Multi-agent System
CSE-531
Final Exam (Take home)
Submission: Dec 2 in class through presentation

Problem statement:

Consider a road network with junctions as nodes and the road between the junctions as edges (as shown in Figure 1). Few hospitals are randomly connected to the some of the nodes. That is, one hospital is connected to one node only. Initially, ambulances are randomly placed in the graph. Accidents happen on the road network and each ambulance receives this information in near real-time. So the ambulances have to cooperate with each other such that the patient is treated by the hospital in time.

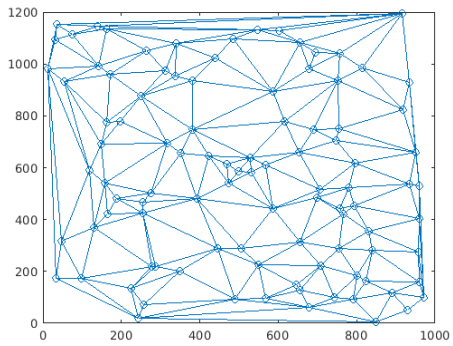

Figure 1: Road network

Assumptions

1. Previous 48Hrs of data is available.
2. Everyone knows everything – fully connected network
3. No fuel limitations
4. An ambulance can change (exchange) the patient if they are within a distance of r (5-10m) (only at the junctions). R can be defined by you.
5. Each patient is cleared within **1800 seconds** after they are dropped at the hospital.

Constraints

1. The ambulances move along the road network only. Their max speed is fixed by the traffic. However, they can go as slow as you want.
2. **The traffic changes periodically.** So at any point of time, each ambulance can know the traffic in terms of max speed on that road section.
3. Each hospital has a max capacity of **10 patients** at any point in time. If you bring in a new patient, then the patient needs to wait until one of the patient is cleared.
4. One ambulance can carry one person.
5. Each accident patient needs to be treated within ‘x’ seconds after the accident has occurred (t+x seconds). Note that if the patient is bough to a hospital that is full within ‘x’ but is in queue and by the time the treatment is started, the time the time is more than ‘t+x’ then the patient is treated as dead.

Objective

1. Minimize the number of dead people with the simulation duration

2. Plot a graph, wherein, for the same traffic data, the number of people dead while increasing the number of ambulances
3. Plot a graph, for a given number of ambulances, the number of accidents are increased.

What needs to be shown in the class

1. PPT with the scenario
2. Describe your strategy and why did you select that. How do you think it will fair better
3. Show a simulation video of how the vehicles are moving from their current location to the patient, picking the patient and dropping at the hospital. For all the vehicles and not just one vehicle
4. Show the graphs

Bonus

1. The ambulances have limited fuel.
2. Include few depots (5)
3. Show that the ambulance fuel is coming low and it is going to the fuel depot for refueling and performing its other functions.