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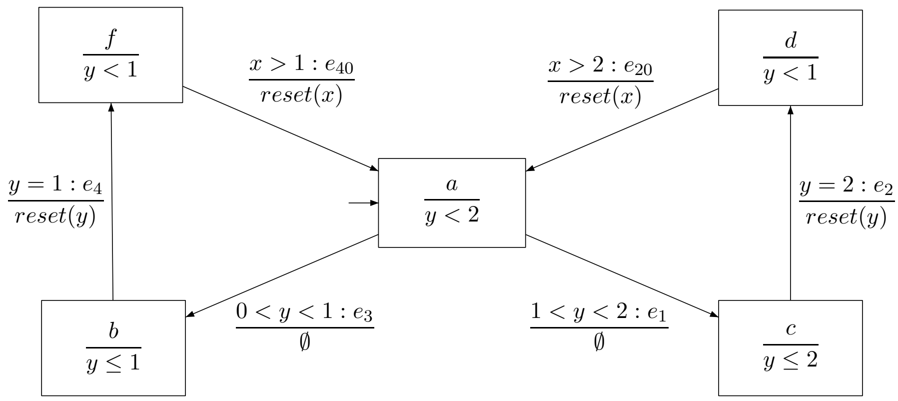
Advanced Model Checking
Summer term 2014

– Series 11 –

Hand in on **9 July** before the exercise class.

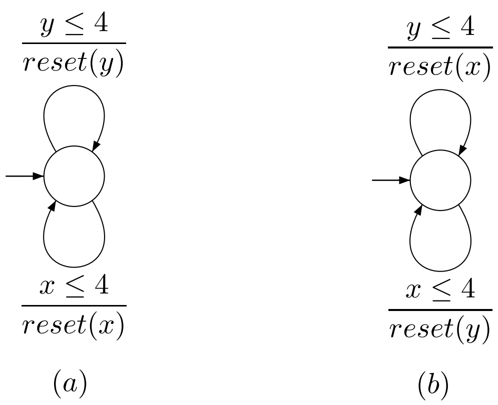
Exercise 1 (4 points)

Give the formal semantics of the following timed automaton *TA* by means of a transition system. That is, formally define the components of the (infinite) transition system.



Exercise 2 (2 points)

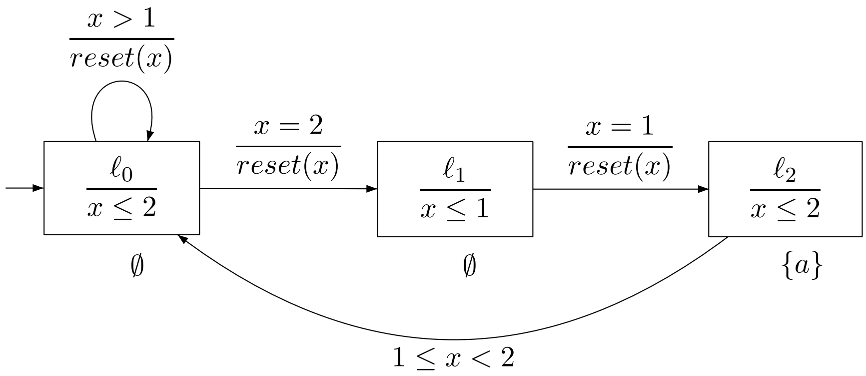
Consider the following two timed automata TA_1 and TA_2.



As these automata only have a single location, their *states* can be thought of as a point in the real plane. A point $(d, e) \in \mathbb{R}^2_{\geq 0}$ then represents that clock x has value d and clock y has value e. Determine the reachable state space of both timed automata. Justify your answers.

Exercise 3 (3 points)

Consider the following timed automaton TA.



(a) Determine the set of states $Sat(\exists\Diamond^{<4}a)$.

(b) Determine the region transition system $RTS(TA, true)$.

(c) Is the TA timelock-free? Justify your answer.

Exercise 4 (1 points)

(a) Find a counterexample showing that

$$\forall\Diamond^{=d}\Phi \;\wedge\; \forall\Diamond^{=d}\Psi \quad \not\equiv \quad \forall\Diamond^{=d}(\Phi \wedge \Psi),$$

where $\Diamond^{=d} = \Diamond^{[d,d]}$ for $d \in \mathbb{R}_{\geq 0}$.

(b) Does this also hold for $J = [0, \infty)$? Justify your answer.