
Artificial Intelligence : Lab Exercise 2

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1 Motivation

We want to see for ourselves how *Google* maps works when it is suggesting routes based on congestion. First step is to simulate the traffic and congestion (which is the exercise of this lab session). Once we have created the traffic, the hope is that, we can run some heuristic search algorithm to find the best route (will change based on congestion) from source to destination (for future classes).

2 Simple Traffic Simulator

Creating environments is key, and in this lab session we will create an environment for the *Traffic Control* problem defined as below:

- The connection of the road network is specified as a matrix M (filename is *road*). There are 10 sites $(0, 1, \dots, 9)$. Entry $M(i, j)$ denotes the length of the road between site i and j (the roads are uni-directional). If the entry is 0, it means no connection.
- Vehicles depart from a source and then take a path (filename *vehicle*).
- The time of departure (in minutes) is also given in filename *time*, n^{th} vehicle departs at time instance n .
- Load the three files mentioned above using command, for example,
`pickle.load(open("road", "r"))`.
Each of them is a *numpy* matrix. So, you have to *import numpy* and *import pickle*.
- The roads are uni-directional (i.e., there could be a road from A to B , but not from B to A). The speed in unit distance per hour of the vehicle in a road is given by the formula
$$\exp(0.5x)/(1 + \exp(0.5x)) + 15/(1 + \exp(0.5x)), \quad (1)$$
where x is the number of vehicles ahead in a given road. If there are n vehicles in the road, then for the first vehicle $x = 0$, second vehicle $x = 1$, and for the last vehicle $x = n - 1$. The time taken to travel the road is $\frac{dist}{speed}$.

3 Some tips

The traffic system is a *event-driven* environment. Here, we have to keep track of what happens when, i.e., the state evolves based on activity. In particular, the state will contain: a) the current road the vehicle is in, b) the time it will leave the current road (equal to the time it enters plus the time taken to travel the road). Once the vehicle leaves the road network, we no longer care about it (it can be removed). Please evolve the data structure along this idea.

4 General Instructions

- You are allowed to work in groups of 2 or 3. Once you finish the exercise, please send a .zip file that contains your code (as well as an info.txt with your names/roll and a brief description of the code) to Rekha Raj C T (111804102@smail.iitpkd.ac.in). The evaluation will be 20, 20, 60 (two internals and finals), but your submissions of lab exercise will be taken as additional credit (just in case to save you if you did badly in the finals or the internals).