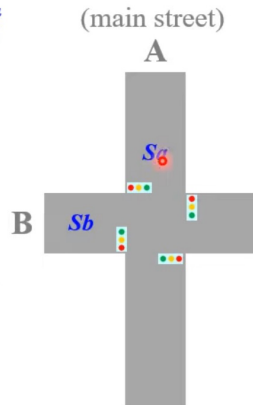


4.4 Traffic Light Controller

Traffic Light Controller

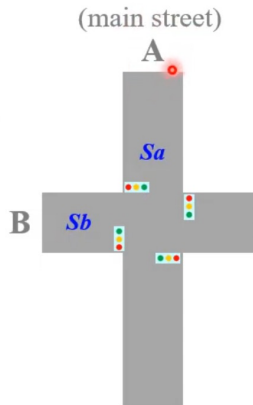
■ Problem description: a *seq ckt*

- Design a traffic light controller for the intersection of street “A” and street “B”.
- Each street has traffic sensors, which detect the presence of vehicles approaching or stopped at the intersection.
 - $S_a = 1$: a vehicle is approaching on street “A”
 - $S_b = 1$: a vehicle is approaching on street “B”



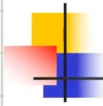
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- Street “A” is a main street.
- When “A” is green, it remains green at least 60 seconds.
- If there is no car approaches on “B”, the “A” cycle is extended for 10 additional seconds until a car approaches on “B”.
- Then the lights change, and “B” has a green light.
- At the end of 50 seconds, the lights change back to “A” unless there is a car on street “B” and none on “A”, in which case the “B” cycle is extended for 10 additional seconds.
- If cars continue to arrive on street “B” and no car appears on street “A”, “B” continues to have a green light.
- The yellow light lasts for 10 seconds.



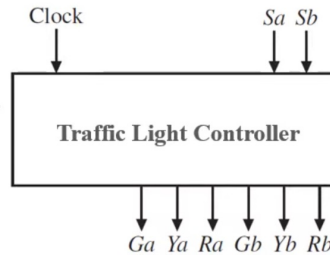
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Implementation :



Block Diagram

- Block diagram of traffic light controller:



– Inputs:

- $Sa = 1$ means a vehicle is approaching on street “A”
- $Sb = 1$ means a vehicle is approaching on street “B”

– Outputs:

- Ga, Ya, Ra : drive the green, yellow, and red lights on street “A”
- Gb, Yb, Rb : drive the corresponding lights on street “B”

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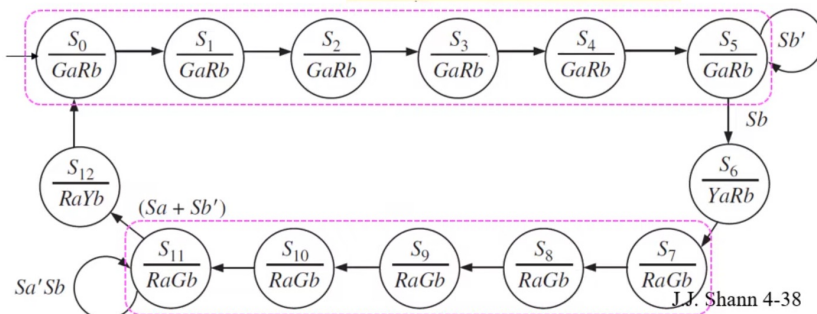
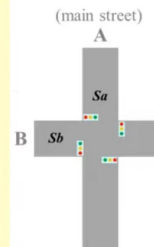


State Graph

- Moore State graph

– For timing purpose by a clock w/ a

- When “A” is green, it remains green at least 60 seconds.
- If there is no car approaches on “B”, the “A” cycle is extended for 10 additional seconds until a car approaches on “B”.
- Then the lights change, and “B” has a green light.
- At the end of 50 seconds, the lights change back to “A” unless there is a car on street “B” and none on “A”, in which case the “B” cycle is extended for 10 additional seconds.
- The yellow light lasts for 10 seconds.



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