

Uppaal Demo

Outline

- The Light Controller Example
- Creating Automata Templates
- Simulation
- Specifying Properties
- Verification

Creating Automata Templates



▪ Locations

- Name, invariants or comments (double click on locations)
- Setting initial, urgent, and commented (right click menu)

Creating Automata Templates



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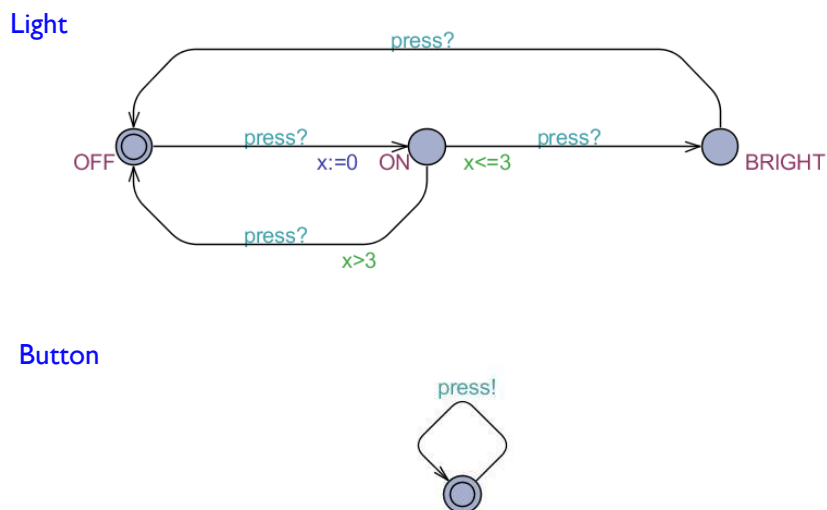
▪ Edge

- Location to location connection, routed with “Nails”
- Setting Properties (double click on an edge)
 - Selections, Guards, Synchronization, and Updates
 - Selections are randomized initialization of some variable in a range whenever an edge is executed
 - ♦ E.g., “i: int[3,5]” – randomly set i to be between 3 to 5, inclusively

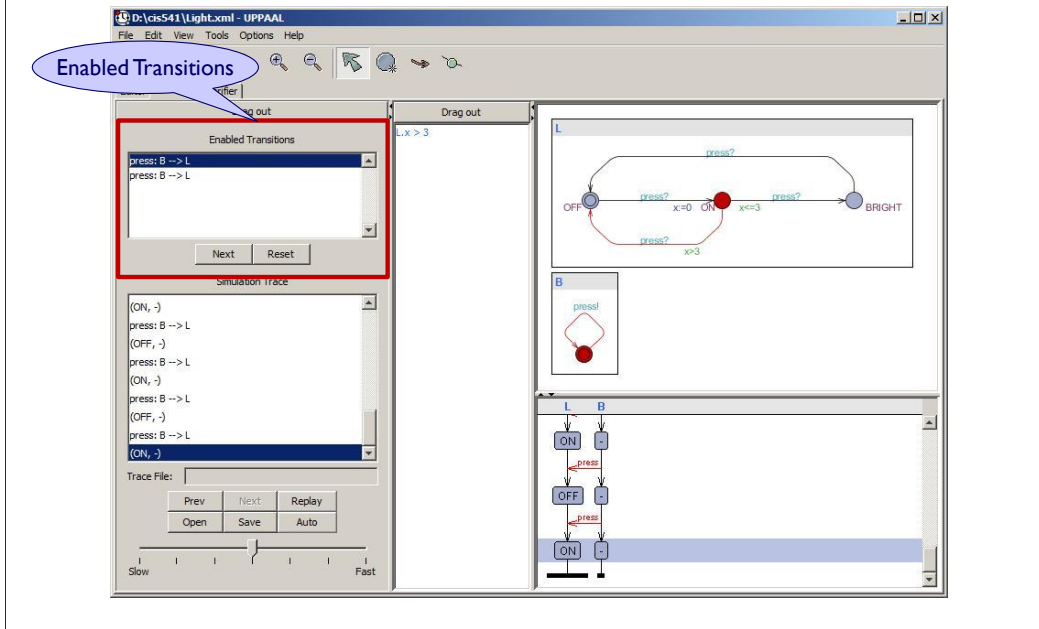
Creating Automata Templates

- **Declarations**
 - Scope
 - Local: used by an instance of a template itself
 - Global: used by all automata instances
 - Variables and function definitions
- **System Declarations**
 - Instantiate templates
 - Composing a system
- **Syntax Checking**

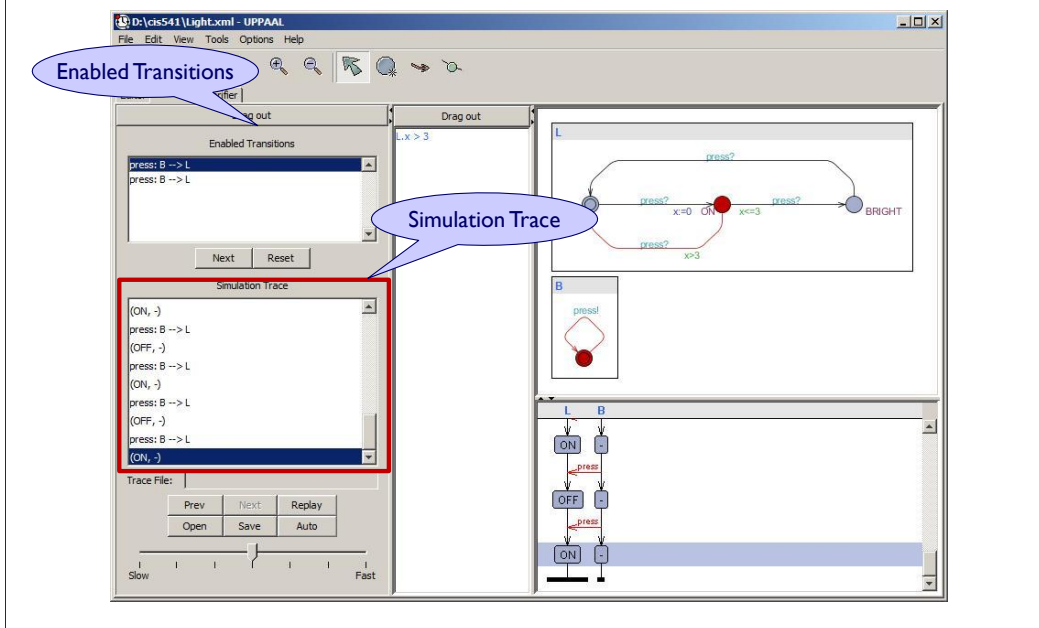
The Light Controller Example



Simulation



Simulation



Simulation

The screenshot shows the UPPAAL simulation environment. The main window displays a Petri net diagram with places L, B, and BRIGHT, and transitions labeled 'press?'. The 'Enabled Transitions' list on the left shows 'press: B -> L'. The 'Simulation Trace' window shows a sequence of events: (ON, -), press: B -> L, (OFF, -), press: B -> L, (ON, -), press: B -> L, (OFF, -), press: B -> L, and (ON, -). The 'Controls' section at the bottom is highlighted with a red box and includes buttons for 'Prev', 'Next', 'Replay', 'Open', 'Save', and 'Auto', along with a speed slider from 'Slow' to 'Fast'.

Simulation

This screenshot is similar to the first one but highlights the 'Variable Values' section. The 'Enabled Transitions' and 'Simulation Trace' windows are the same. The 'Variable Values' window, located in the center, is highlighted with a red box and shows the variable 'L.x > 3'. The 'Controls' section at the bottom remains highlighted with a red box.

Simulation

The screenshot shows the UPPAAL simulation environment. The main window displays a Petri net diagram with places L, B, and BRIGHT, and transitions labeled with 'press?' and 'press'. The variable values are shown as $x=0$ and $x=3$. The simulation trace shows a sequence of events: (ON, -), press: B \rightarrow L, (OFF, -), press: B \rightarrow L, (ON, -), press: B \rightarrow L, (OFF, -), press: B \rightarrow L, and (ON, -). The controls panel includes buttons for Prev, Next, Replay, Open, Save, and Auto, along with a speed slider.

Enabled Transitions

Variable Values

System

Simulation Trace

Controls

Simulation

This screenshot is similar to the first one but includes an additional callout for 'Synchronization History' pointing to the synchronization diagram at the bottom right. The synchronization diagram shows the interaction between processes L and B, with events 'press' and 'press?' and states 'ON' and 'OFF'.

Enabled Transitions

Variable Values

System

Simulation Trace

Controls

Synchronization History

Simulation

- Step-by-step simulation
 - Good for observations of variable values at each step
 - Manually selecting transitions (when many are enabled)
 - Good for tracing errors
- Automatic simulation
 - Good for observing overall system behavior
- Saving/Opening Simulation Traces

Specifying Properties

- `A[] not deadlock`
 - no deadlocks
 - true
- `E[] L.OFF`
 - is it possible that the the light is always OFF
 - true
- `E<> (L.ON and L.x>3)`
 - it is possible that the light isn't pressed a second time within 3secs after it's turned on
 - true
- `A<> L.OFF`
 - no matter how your operate the light, it will go to OFF
 - true
- `A<> L.BRIGHT`
 - no matter how your operate the light, it will go to BRIGHT
 - false



Quick Quiz!

Verification

- Loading the error trace into the simulator
 - Menu → Options → Diagnosis Trace → Shortest
- Replaying the trace

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- A Final Note
 - The Uppaal help is handy information