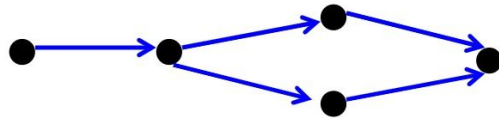


31: Hybrid system example; composition of transition systems

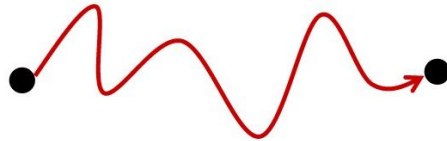


Hybrid systems

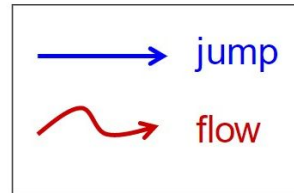
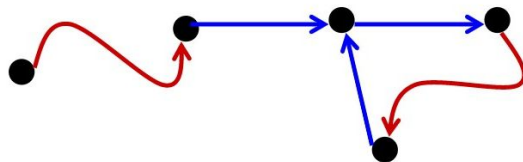
Discrete System (FSM)



Continuous System



Hybrid System





Example: bouncing ball



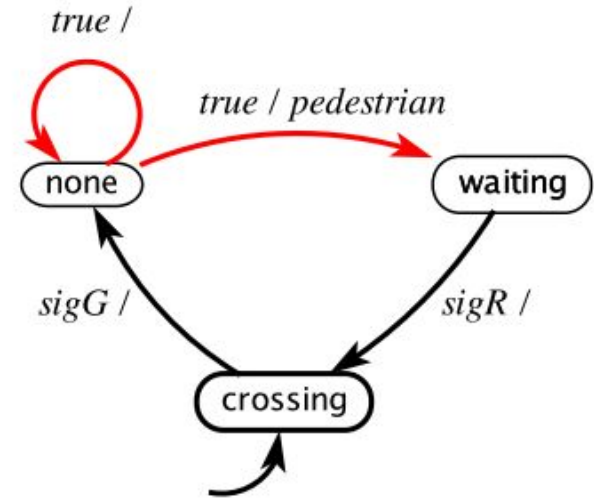
[Image source](#)

Nondeterminism

Guards out of a state are not mutually exclusive

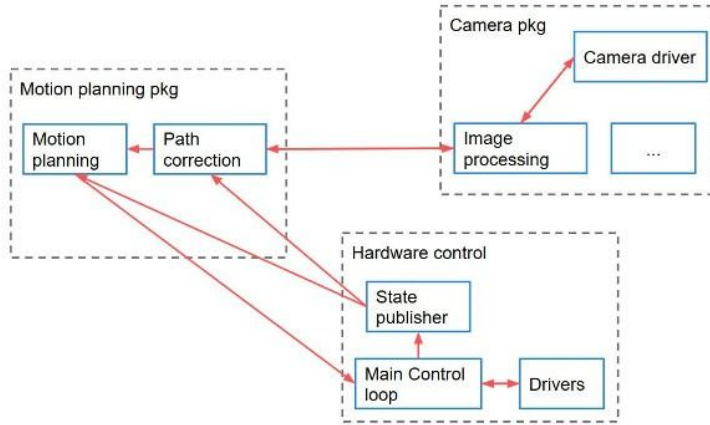
- Reason about the “possible set of states” a system can be in
- Useful for modeling environment

inputs: $sigR, sigG, sigY$: pure
outputs: $pedestrian$: pure



Lee/Seshia fig. 3.11

Review: Embedded systems as distributed systems



[image source](#)



[image source](#)

Composition of automata

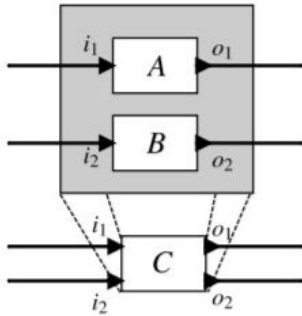


Figure 5.2: Side-by-side composition of two actors.

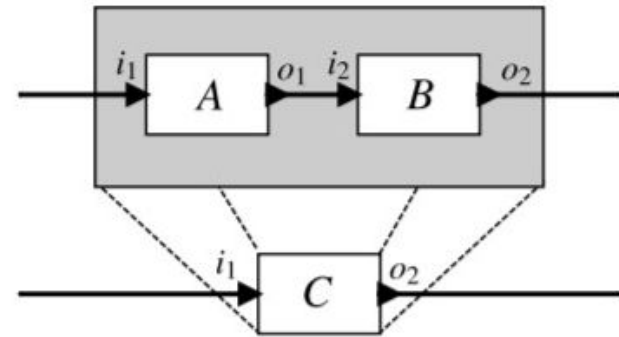


Figure 5.7: Cascade composition of two actors.

Feedback loops in automata

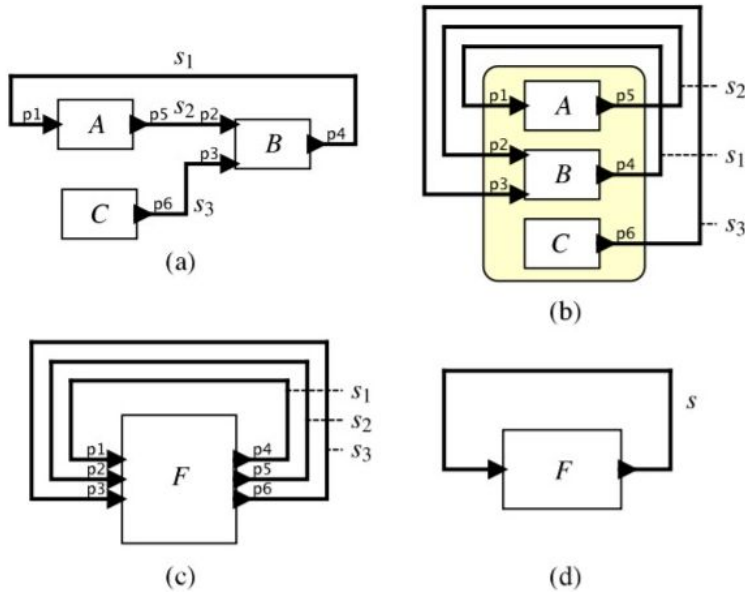


Figure 6.1: Any interconnection of actors can be modeled as a single (side-by-side composite) actor with feedback.