Model Checking Real-Time Systems

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Set of *time values*: $\mathbb{R}_{\geq 0}$

Timed words over $\Sigma \times \mathbb{R}_{\geq 0}$

Set of *valuations* over a set of clocks C: $\mathbb{R}_{\geq 0}^{C}$

Constraints over C: $\varphi ::= x \odot k \mid \varphi \wedge \varphi$ where $x \in C$, $k \in \mathbb{Z}$ and $\odot \in \{<, \leq, =, \geq, >\}$

Set of valuations *satisfying* φ: $[\![\varphi]\!]_C = \{v \in \mathbb{R}_{\geq 0}^{C} \mid v \models \varphi\}$

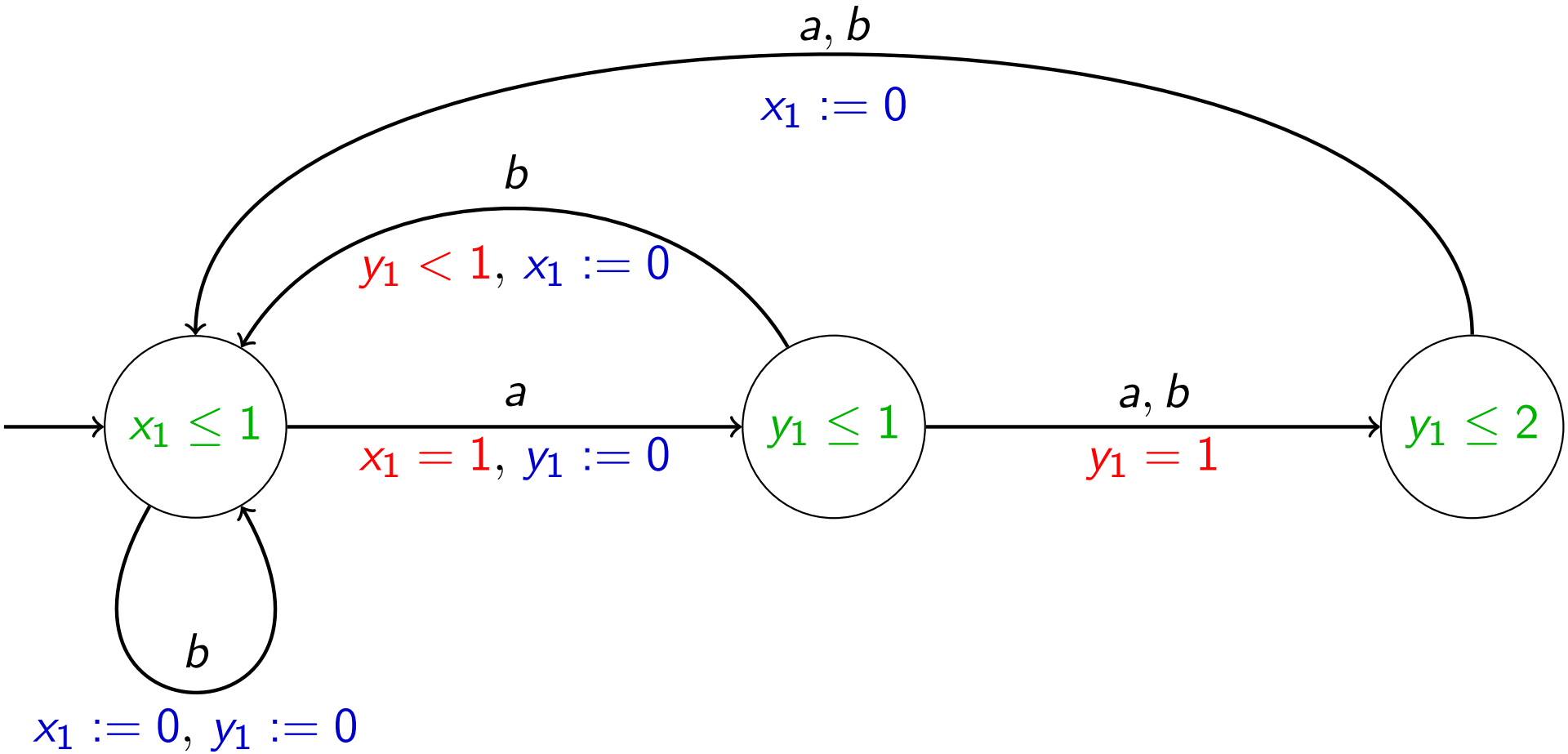
Definition 1

A *Timed Automaton* (TA) $\mathcal{A}$ is the tuple $(L, \ell_0, C, \Sigma, I, E)$ where:

- L is a finite set of *locations* with initial location $\ell_0 \in L$
- C is a finite set of *clocks*
- Σ is a finite set of *actions*
- $I : L \to \Phi(C)$ is an *invariant mapping*
- $E \subseteq L \times \Phi(C) \times \Sigma \times 2^C \times L$ is a set of edges.

Edges are denoted by $\ell \xrightarrow{\varphi, a, r} \ell'$.

Example of a TA with 3 locations, 2 clocks and 2 actions (letters):



References