



Chapter 5 Traffic Analysis

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Course Text: Chapter 5

Example 5.1: (Traffic Stream Model)

Available Information:

- A highway section is designed with a free-flow speed of 90 km/h and a capacity of 3300 veh/h
- A traffic volume of 2100 veh/h is observed on this highway.

Question:

- Predict the space-mean speed of the traffic flow (assume the Greenshield model applies)
- Construct a scenario that would correspond to the dual results obtained in the previous question.



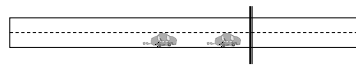
Example 5.2: (Poisson Model)

Available Information:

- Traffic volume (arrival rate) at a specific highway section is 360 veh/h (two way total)

Question:

- If an engineer is to count the number of vehicles passing this highway over a 20 second interval, what is the probability that he/she will observe 0, 1, or more than 2 vehicles over the given interval?
- If a pedestrian tries to cross this highway, what is the probability that she/he is able to cross the street immediately? (Note that in order to safely cross the street, she/he needs a gap of at least 8 seconds)



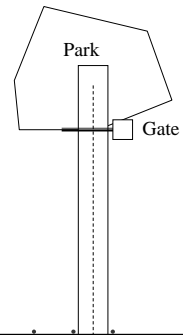
Example 5.3: (D/D/1 model)

Available Information:

- Vehicle arrives at the park gate uniformly:
8:00-8:20am: 480 veh/h
After 8:20am: 120 veh/h
- Vehicles are serviced at the gate at the same amount of time of 15 sec/veh.

Question:

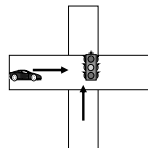
- What will be the length of length
- What will be the maximum delay?
- What will be the total vehicle delay?
- What will be the average delay?



Example 5.4: (Signalized Intersection)

Available Information:

- An intersection includes two approaches, each with one lane
- Vehicle arrives at the intersection at a constant rate (λ_1, λ_2)
- Signal control is pre-timed with a cycle time of C and a green duration of g and red duration of r ($r + g = C$)
- Vehicles can departure from the stop line during green time at a maximum rate of s



Question:

- What is the average delay for all vehicles passing the intersection?
- What is the maximum queue length?

Example 5.5: (M/M/1)

Available Information (Freeway metering system):

- An on-ramp of an expressway is controlled by a metering system (signal)
- The ramp can hold a maximum of 5 vehicles
- The average arriving traffic is 400 veh/h.
- Currently the metering system is operating at a rate of 500 veh/h (vehicles that can enter the expressway).

Question:

- What will be the expected number of cars in the system?
- If the metering system operates for 60 minutes, what is the expected number of minutes over which we will observe a queue spilling back to the arterial?

