

State Transition Diagram

Goal

Create a state transition diagram based on a traffic light example.

Scenario

You must complete a state transition diagram for a traffic light which can detect whether cars are waiting at a red light.

Implementation

A state transition diagram shows the states of a state machine and the transition between each state. Figure 1 shows the state transition diagram for a simple traffic light. Table 1 defines the states and their transitions.

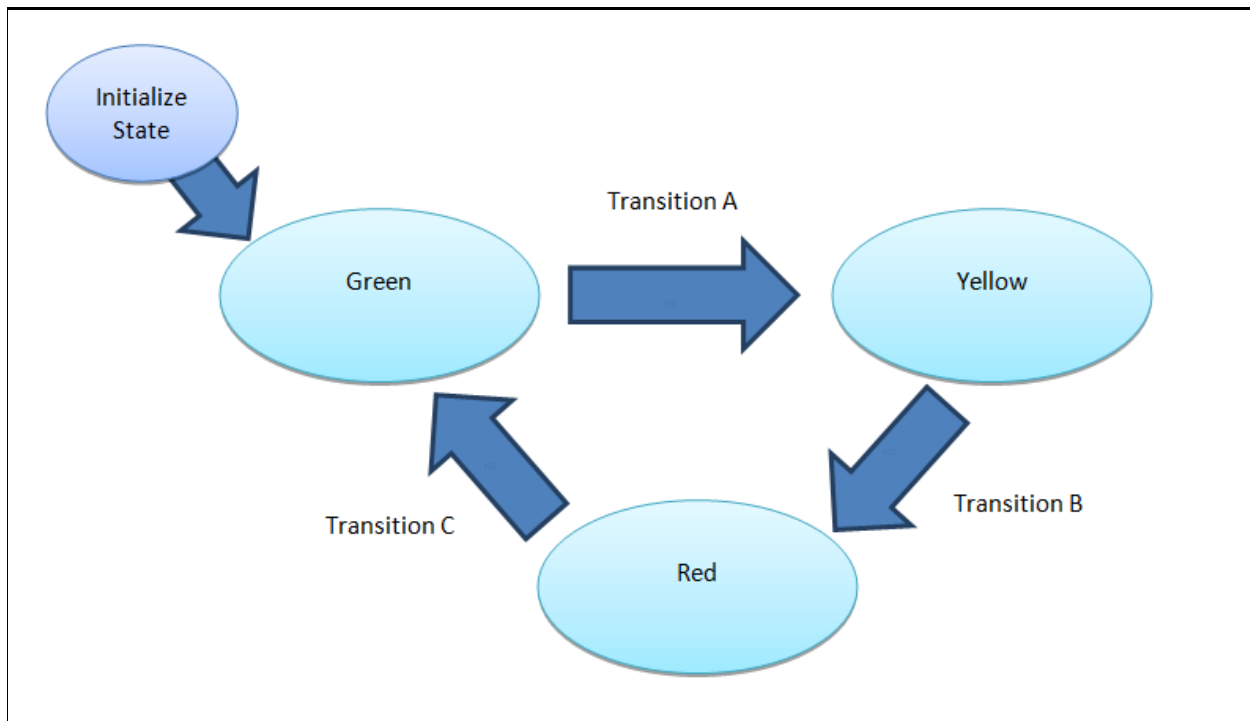
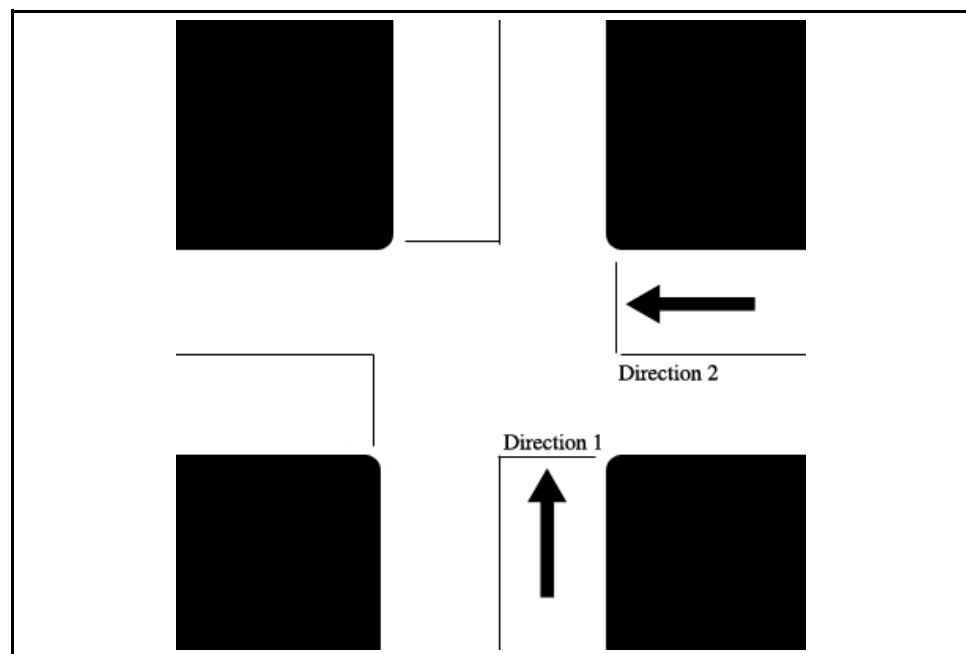


Figure 1. Simple Traffic Light

Table 1. Simple Traffic Light

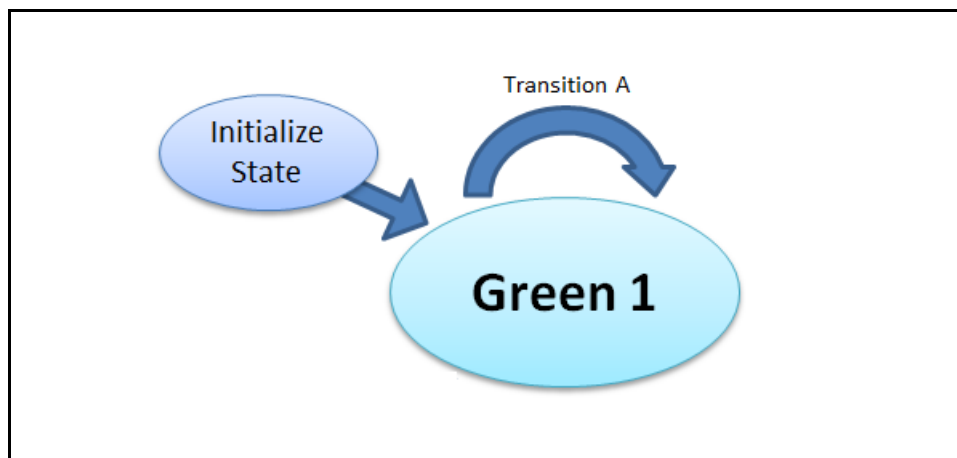
Current State	State Description	Next State	Transition Description	Transition
Green	Cars in direction 1 may go through and cars in direction 2 must wait at red light	Yellow	45 seconds have elapsed	A
Yellow	Cars in direction 1 clear the intersection and stop	Red	Five seconds have elapsed	B
Red	Cars in direction 1 are stopped	Green	45 seconds have elapsed	C

The configuration of the intersection is shown in Figure 2. When Traffic comes from direction 1, cars in direction 2 are stopped.

**Figure 2.** Intersection Example

Now, expand on the simple traffic light to implement a traffic light which can detect cars waiting at a red light.

Use Figure 3 as a starting point for the expanded state transition diagram. Also, the state descriptions are shown in Table 2. Use these resources to complete the rest of this state transition diagram and complete the transition descriptions in Table 2.

**Figure 3.** Expanded Traffic Light**Table 2.** Expanded Traffic Light

Current State	State Description	Next State	Transition Description	Transition
Green 1	Cars in direction 1 may go through and cars in direction 2 must wait at red light	Green 1		A
Green 1	Cars in direction 1 may go through and cars in direction 2 must wait at red light	Yellow1		B
Yellow 1	Cars in direction 1 clear the intersection and stop	Green 2		C
Green 2	Cars in direction 2 may go through and cars in direction 1 must wait at red light	Green 2		D
Green 2	Cars in direction 2 may go through and cars in direction 1 must wait at red light	Yellow 2		E
Yellow 2	Cars in direction 2 clear the intersection and stop	Green 1		F

Solution

Figure 4 and Table 3 show solutions to a traffic light which can detect cars waiting at a red light.

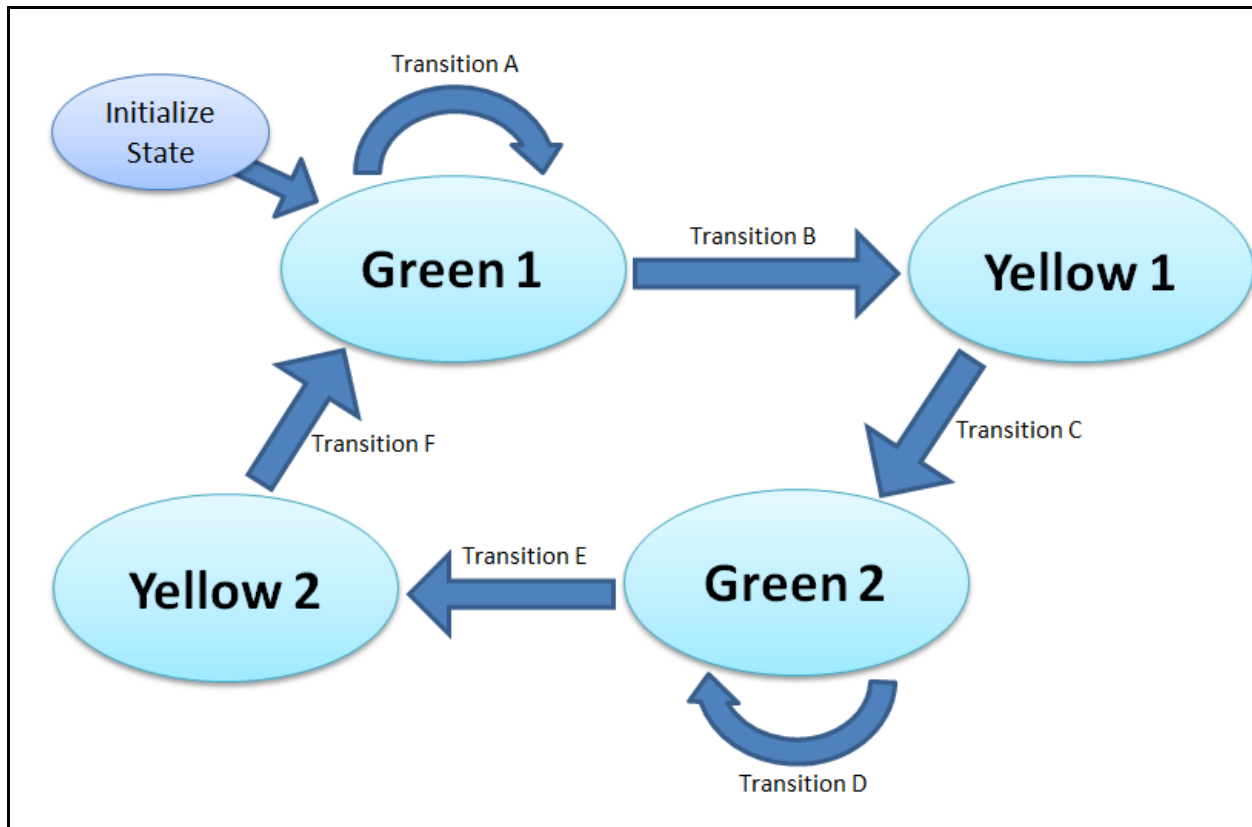


Figure 4. Traffic State Solution

Table 3. Expanded Traffic Light Solution

Current State	State Description	Next State	Transition Description	Transition
Green 1	Cars in direction 1 may go through and cars in direction 2 must wait at red light	Green 1	No cars are detected waiting at red light in direction 2	A
Green 1	Cars in direction 1 may go through and cars in direction 2 must wait at red light	Yellow1	Cars are detected waiting at red light in direction 2	B
Yellow 1	Cars in direction 1 clear the intersection and stop	Green 2	Five seconds have elapsed	C
Green 2	Cars in direction 2 may go through and cars in direction 1 must wait at red light	Green 2	Cars are detected waiting at red light in direction 1	D
Green 2	Cars in direction 2 may go through and cars in direction 1 must wait at red light	Yellow 2	Cars are detected waiting at red light in direction 1	E
Yellow 2	Cars in direction 2 clear the intersection and stop	Green 1	Five seconds have elapsed	F

End of Exercise

Notes
