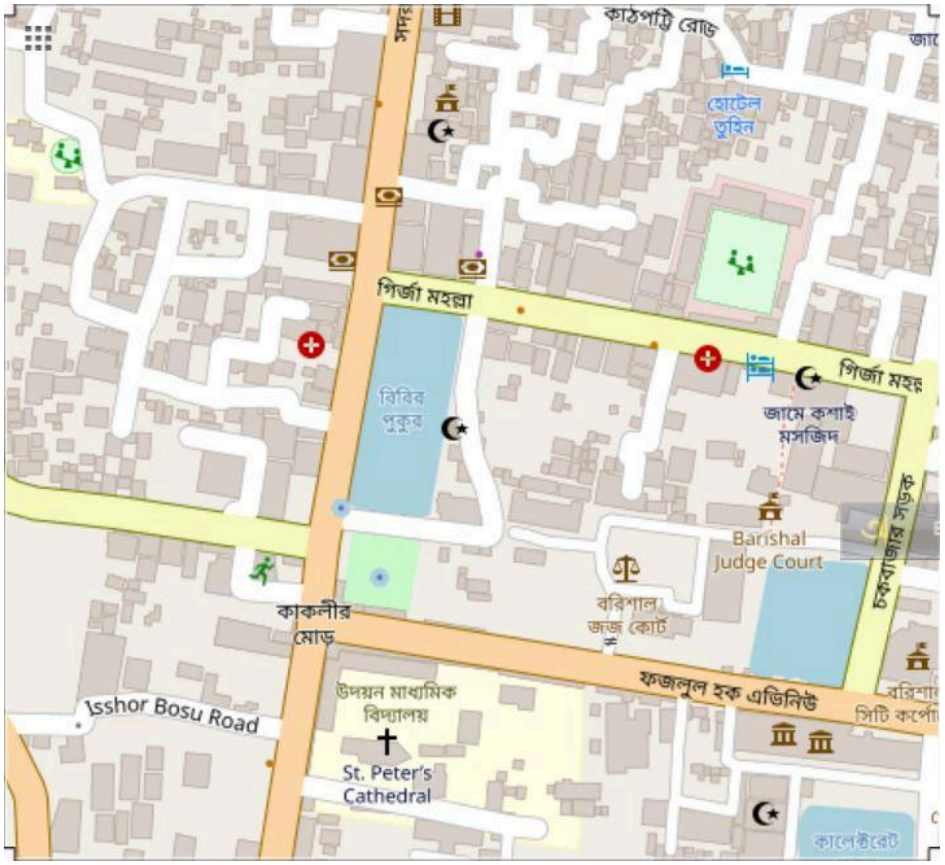
Project SUMO

Home District Map

A portion of the “Home District” is exported from “OpenStreetMap” as 170051025_map.osm.

Home District: Barishal



Converting OSM to XML

The following command is used in cmd for transforming the OSM file to XML, keeping the osmNetconvert.typ.xml file in the same directory. Output File Name: 170051025.net.xml.

Command: netconvert --osm-files 170051025_map.osm -o 170051025.net.xml -t osmNetconvert.typ.xml --xml-validation never.

```
Microsoft Windows [Version 10.0.19045.5440]
(c) Microsoft Corporation. All rights reserved.

D:\My Project\F>netconvert --osm-files "D:\My Project\F\Fmap.osm" -o "D:\My Project\F\Fmap.net.xml" -t "C:\Program Files
 (x86)\Eclipse\Sumo\data\typemap\osmNetconvert.typ.xml" --xml-validation never
Warning: Found sharp turn with radius 6.60 at the start of edge '-601497764#0'.
Warning: Speed of straight connection '-513966198#2_0->-513966198#1_0' reduced by 11.50 due to turning radius of 48.16 (
length=21.11, angle=40.54).
Warning: Speed of straight connection '-513966198#2_1->-513966198#1_1' reduced by 12.06 due to turning radius of 44.92 (
length=19.66, angle=40.54).
Warning: Speed of straight connection '513966198#1_0->513966198#2_0' reduced by 13.25 due to turning radius of 38.39 (le
ngth=16.75, angle=40.54).
Warning: Speed of straight connection '513966198#1_1->513966198#2_1' reduced by 12.65 due to turning radius of 41.64 (le
ngth=18.20, angle=40.54).
Warning: Speed of straight connection '-533904625_0->-513966198#2_0' reduced by 20.15 due to turning radius of 10.59 (le
ngth=10.81, angle=78.23).
Warning: 8 total messages of type: Speed of % connection '%' reduced by % due to turning radius of % (length=%, angle=%)
.
Success.

D:\My Project\F>
```

Built Network

The built network is, (170051025.net.xml)

Defining TAZ

Total Six TAZs are defined. (In future steps, 3 of the 6 TAZs are elected as Origin and remaining 3 out of the 6 TAZs are kept as destinations.)

TAZ No.	TAZ ID
1	-277166430
2	277166430
3	-533904625
4	533904625
5	336600790#3
6	-336600790#3
7	336600790#2
8	-336600790#2
9	602862812#0

10	-602862812#0
11	336600790#1
12	-336600790#1
13	336600790#0
14	-336600790#0

Code (File Name- 170051025taz.taz**):**

```
<additional>
    <tazs>
        <taz id="1" edges="-277166430">
        </taz>
        <taz id="2" edges="277166430">
        </taz>
        <taz id="3" edges="-533904625">
        </taz>
        <taz id="4" edges="533904625">
        </taz>
        <taz id="5" edges="336600790#3">
        </taz>
        <taz id="6" edges="-336600790#3">
        </taz>
        <taz id="7" edges="336600790#2”>
        </taz>
        <taz id="8" edges="-336600790#2">
        </taz>
        <taz id="9" edges="602862812#0">
```

```
        </taz>
        <taz id="10" edges="-602862812#0">
        </taz>
        <taz id="11" edges="336600790#1">
        </taz>
        <taz id="12" edges="-336600790#1">
        </taz>
        <taz id="13" edges="336600790#0">
        </taz>
        <taz id="14" edges="-336600790#0">
        </taz>
    </tazs>
</additional>
```

Defining OD

For intersection 1;

electing 2, 12 & 13, as “**Origins**”

1, 11 & 14 as “**Destinations**”

Similarly,

For intersection 2;

electing 8, 10 & 11, as “**Origins**”

7, 9 & 12 as “**Destinations**”

For intersection 1;

electing 4, 6 & 7, as “**Origins**”

3, 5 & 8 as “**Destinations**”

The total number of vehicles is equal to that of sum of all digits in the **student ID * 1000**. Therefore,

Number of vehicles = (1+8+0+7+0+1+0+2+5) * 1000

= 21 * 1000

= 21,000 vehicles

The vehicles are now evenly distributed in six OD pairs evenly as 21,000/6 = 3,500 vehicles.

For Intersection 1-

The vehicles are now evenly distributed in six OD pairs evenly as 21,000/6 = 3,500 vehicles.

OD Pair (O, D)	Vehicles
2, 11	3,500
2, 14	3,500
12, 1	3,500
12, 14	3,500
13, 11	3,500
13, 1	3,500

For Intersection 2:

The vehicles are now evenly distributed in six OD pairs evenly as 21,000/6 = 3,500 vehicles.

OD Pair (O, D)	Vehicles
11, 7	3,500
11, 9	3,500
8, 12	3,500
8, 9	3,500
10, 7	3,500
10, 12	3,500

For Intersection 3:

The vehicles are now evenly distributed in six OD pairs evenly as 21,000/6 = 3,500 vehicles.

OD Pair (O, D)	Vehicles

4, 5	3,500
4, 8	3,500
6, 3	3,500
6, 8	3,500
7, 5	3,500
7, 3	3,500

Code (File Name- FOD.od**):**

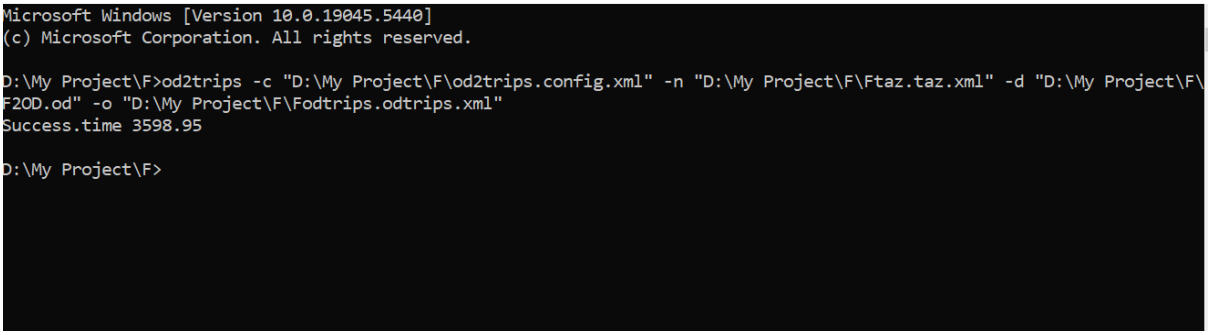
```
$O;D2

* From-Time To-Time

0.00 1.00

* Factor

1.00

* some

* additional

* comments

        2       11      350.00

        2       14      250.00

        12      1       350.00

        12      14      250.00

        13      1       450.00

        13      11      150.00

        11      7       250.00

        11      9       250.00

        8       12      250.00

        8       9       250.00

        10      7       350.00
```

10	12	350.00
4	5	350.00
4	8	250.00
6	3	350.00
6	8	250.00
7	5	350.00
7	3	250.00

Converting OD to OD2TRIPS:

Now, converting the ODs to OD2TRIPS. Following command was used in cmd, while keeping the od2trips.config.xml file in the same directory **Output File -** 170051025.odtrips.xml

Command: od2trips -c "D:\My Project\F\od2trips.config.xml" -n "D:\My Project\F\Ftaz.taz.xml" -d "D:\My Project\F\FOD.od" -o "D:\My Project\F\Fodtrips.odtrips.xml"



Creating Routes:

I create route files and save it as output file Froutes.rou.xml

Code for this:

<?xml version="1.0" encoding="UTF-8"?>

<routes>

<!-- Vehicle Types -->

<vType id="car" accel="2.5" decel="4.5" length="5.0" maxSpeed="50" sigma="0.1" color="0,0,0"/>

<vType id="truck" accel="1.0" decel="2.0" length="12.0" maxSpeed="30" sigma="0.1" color="0,0,0.5"/>

<vType id="autonomous" accel="2.0" decel="4.0" length="4.5" maxSpeed="55" sigma="0.05" color="1,0,0"/>

<vType id="bus" accel="1.2" decel="2.5" length="12.0" maxSpeed="25" sigma="0.1" color="1,1,0"/>

<vType id="autorickshaw" accel="1.5" decel="3.0" length="3.0" maxSpeed="35" sigma="0.1" color="0.82,0.70,0.55"/>

<!-- Routes from OD pairs -->

<route id="r_2_11" edges="277166430 336600790#1"/>

<route id="r_2_14" edges="277166430 -336600790#0"/>

<route id="r_12_1" edges="-336600790#1 -277166430"/>

<route id="r_12_14" edges="-336600790#1 -336600790#0"/>

<route id="r_13_1" edges="336600790#0 -277166430"/>

<route id="r_13_11" edges="336600790#0 336600790#1"/>

<route id="r_11_7" edges="336600790#1 336600790#2"/>

<route id="r_11_9" edges="336600790#1 602862812#0"/>

<route id="r_8_12" edges="-336600790#2 -336600790#1"/>

<route id="r_8_9" edges="-336600790#2 602862812#0"/>

<route id="r_10_7" edges="-602862812#0 336600790#2"/>

<route id="r_10_12" edges="-602862812#0 -336600790#1"/>

<route id="r_4_5" edges="533904625 336600790#3"/>

<route id="r_4_8" edges="533904625 -336600790#2"/>

<route id="r_6_3" edges="-336600790#3 -533904625"/>

<route id="r_6_8" edges="-336600790#3 -336600790#2"/>

<route id="r_7_5" edges="336600790#2 336600790#3"/>

<route id="r_7_3" edges="336600790#2 -533904625"/>

```
    <!-- Flows for each route with all 5 vehicle types -->


    <!-- 2->11 -->

        <flow id="flow_2_11_car" type="car" route="r_2_11" begin="0" end="3600" number="200"/>

        <flow id="flow_2_11_truck" type="truck" route="r_2_11" begin="0" end="3600" number="50"/>

        <flow id="flow_2_11_autonomous" type="autonomous" route="r_2_11" begin="0" end="3600" number="50"/>

        <flow id="flow_2_11_bus" type="bus" route="r_2_11" begin="0" end="3600" number="10"/>

        <flow id="flow_2_11_autorickshaw" type="autorickshaw" route="r_2_11" begin="0" end="3600" number="40"/>


    <!-- 2->14 -->

        <flow id="flow_2_14_car" type="car" route="r_2_14" begin="0" end="3600" number="150"/>

        <flow id="flow_2_14_truck" type="truck" route="r_2_14" begin="0" end="3600" number="50"/>

        <flow id="flow_2_14_autonomous" type="autonomous" route="r_2_14" begin="0" end="3600" number="30"/>

        <flow id="flow_2_14_bus" type="bus" route="r_2_14" begin="0" end="3600" number="10"/>

        <flow id="flow_2_14_autorickshaw" type="autorickshaw" route="r_2_14" begin="0" end="3600" number="10"/>


    <!-- 12->1 -->

        <flow id="flow_12_1_car" type="car" route="r_12_1" begin="0" end="3600" number="200"/>

        <flow id="flow_12_1_truck" type="truck" route="r_12_1" begin="0" end="3600" number="100"/>
```

<flow id="flow_12_1_autonomous" type="autonomous" route="r_12_1" begin="0" end="3600" number="30"/>

<flow id="flow_12_1_bus" type="bus" route="r_12_1" begin="0" end="3600" number="10"/>

<flow id="flow_12_1_autorickshaw" type="autorickshaw" route="r_12_1" begin="0" end="3600" number="10"/>

<!-- 12->14 -->

<flow id="flow_12_14_car" type="car" route="r_12_14" begin="0" end="3600" number="150"/>

<flow id="flow_12_14_truck" type="truck" route="r_12_14" begin="0" end="3600" number="50"/>

<flow id="flow_12_14_autonomous" type="autonomous" route="r_12_14" begin="0" end="3600" number="30"/>

<flow id="flow_12_14_bus" type="bus" route="r_12_14" begin="0" end="3600" number="10"/>

<flow id="flow_12_14_autorickshaw" type="autorickshaw" route="r_12_14" begin="0" end="3600" number="10"/>

<!-- 13->1 -->

<flow id="flow_13_1_car" type="car" route="r_13_1" begin="0" end="3600" number="200"/>

<flow id="flow_13_1_truck" type="truck" route="r_13_1" begin="0" end="3600" number="50"/>

<flow id="flow_13_1_autonomous" type="autonomous" route="r_13_1" begin="0" end="3600" number="150"/>

<flow id="flow_13_1_bus" type="bus" route="r_13_1" begin="0" end="3600" number="10"/>

<flow id="flow_13_1_autorickshaw" type="autorickshaw" route="r_13_1" begin="0" end="3600" number="10"/>

<!-- 13->11 -->

<flow id="flow_13_11_car" type="car" route="r_13_11" begin="0" end="3600" number="100"/>

<flow id="flow_13_11_truck" type="truck" route="r_13_11" begin="0" end="3600" number="20"/>

<flow id="flow_13_11_autonomous" type="autonomous" route="r_13_11" begin="0" end="3600" number="150"/>

<flow id="flow_13_11_bus" type="bus" route="r_13_11" begin="0" end="3600" number="10"/>

<flow id="flow_13_11_autorickshaw" type="autorickshaw" route="r_13_11" begin="0" end="3600" number="10"/>

<!-- 11->7 -->

<flow id="flow_11_7_car" type="car" route="r_11_7" begin="0" end="3600" number="150"/>

<flow id="flow_11_7_truck" type="truck" route="r_11_7" begin="0" end="3600" number="50"/>

<flow id="flow_11_7_autonomous" type="autonomous" route="r_11_7" begin="0" end="3600" number="30"/>

<flow id="flow_11_7_bus" type="bus" route="r_11_7" begin="0" end="3600" number="10"/>

<flow id="flow_11_7_autorickshaw" type="autorickshaw" route="r_11_7" begin="0" end="3600" number="10"/>

<!-- 11->9 -->

<flow id="flow_11_9_car" type="car" route="r_11_9" begin="0" end="3600" number="150"/>

<flow id="flow_11_9_truck" type="truck" route="r_11_9" begin="0" end="3600" number="50"/>

<flow id="flow_11_9_autonomous" type="autonomous" route="r_11_9" begin="0" end="3600" number="30"/>

<flow id="flow_11_9_bus" type="bus" route="r_11_9" begin="0" end="3600" number="10"/>

<flow id="flow_11_9_autorickshaw" type="autorickshaw" route="r_11_9" begin="0" end="3600" number="10"/>

<!-- 8->12 -->

<flow id="flow_8_12_car" type="car" route="r_8_12" begin="0" end="3600" number="150"/>

<flow id="flow_8_12_truck" type="truck" route="r_8_12" begin="0" end="3600" number="50"/>

<flow id="flow_8_12_autonomous" type="autonomous" route="r_8_12" begin="0" end="3600" number="30"/>

<flow id="flow_8_12_bus" type="bus" route="r_8_12" begin="0" end="3600" number="10"/>

<flow id="flow_8_12_autorickshaw" type="autorickshaw" route="r_8_12" begin="0" end="3600" number="10"/>

<!-- 8->9 -->

<flow id="flow_8_9_car" type="car" route="r_8_9" begin="0" end="3600" number="150"/>

<flow id="flow_8_9_truck" type="truck" route="r_8_9" begin="0" end="3600" number="50"/>

<flow id="flow_8_9_autonomous" type="autonomous" route="r_8_9" begin="0" end="3600" number="30"/>

<flow id="flow_8_9_bus" type="bus" route="r_8_9" begin="0" end="3600" number="10"/>

<flow id="flow_8_9_autorickshaw" type="autorickshaw" route="r_8_9" begin="0" end="3600" number="10"/>

<!-- 10->7 -->

<flow id="flow_10_7_car" type="car" route="r_10_7" begin="0" end="3600" number="200"/>

<flow id="flow_10_7_truck" type="truck" route="r_10_7" begin="0" end="3600" number="50"/>

<flow id="flow_10_7_autonomous" type="autonomous" route="r_10_7" begin="0" end="3600" number="50"/>

<flow id="flow_10_7_bus" type="bus" route="r_10_7" begin="0" end="3600" number="10"/>

<flow id="flow_10_7_autorickshaw" type="autorickshaw" route="r_10_7" begin="0" end="3600" number="10"/>

<!-- 10->12 -->

<flow id="flow_10_12_car" type="car" route="r_10_12" begin="0" end="3600" number="200"/>

<flow id="flow_10_12_truck" type="truck" route="r_10_12" begin="0" end="3600" number="50"/>

<flow id="flow_10_12_autonomous" type="autonomous" route="r_10_12" begin="0" end="3600" number="50"/>

<flow id="flow_10_12_bus" type="bus" route="r_10_12" begin="0" end="3600" number="10"/>

<flow id="flow_10_12_autorickshaw" type="autorickshaw" route="r_10_12" begin="0" end="3600" number="10"/>

<!-- 4->5 -->

<flow id="flow_4_5_car" type="car" route="r_4_5" begin="0" end="3600" number="150"/>

<flow id="flow_4_5_truck" type="truck" route="r_4_5" begin="0" end="3600" number="50"/>

<flow id="flow_4_5_autonomous" type="autonomous" route="r_4_5" begin="0" end="3600" number="120"/>

<flow id="flow_4_5_bus" type="bus" route="r_4_5" begin="0" end="3600" number="10"/>

<flow id="flow_4_5_autorickshaw" type="autorickshaw" route="r_4_5" begin="0" end="3600" number="20"/>

<!-- 4->8 -->

<flow id="flow_4_8_car" type="car" route="r_4_8" begin="0" end="3600" number="150"/>

<flow id="flow_4_8_truck" type="truck" route="r_4_8" begin="0" end="3600" number="50"/>

<flow id="flow_4_8_autonomous" type="autonomous" route="r_4_8" begin="0" end="3600" number="30"/>

<flow id="flow_4_8_bus" type="bus" route="r_4_8" begin="0" end="3600" number="10"/>

<flow id="flow_4_8_autorickshaw" type="autorickshaw" route="r_4_8" begin="0" end="3600" number="10"/>

<!-- 6->3 -->

<flow id="flow_6_3_car" type="car" route="r_6_3" begin="0" end="3600" number="200"/>

<flow id="flow_6_3_truck" type="truck" route="r_6_3" begin="0" end="3600" number="50"/>

<flow id="flow_6_3_autonomous" type="autonomous" route="r_6_3" begin="0" end="3600" number="100"/>

<flow id="flow_6_3_bus" type="bus" route="r_6_3" begin="0" end="3600" number="10"/>

<flow id="flow_6_3_autorickshaw" type="autorickshaw" route="r_6_3" begin="0" end="3600" number="10"/>

<!-- 6->8 -->

<flow id="flow_6_8_car" type="car" route="r_6_8" begin="0" end="3600" number="150"/>

<flow id="flow_6_8_truck" type="truck" route="r_6_8" begin="0" end="3600" number="50"/>

<flow id="flow_6_8_autonomous" type="autonomous" route="r_6_8" begin="0" end="3600" number="30"/>

<flow id="flow_6_8_bus" type="bus" route="r_6_8" begin="0" end="3600" number="10"/>

<flow id="flow_6_8_autorickshaw" type="autorickshaw" route="r_6_8" begin="0" end="3600" number="10"/>

<!-- 7->5 -->

<flow id="flow_7_5_car" type="car" route="r_7_5" begin="0" end="3600" number="150"/>

<flow id="flow_7_5_truck" type="truck" route="r_7_5" begin="0" end="3600" number="150"/>

<flow id="flow_7_5_autonomous" type="autonomous" route="r_7_5" begin="0" end="3600" number="30"/>

<flow id="flow_7_5_bus" type="bus" route="r_7_5" begin="0" end="3600" number="10"/>

<flow id="flow_7_5_autorickshaw" type="autorickshaw" route="r_7_5" begin="0" end="3600" number="10"/>

<!-- 7->3 -->

<flow id="flow_7_3_car" type="car" route="r_7_3" begin="0" end="3600" number="100"/>

<flow id="flow_7_3_truck" type="truck" route="r_7_3" begin="0" end="3600" number="100"/>

<flow id="flow_7_3_autonomous" type="autonomous" route="r_7_3" begin="0" end="3600" number="50"/>

<flow id="flow_7_3_bus" type="bus" route="r_7_3" begin="0" end="3600" number="10"/>

<flow id="flow_7_3_autorickshaw" type="autorickshaw" route="r_7_3" begin="0" end="3600" number="10"/>

</routes>

Creating Sumo Config. File:

File Name- 170051025_config.sumocfg

Code:

<configuration>

<input>

<net-file value="Fmap.net.xml"/>

<route-files value="Froutes.rou.xml"/>

</input>

<output>

```
        <queue-output
         value="D:\My Project\F\Fqueue.xml"/>
        <summary-output
         value="D:\My Project\F\Foutput.xml"/>
        <emission-output
                value= "D:\My Project\F\Femission.xml"/>
        <collision-output
                value= "D:\My Project\F\Fcollision.xml"/>
</output>

<time>
        <begin value="0"/>
        <end value="1000000000000"/>
</time>

</configuration>
```

Output Files –

queue-output

Fqueue.xml

summary-output

Foutput.xml

emission-output

Femission.xml

collision-output

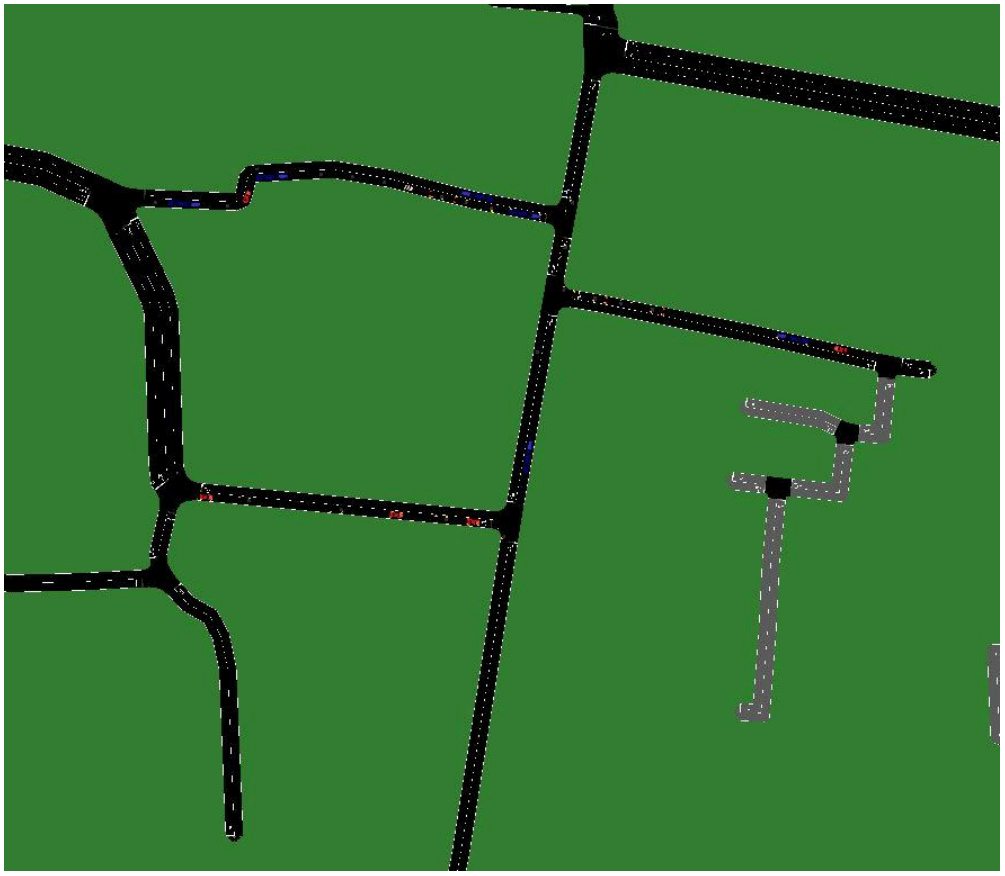
Fcollision.xml

Comments

Notable parameters identified from the outputs by converting the xml files to xlsx files are,

Parameters	Values
Queue Time	569 seconds
Queue Length	412.94 meters
Mean Waiting Time	248.14 seconds
Mean Travel Time	687.22 seconds

All the parameters value are very high. From the simulation it is seen that, most of the queue is formed at the T junction shown below,



Some key solutions can be

1. Increasing lane numbers

2. Channelization (For Left turning vehicles)
3. Actuated Signals
4. Interchange (Cloverleaf)