EE2016 Micropprocessor Lab & Theory

EE Department, IIT, Madras.

Project 6: Traffic Light Controller with C-Interfacing of ViARM2378

1 Aim

Implement the traffic light controller (described below) (through C-interface) in

1. ViARM2378 development board
2. The user arrivals are simulated by generating random number in ARM (using RNG utility).

2 Equipments, Hardware Required

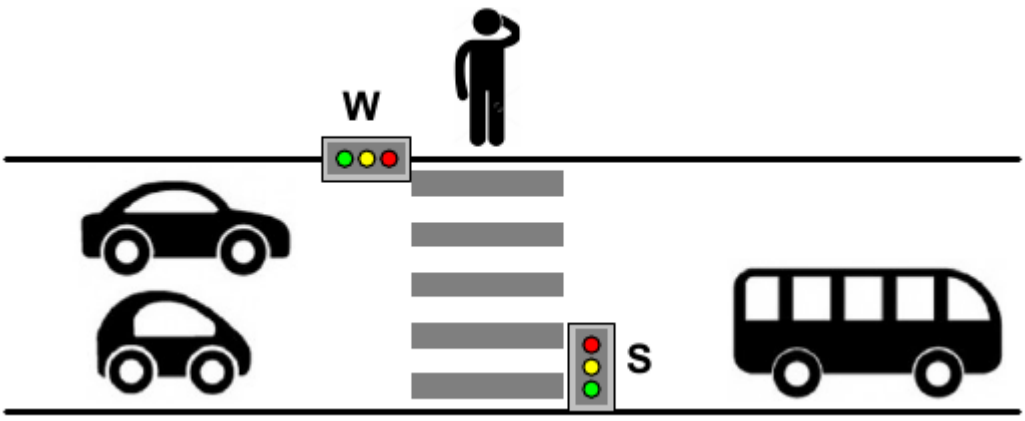
The list of equipments, components required are:

1. ARM ViARM 2378 Development board and accessaries
2. Atmel studio6 & keil microvision 5
3. flash magic
4. Burn o-mat

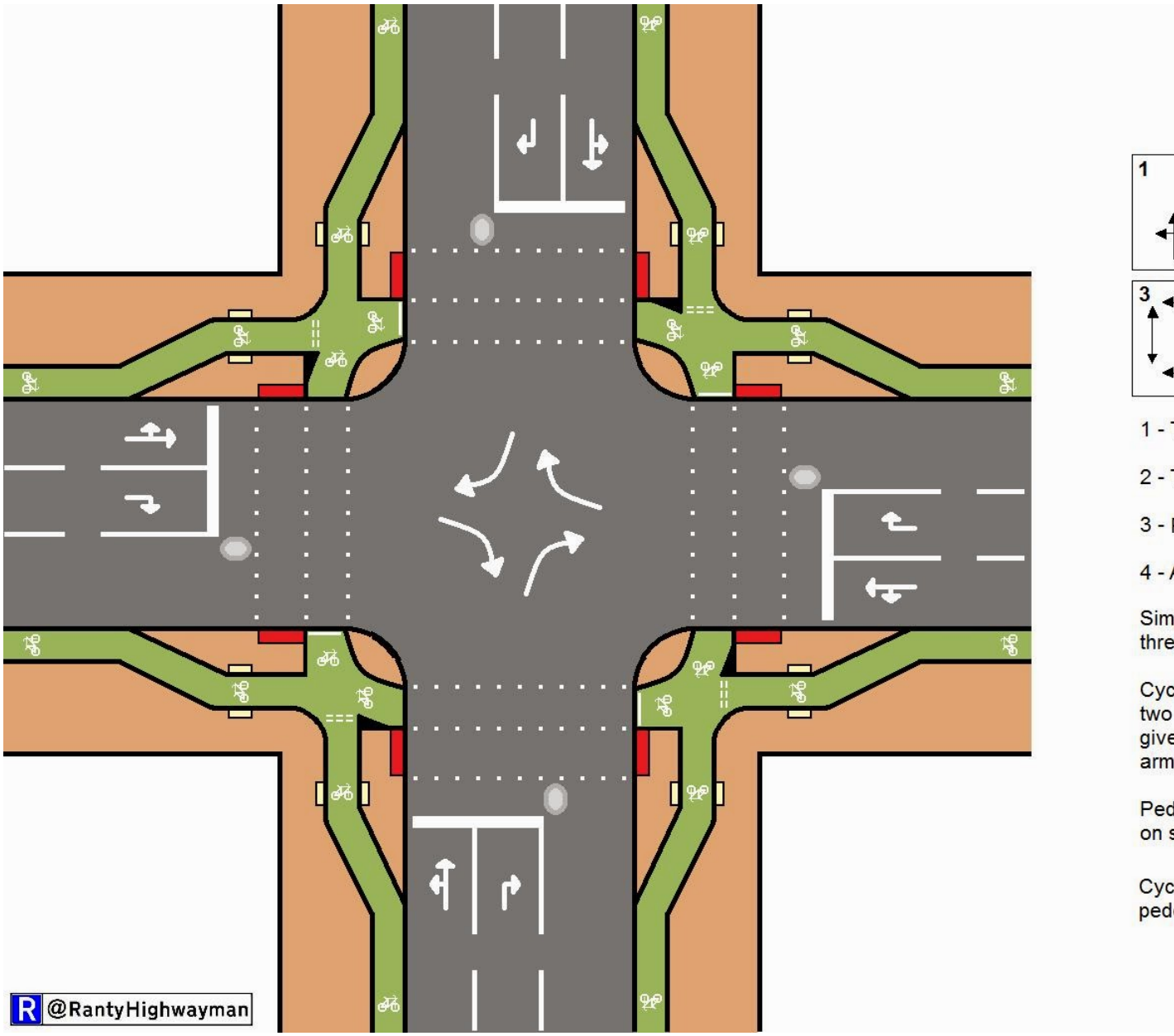
3 Problem definition

The traffic light controller has the following specifications (the corresponding flow chart is given below)

1. Pedestrian Crossing in a throughfare:
   (a) the pederstrian presses the key when he/she wants to cross the road (in which vehicles are plying or none out there)
   (b) the controller would take few secs (12 secs - 3 secs to go from green-MR to yellow-MR, 5 secs to go from yellow-MR to red-MR, 4 secs later red-P to green-P) to stop the traffic and allow the pedestrian to cross (pedestrian has 15 secs to cross, say)
   (c) Within the 15 secs allowed for pedestrian to cross, if a next pedestrian issues a request he would also be accommodated and the time for crossing would be extended for 8 secs from then on.
   (d) The key pressing events by pedestrians are randomly generated (use RNG to generate these events).



2. Four road junction (Extend the above into 4 road junction, divided between traffic A-C, and B-D)

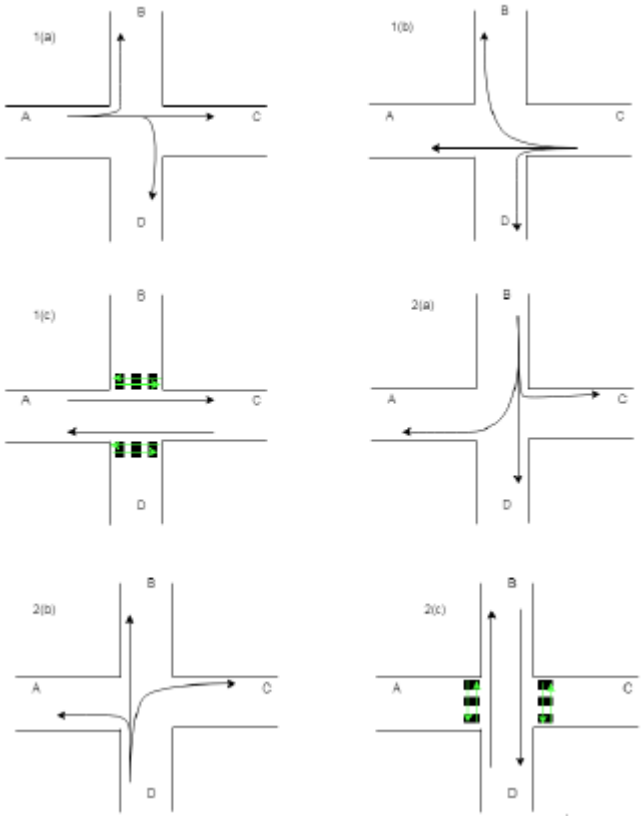


(a) The rules 1(a) through 1(c) are valid and complied in 4 road junction traffic light control.

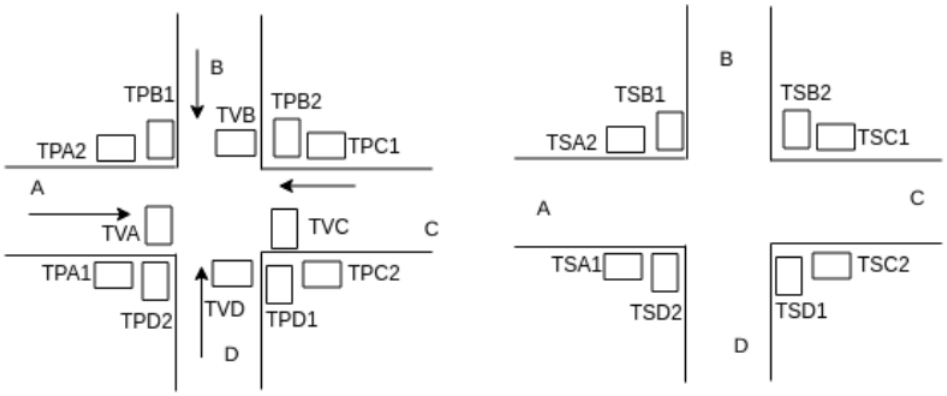
(b) Traffic lights (of type V, with red, green & yellow) are deployed one in each of A, B, C and D locations as indicated. These are exclusively for vehicular traffic. Apart from this there are traffic lights exclusively for pedestrians (of type P, with 'walking man' image, red or green), for crossing on each of the roads - one on either side of the road as indicated.

(c) Thus, in total there are 4P + 4V traffic lights, with possible combinations of $2^4 * 3^4$ states, when we assume independence. But, one state precludes the other. Hence, not ALL of these states are allowed. Only 6 states are allowed. [Evaluate the number of allowed combinations, given the following constraints].

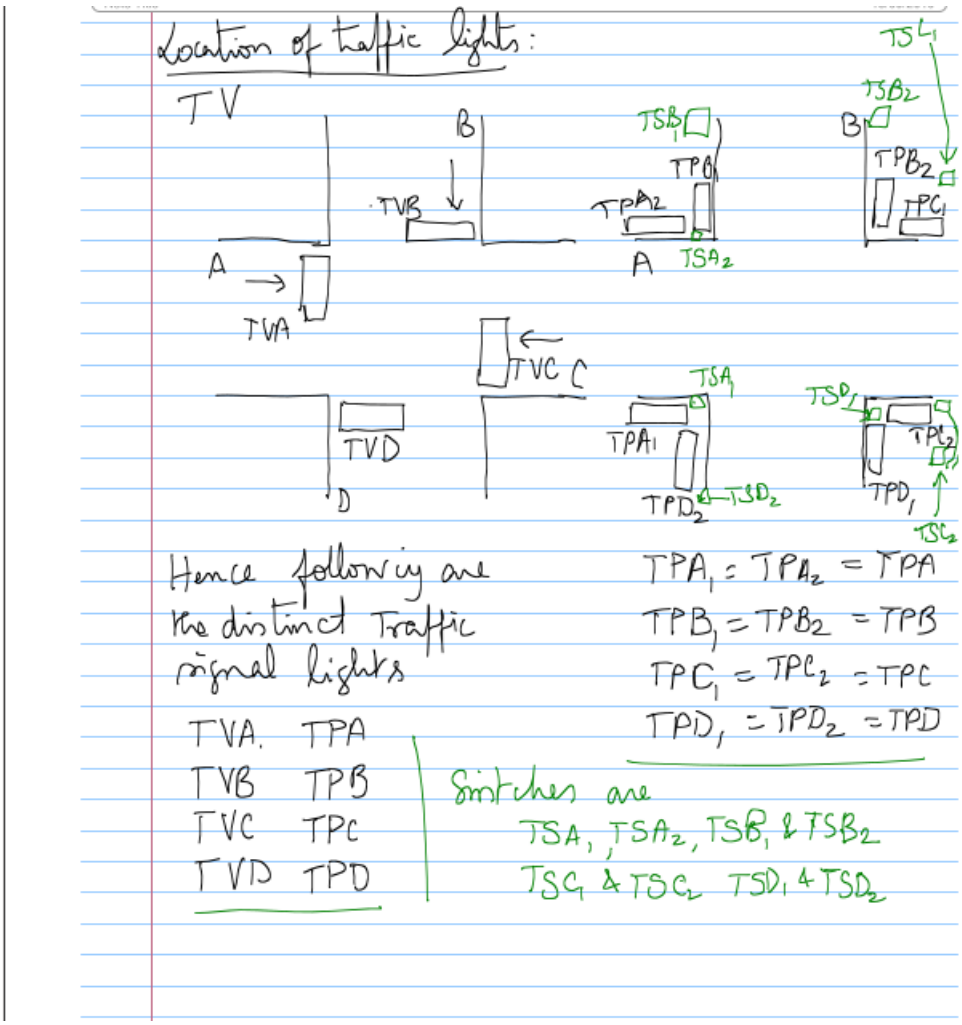
(d) The traffic originating from A has 2 states, similarly the one originating from C has 2 states. But the there is a common state between themselves and hence effectively there are 3 states. In the overlapping states, the pedestrian traffic (on either side) is also served. Ditto for vehicular traffic originating from B and D. Hence, there are a total of 6 states as shown.



(e) The pedestrian requests to cross the road are registered in the push-button box. These switches are TSA1, TSA2, TSB1, TSB2, TSC1, TSC2, TSD1 and TSD2. But, TSA1 & TSA2 could be viewed as a single unit. Ditto for TSB, TSC & TSD.



(f) The pedestrian requests are random.



4 Procedure

Development of Code in C

1. Write a C program to implement the flow chart as above
2. The input could be the key press by TAs. There are 4 keys corresponding to each of the road cross requests. Use polling.
3. The outputs are:
   (a) the three LED lights (b_2, b_1, b_0) towards LSB corresponding to W
   (b) the next three LED lights (b_5, b_4, b_3) representing S
4. Implementation in ViARM 2378
   (a) Load the C-program file in Keil software (Keil software also provides an IDE wherein one can edit, recompile and run etc). Compile it in Keil platform
   (b) Connect the ViARM 2378 development board to PC loaded with Keil software.
   (c) Dump the program into ARM processor, run the program and demonstrate

5 Results

1. Run the program and ask the TA to give input and demonstrate it to TAs
2. Take a snapshot using your mobile, make a report (with the code you had used) and send it to respective TA.