INFO 6205 Traffic simulation Project Report

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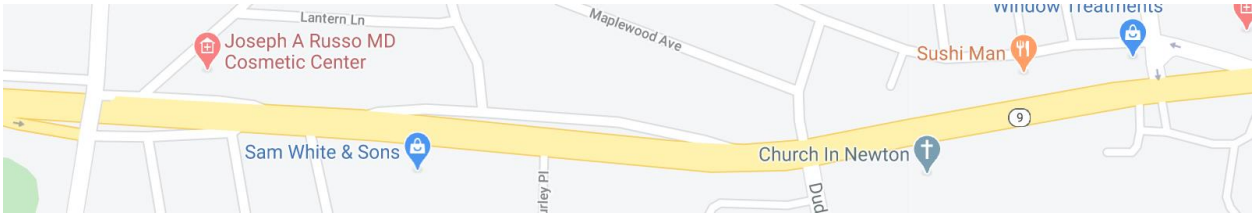
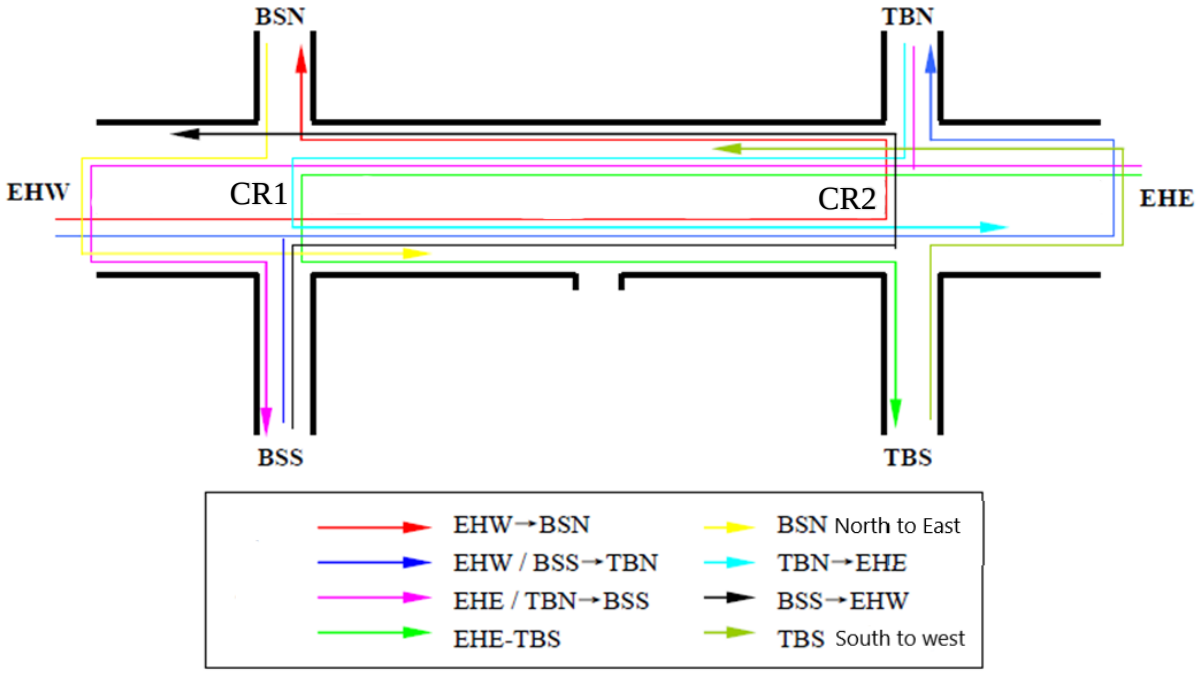
Introduction

As this is a solo project, this traffic simulation will focus on flow control on the light. I notice during COVID-19, traffic on the 9th road slow down as home quarantine order published. This project will do the simulation and compare the light duration time for different scenarios.



Building a traffic simulation for the 9th road in front of my apartment. As quarantine in the home in the past few months, I got more time to observe the traffic flow of the 9th road. Set two intersections as CR1 and CR2 and simplify the problem as the sample graph below.



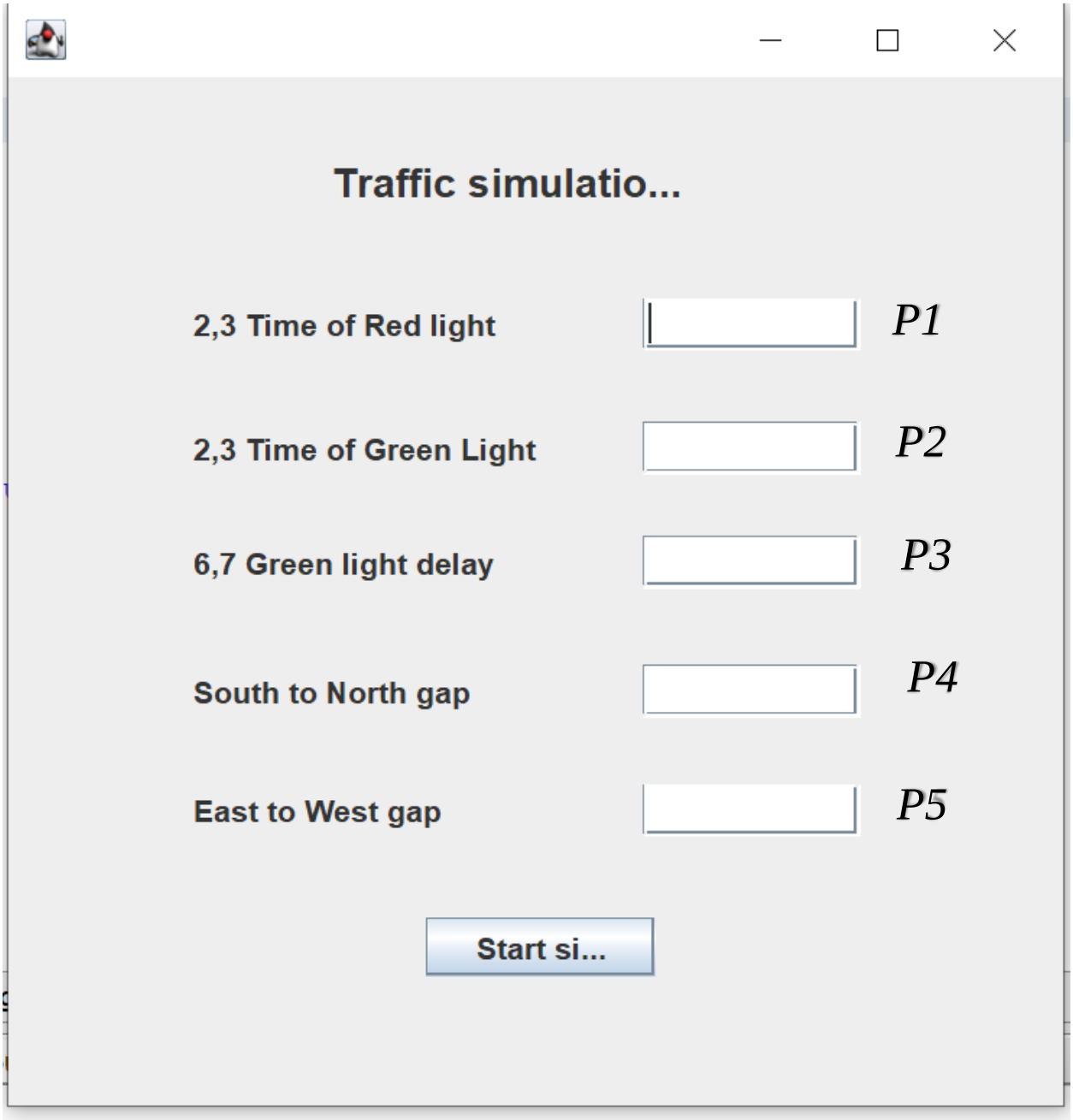
Assume light set (1,4) (2,3) (5,8), (6,7) change at the same time. And ignore the Yellow light.

Base on Observation, light set (1,4) and (5,8) has 20 seconds for green and 120 seconds for red. On the other hand, light set (2,3) and (6,7) has opposed set which is 20 seconds for red and 120 seconds for green.

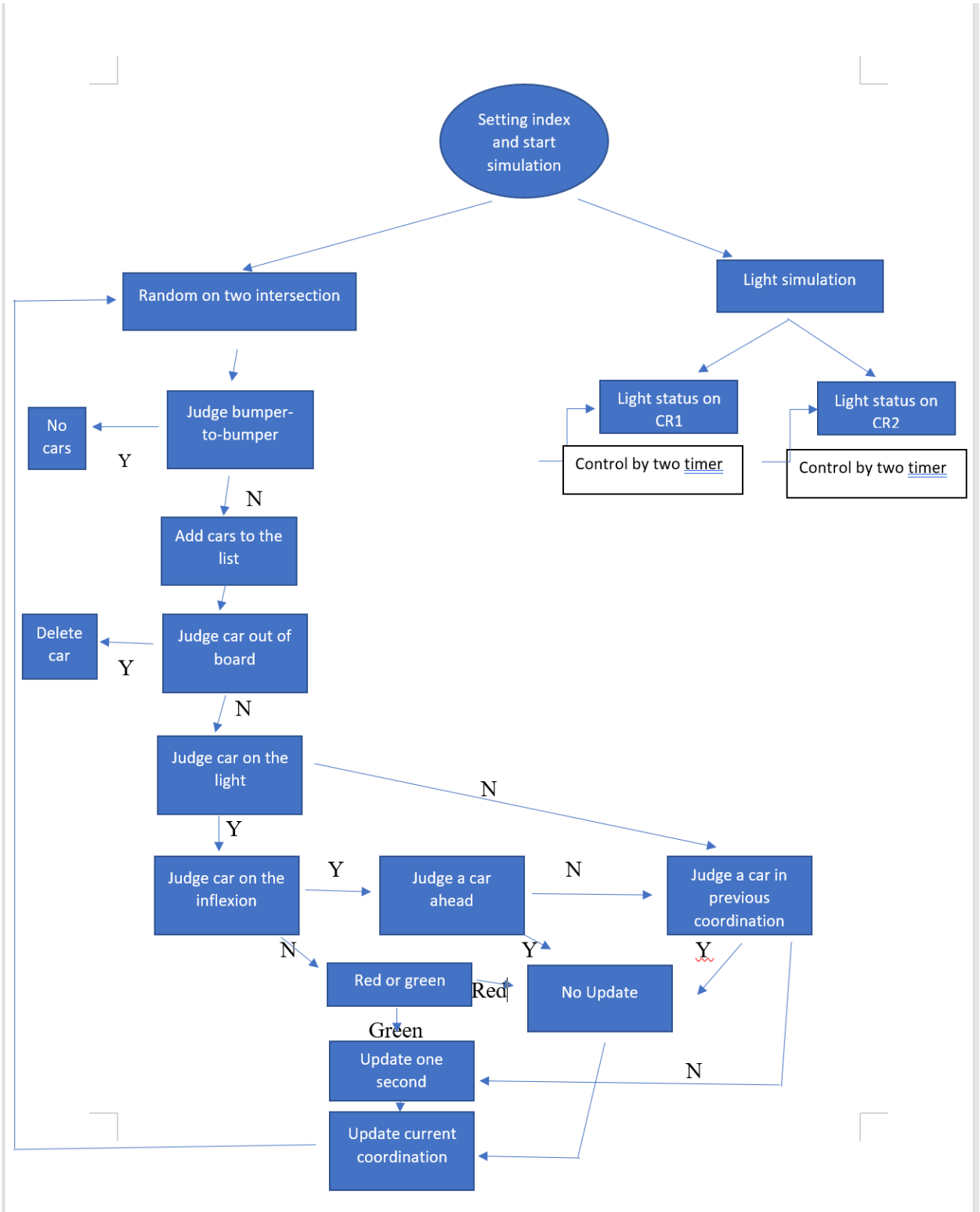
Assume all the car drives at the same speed and would not crash and past over. Simplify the multiple lances into the single lances. Driving time for different section assumes as below.

Section	Times (s)
BSN-CR1	5
TBN-CR2	5
CR1-CR2	60
EHW-CR1	15
EHW-CR2	15
BSS-CR1	20
TBS-CR2	20

Implementation



This is an interface for input the parameter includes duration time for the red light and green light. As we assume light set (1,4) (2,3) (5,8), (6,7) pare and change at the same time. Light set (1,4) and (2,3) in oppose and light set (5,8) and (6,7) in the opposite. 3 parameters can control all 8 status of the light set. The gap is the average time for a new car added. For two intersections we assume in the same time period, cars added smoothly.


Setting index and start simulation
Random on two intersection
Light simulation
Judge bumper-to-bumper
No cars
Y
N
Light status on CR1
Light status on CR2
Control by two timer
Control by two timer
Add cars to the list
Judge car out of board
Delete car
Y
N
Judge car on the light
N
Y
Judge car on the inflexion
Y
Judge a car ahead
N
Judge a car in previous coordination
N
Y
Y
Red or green
Red
No Update
Green
Update one second
N
Update current coordination

UML

Scenario 1 (Current COVID-19 condition)

set P1 = 20s , P2 = 120s, P3 = 60s, P4 = 2s and P5 =3s and start simulation. Cars from EHW and EHE shown in gray and cars from BSN, TBN, BSS, TBS shown in blue.

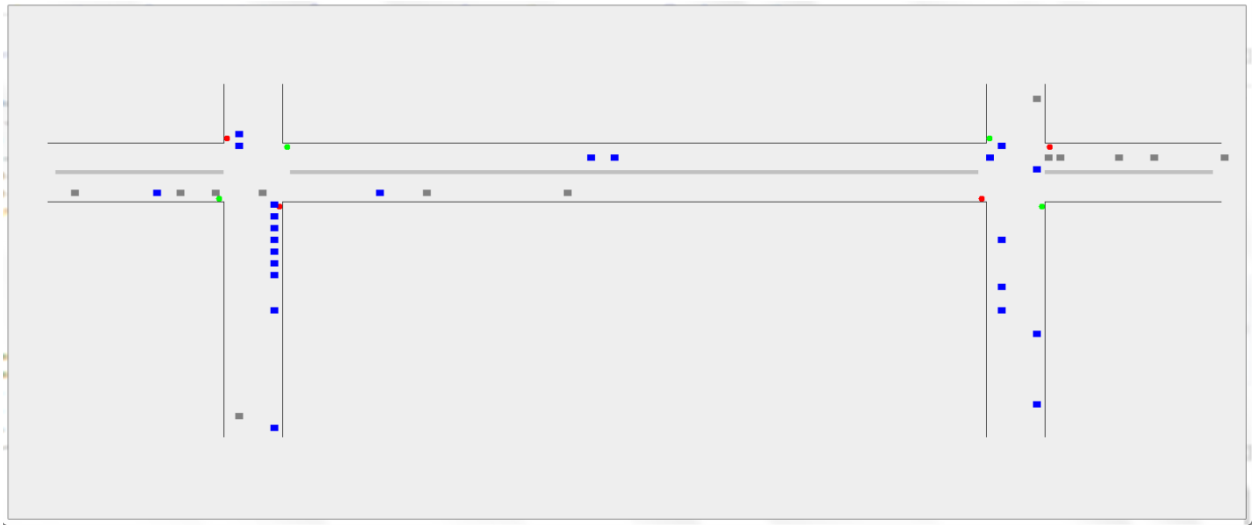


Figure1

As shown in figure 1 above, cars line up in CR1 from south to north in red light at (1,4) and (6,7).

As to keep going in the program like 5 mins, it is shown in figure 2. It becomes more line up in CR2 as turn left car is waiting for the go straight one.

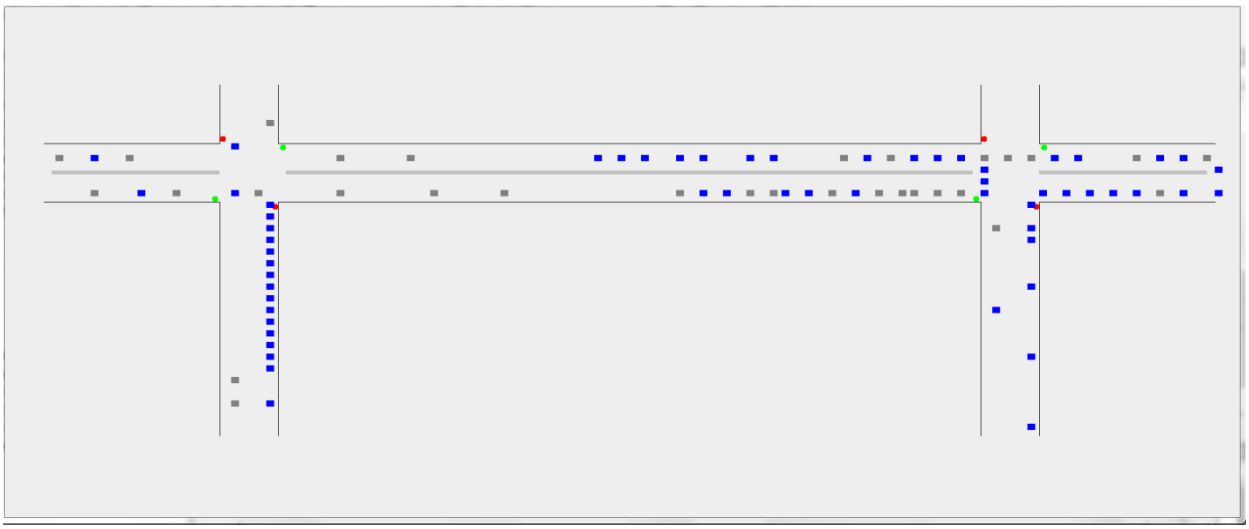


Figure 2

Scenario 2

if we switch the duration time for red and green which set the P1 = 120s , P2 = 20s and all the other parameter keep same

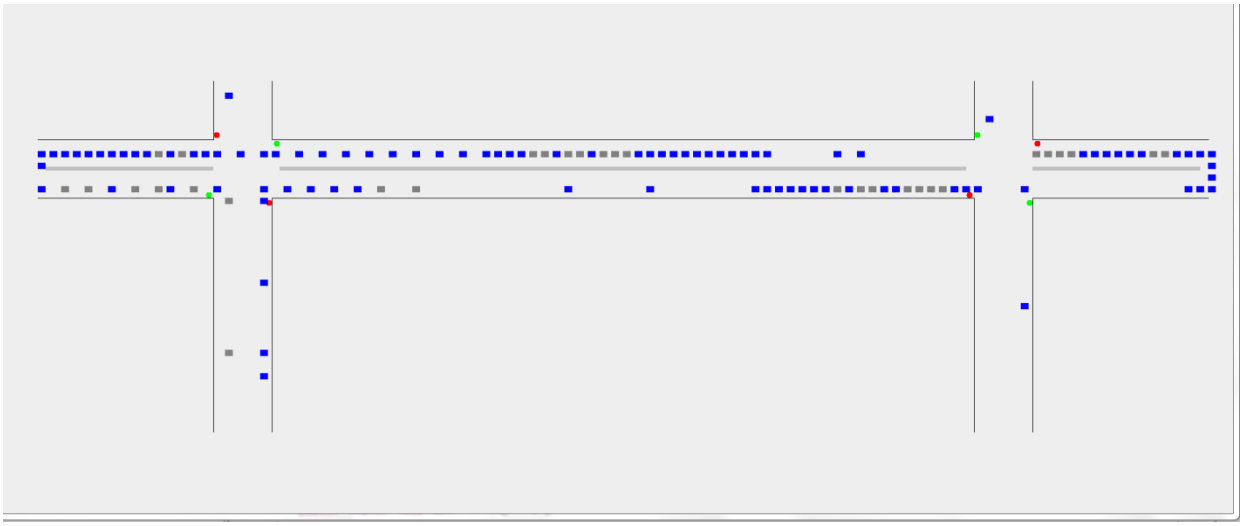


Figure 3

It starts jam immediately on 9th road (East-West) and the local drive path is empty (North-South). Like this, we can assume the 9th road arterial traffic should have more green light time to prevent a jam.

Scenario 3 (Normal condition)

As normal time with no COVID-19 condition, there has more traffic. Assume P4 =1s and P5 =1s , all the other parameter same as scenario 1

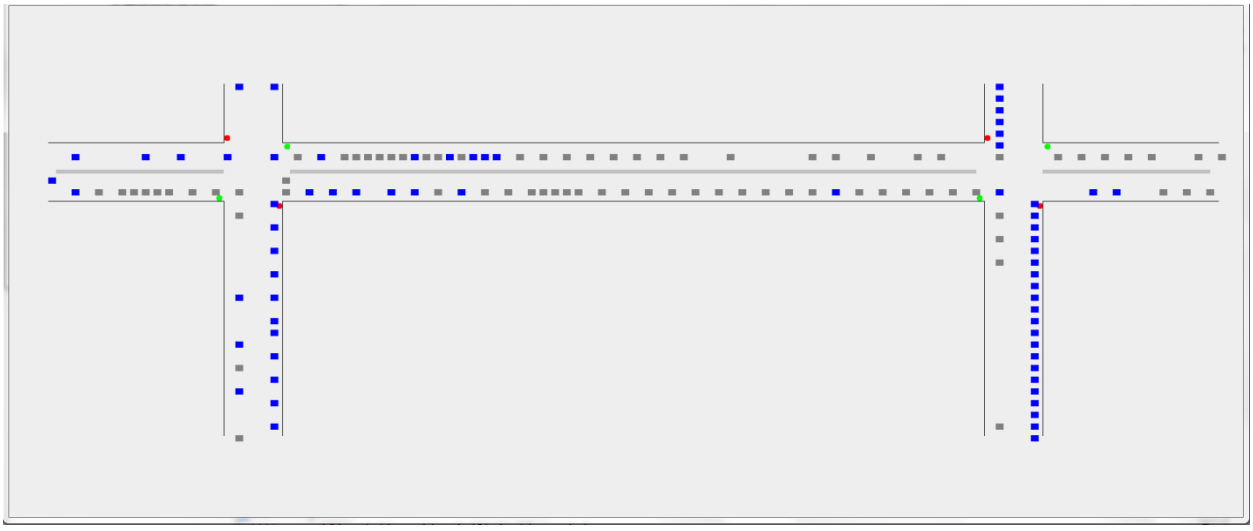


Figure 4

The program runs and started jam everywhere which is exact as morning traffic as usual.

Conclusion and future improvement

Based on the experiment it proves current traffic conditions turn better as the fewer car on the road. The density of the traffic is a key point for the traffic condition on the 9th road. Also, it is proved the 9th road needs more green light time for proven jam. As it is a solo project, a lot of factors are simplified, and all the car conditions assume the same. No crash, police vehicle ambulance is considered. No merge in the main road and all the cars at the same speed. For future improvement, all the factor can be more dynamic and more realistic