MARMARA UNIVERSITY

FACULTY OF ENGINEERING
COMPUTER SCIENCE & ENGINEERING DEPARTMENT

IE3081
MODELING AND DISCRETE SIMULATION
Homework #3

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System Components

We can simply explain our system components as follows:

- Booths: In our system design, there are two different booth types that are responsible for passing operations. One of them is the “Fast Payment System”, which is a system that allows drivers to checkout quicker; the other one is the “Cash Payment System” where drivers have to pay hand-to-hand.
- Vehicles: Drivers use vehicles in order to reach their destination points. Based on their attributes, they have to choose one type of booth to continue their paths.
- Highway Lines: The number of booths that we have in our system depend on the count of the highway lines. In addition, for the different variations of the traffic, number of highway lines have a massive importance.

Relations between System Components

According to architecture of our simulation, we can express the relations between our system components as follows:

- Vehicle – Fast Payment System Booth: Vehicles may pass through from these types of booths if they are suitable for this system. Serving time is relatively less than cash payment system booth, so it is more preferable for traffic crowdedness.
- Vehicle – Cash Payment System Booth: This is an alternative and more obsolete version of passing systems. Based on the primitiveness of this system, vehicles have to wait longer amount of times in order to get served.
- Highway Lines – Booths: The traffic density is strictly connected to these constants in our system. Besides, the number of total booths are exactly same with the number of highway lines in our system.

Generation of Random Variates

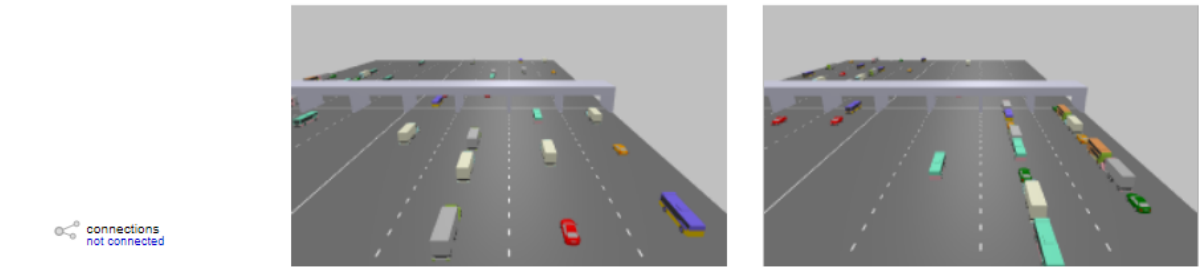
To examine different variates of our system, we've designed several approach cases for our system as follows:

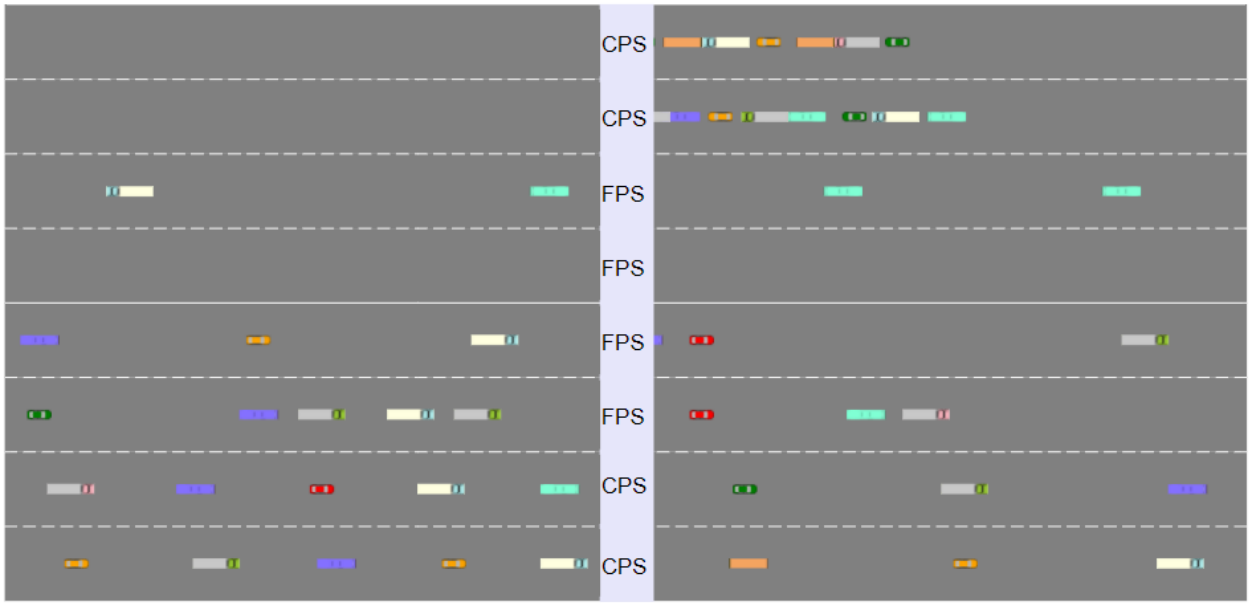
- Evening & Job Departure Time: In this variate design, vehicles are spawned at extremely high level. Most of the drivers are trying to reach their houses, so one of the highways is more crowded than the opposite highway.
- Afternoon & Regular Time: System is running at stabilized variables; traffic flow is moderate with reasonable number of vehicles.
- Morning & Job Arrival Time: This design is similar to the first one, but in an opposite manner. Drivers are trying to reach their jobs, so highway population is crowded.

We will be giving screenshots of our sample executions of these variates at upcoming parts.

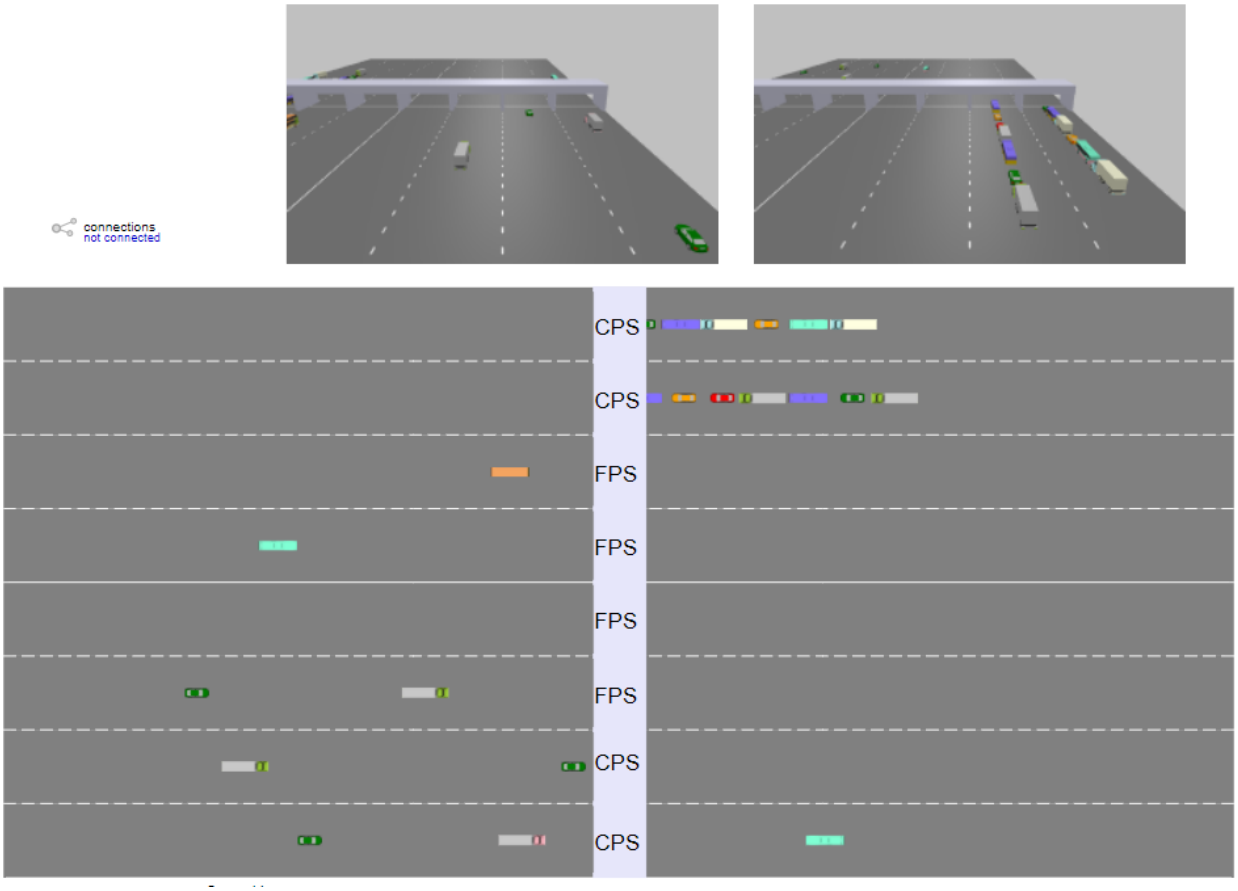
2D & 3D Views of the Model

- Evening Job Departure Time

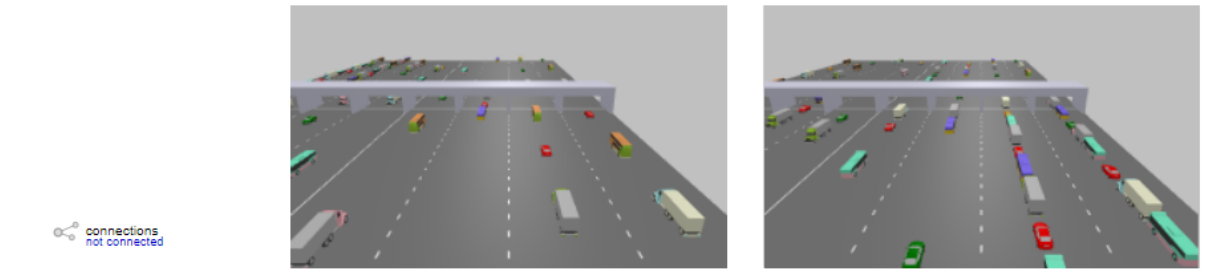


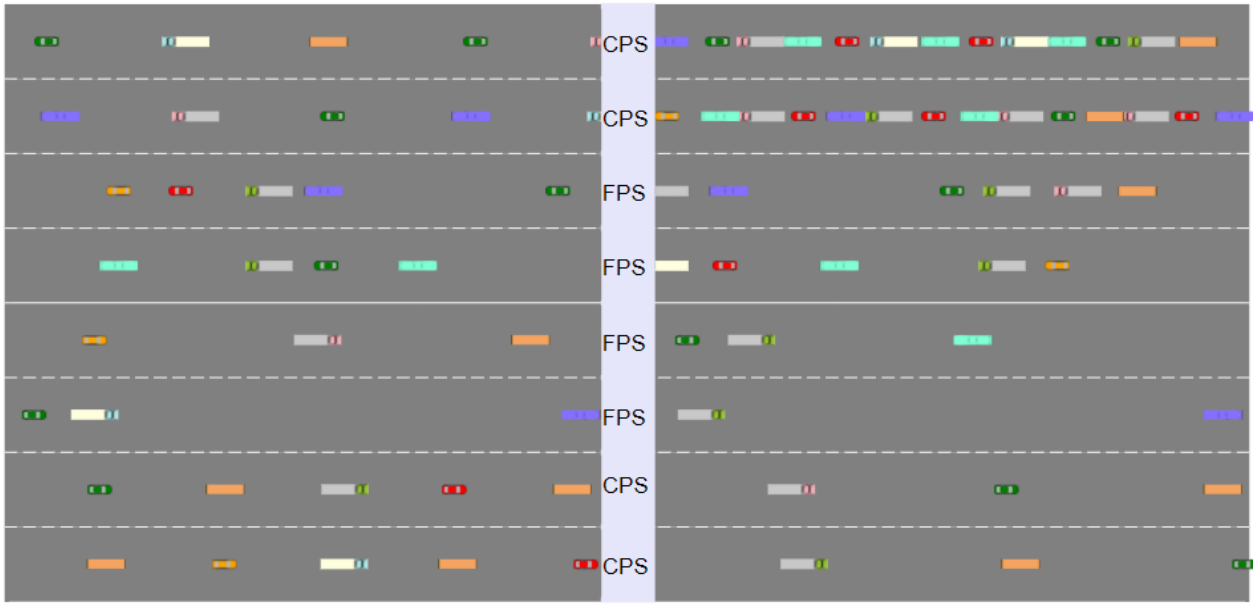


- Afternoon & Regular Time



- Morning & Job Arrival Time





Input Variables

Decision Variables

- Vehicle Count: To examine different variates, we can initialize this variable with different values.
- Vehicle Speed: Vehicle speed is also another aspect than we can control to modify traffic density.

Uncontrollable Variables

- Booth Count & Highway Lines: These constant values will be determined before the execution of our system.
- Randomness of different vehicles: Vehicles are spawned randomly, so this is another uncontrollable variable.
- Fast Passing Booth Serve Time & Cash Payment Booth Serve Time: Booth Serving Times are predefined, so every time we change the decision variables these two uncontrollable variables will remain same.

Type and the Values of Input Variables

- All of our input values are based on normal integer values.
- Vehicle Speed: Varies within range of 5 to 60 km/h.
- Booth Count: 8 total booths
- Fast Passing Booth Serve Time: around 1 second
- Cash Payment Booth Serve Time: around 2 seconds

Output Variables (Parameters)

- Waiting time at booth and also, throughout the highway will be our output parameters. According to the density of the traffic, chosen booth type and also speed of the vehicles will declare the values of output variables.

Output Values and Responses

- In a crowded road, a single car completes its road around 10 seconds if it chooses Cash Payment System.
- In a crowded road, a vehicle completes its road around 7 seconds if it chooses Fast Passing System.
- In an empty road, a vehicle completes its road around 3 seconds if it chooses Fast Passing System.
- In an empty road, a vehicle completes its road around 6 seconds if it chooses Cash Payment System.