and "Help". The toolbar contains icons for file operations and search. The "Verifier" tab is active, showing a list of properties in the "Overview" section. The selected property is "E<> Train(1).Cross". To the right of the list are buttons for "Check", "Insert", "Remove", and "Comments". The "Query" section contains the text "E<> Train(1).Cross". The "Comment" section contains the text "Train 1 can reach crossing." The "Status" section shows the verification results for each property, all of which are "Property is satisfied."

File Edit View Tools Options Help

Editor Simulator Verifier

Overview

- E<> Gate.Occ
- E<> Train(0).Cross
- E<> Train(1).Cross**
- E<> Train(0).Cross and Train(1).Stop
- E<> Train(0).Cross and (forall (i : id_t) i != 0 imply Train(i).Stop)

Check
Insert
Remove
Comments

Query

E<> Train(1).Cross

Comment

Train 1 can reach crossing.

Status

- E<> Gate.Occ
Property is satisfied.
- E<> Train(0).Cross
Property is satisfied.
- E<> Train(1).Cross
Property is satisfied.

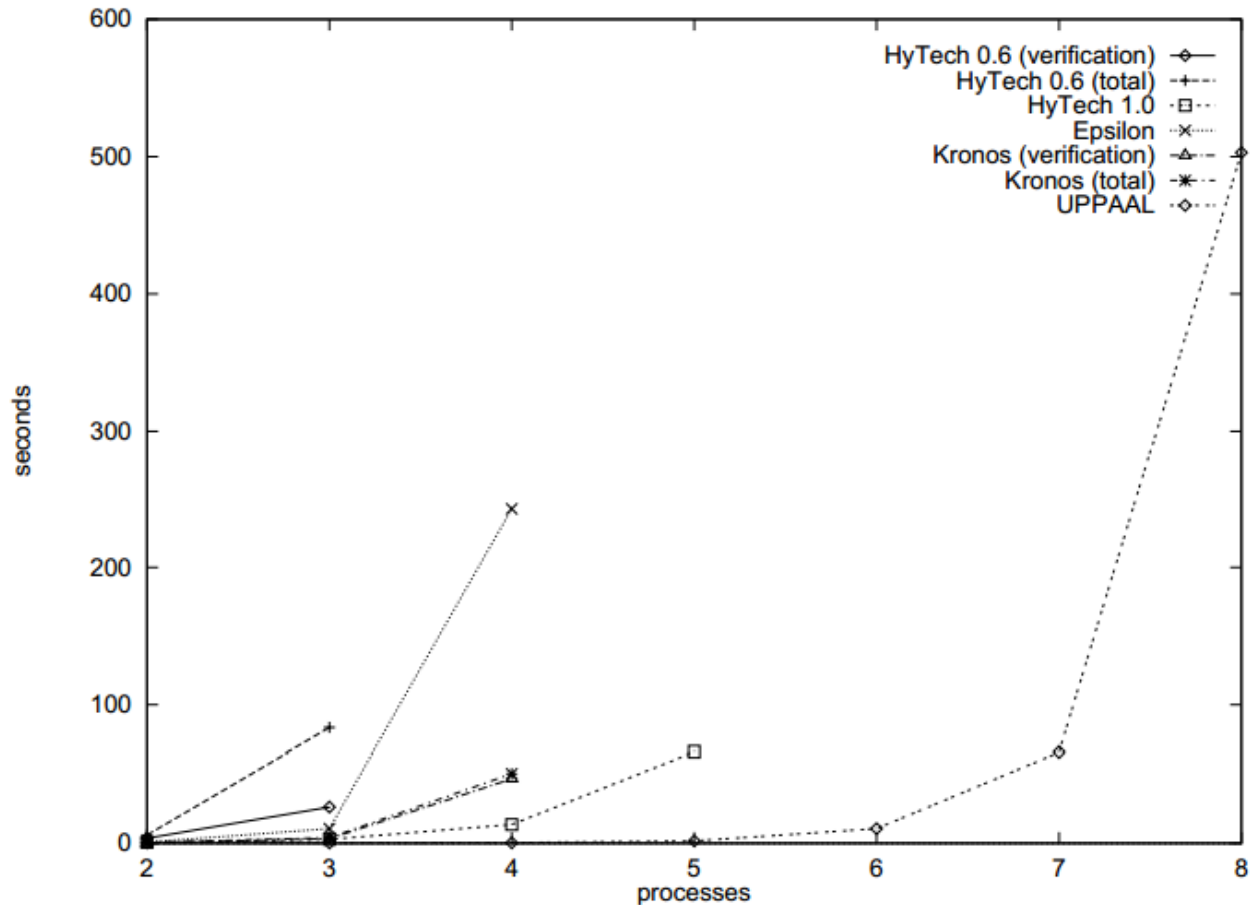
Properties

- Invariants and Reachability analysis
- Safety
 - “Something ‘bad’ can never happen.”
- Bounded liveness
 - “Eventually something ‘good’ happens.”



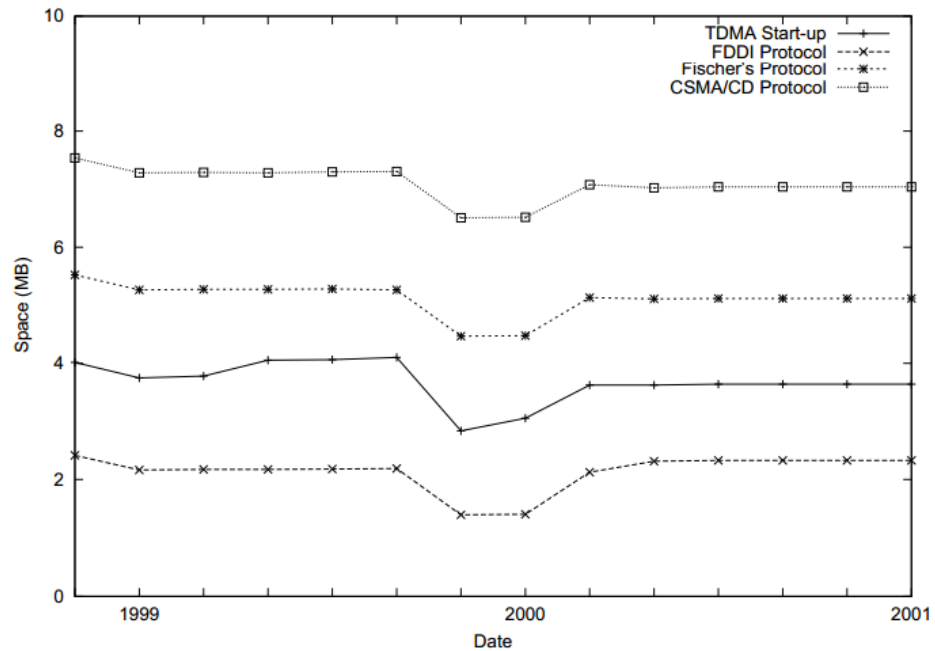
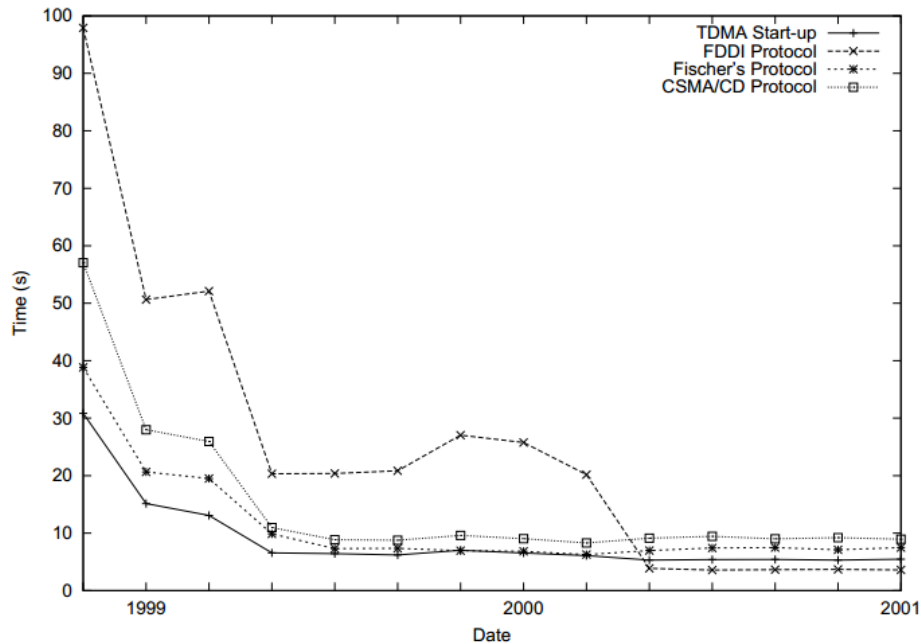
Performance

- Faster than other tools and can handle larger systems



Performance

- Improved over the years



New generation of UPPAAL, Bengtsson et al.



Future work

- Create, simulate and verify RPG models
- Export RPG from AToMPM
- Transform to valid XML



Questions?

