

EECS 124, Homework 2, Problem 3

February 4, 2008

Consider the finite-state machine in Figure 1 that models (somewhat simplistically) the switching of a traffic light.

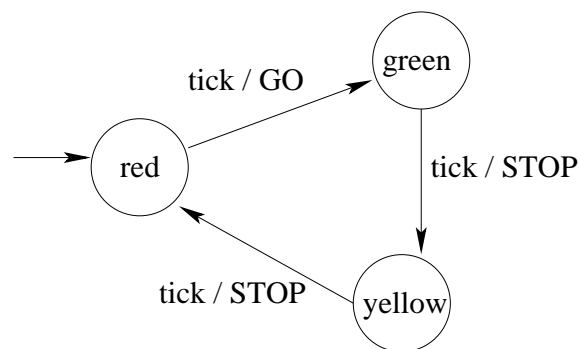


Figure 1: Finite-state machine for Homework 2

- Formally write down the description of this FSM as a 5-tuple: $(States, Inputs, Outputs, Updates, initialState)$.
- Consider the input sequence `tick,tick,tick,...`. Consider a trace of the FSM on this input sequence, including inputs, outputs, and states at each step. Write down a prefix of this trace of length 4 (three steps).
Is this the only trace possible on this input sequence? Why or why not?
- Now consider merging the “red” and “yellow” states into a single “stop” state. Transitions that pointed into or out of those states are now directed into or out of the new “stop” state. Other transitions and the inputs and outputs stay the same. The new “stop” state is the new initial state.
Draw the resulting state machine. Is this state machine deterministic? Why or why not?
If deterministic, exhibit a prefix of the trace of length 4 on the input sequence `tick,tick,tick,...`
If non-deterministic, draw the computation tree up to depth 4 (three steps).
- Does the new state machine simulate the old FSM of Figure 1? Justify your answer formally – if a simulation relation exists, describe it; otherwise, argue why it doesn’t exist.