CSIE 5452, Fall 2020 — Homework 3

Due November 16 (Monday) at Noon

1 Intersection Management (16pts)

In the lecture, we introduced the *timing conflict graph* G to model the intersection management problem. We can remove some edges in G to get an acyclic graph G' as the solution of the problem. However, we need to build and verify the corresponding *resource conflict graph* H' of G' — if H' is acyclic, then there is no deadlock in the solution G'. Please explain what will happen in the special case that the whole intersection is modeled as one single conflict zone. How will you solve the special case?

2 Realization of Level-X Autonomy (24pts)

In your opinion, when will be level-3/level-4/level-5 autonomy become realized? There will be no correct answers to these questions, and you can also answer them from many different perspectives including technology, cost, regulation, law, and human comfort. However, you should justify your answers with some explanation (*e.g.*, few sentences for each level). We will have a discussion session for this later. (This question will be graded by a letter grade with default grade A.)

1. (8pts) Level 3.
2. (8pts) Level 4.
3. (8pts) Level 5.

3 Cycle Removal (30pts)

Please download the benchmark "Input1.dat" and "Input2.dat" from NTU COOL. Each benchmark represents a graph, where the first number is the number of vertices (indexed from 0), and the second number is the number of edges. Each of the following lines contains the index of the source vertex and the index of the target vertex of each edge. You are required to do three things in your submission:

1. Answer if there is a cycle in "Input1.dat" and, if yes, list the edges that you remove to make the graph acyclic (adding any edge that you remove back to the acyclic graph should make the graph cyclic).
2. Answer if there is a cycle in "Input2.dat" and, if yes, list the edges that you remove to make the graph acyclic (adding any edge that you remove back to the acyclic graph should make the graph cyclic).
3. Print out your source codes. We may ask you to provide your source codes which must be the same as those on your printout. If the source codes are clearly wrong implementation, it is regarded as academic dishonesty.