UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH
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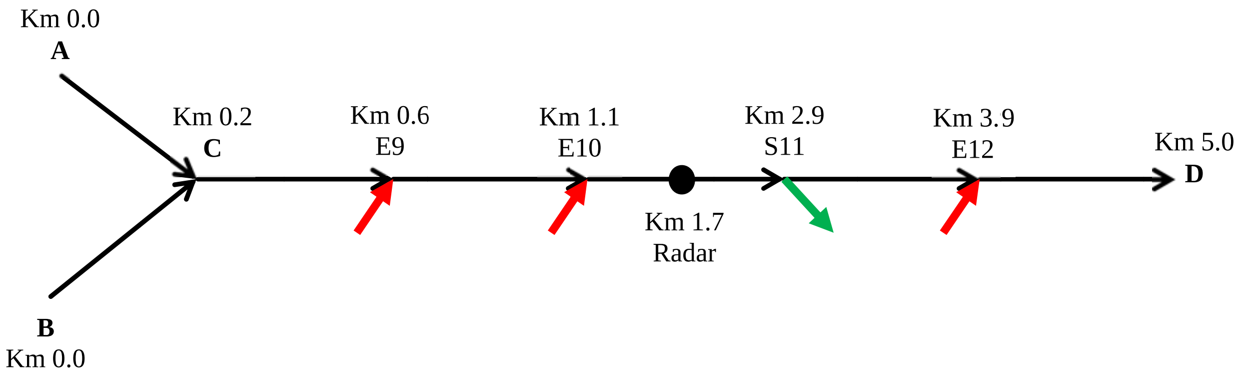
TRAFFIC (250ST2132)
Fall 2017 (Q3)

Mini Project 2 – Coding the CTM logic
(Due December 12th)

Consider the simple traffic network shown below. This is the layout of the B-23 freeway stretch, that you previously analyzed in MP1, suitably adapted for traffic simulation purposes.



Segments AC and BC merge into segment CD. Segments AC and BC are each 0.2 km long. Segment AC has 2 lanes while BC only 1. Vehicles on segment AC and BC have priorities proportional to the relative number of lanes when the merge at location C is queued. Segment CD is 4.8 km long and has 3 lanes. Segment CD contains three on-ramps and one off-ramp.

The capacity for each lane is 2000 veh/h/lane, the jam density is 140 veh/km/lane and the free flow speed is 100 km/h. Assume a triangular q-k relation.

Demand entering segments AC and BC, as well as demand willing to enter at all on-ramps, is given and can be downloaded from Atenea. Data is contained in an Excel spreadsheet named "MP2_Volumes". These data are the traffic demands for all sources on the stretch of the B-23 freeway shown in the figure above, during the morning rush on Tuesday, June 4th, 2013, from 7:00 to 10:00 am. The data is given over 60-second intervals.

On-ramps have enough capacity to handle the receiving demand, and their merging priorities when the main freeway trunk is queued are 0.2 at all on-ramps. In turn, the off-ramp (S11) has a maximum capacity of 1400 veh/h and supports a turning ratio of 0.2 for most of the morning rush. However, during some periods, the turning ratio increases to 0.25 at S11. The increase of the exiting demand activates the bottleneck at the downstream end of the off-ramp (there is a roundabout with traffic signals) and some capacity drop happens. These periods, and the resulting capacities of S11 are detailed in Table 1.

Period	Split Ratio	Capacity
07:53 - 08:05	0.25	1400 veh/h
08:22 - 09:10	0.25	1085 veh/h
09:45 - 09:55	0.25	900 veh/h

Table 1. Exit Demand Surge and Capacity Drop at S11

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YOU ARE TO write code (e.g. using Matlab, Excel or whatever) to simulate the performance of this stretch of the B-23 freeway during the morning rush, between 7:00 and 10:00. Assume that queues never reach the demand source at A and B, and that there is no capacity restriction after D. You are to use the logic of the **Cell Transmission Model**.

You are to submit a **formal report** that includes the following:

1. The code along with an accompanying description of its logic in text. This written description should serve as a kind of pseudo-code so that the reader can readily check your work.

2. The numerical solution of the problem using the Cell Transmission Model, including:
    a. A graphic that illustrates traffic conditions within the site. A time-space contour plot (e.g. color coded according to flow or density) would be appropriate.
    b. Suitable scaled N-curves obtained from CTM numerical results to calculate total delays.

3. Comparisons between the bottlenecks' measured features obtained in MP1 (e.g. the time and location of its activation and its discharge flows) and the simulated ones. Include a brief discussion.

4. Discussion in text. In this discussion, you might comment on the queue lengths and durations; causes of bottleneck activation; possible solutions; etc.