CSIE 3015, Fall 2021: Homework 3

Due November 12 (Friday) at 11:59pm

1 ADAS, Connectivity, and Autonomy (36pts)

1. (18pts) Please list and briefly explain three benefits of connected vehicles and/or autonomous vehicles?
2. (18pts) Please list and briefly explain three concerns of connected vehicles and/or autonomous vehicles?

The question will be graded by qualitative grading. We expect that most students will get 90% points but not 100% points.

2 Fatality Risk of Transportation (18pts)

There are many ways to measure risk and safety. For example, you can measure how often a human driver needs to take over the control from an autonomous vehicle. Here, we are considering the fatality risk of transportation.

1. (6pts) There are also three popular definitions of the fatality risk of transportation: (1) deaths per billion typical journeys taken, (2) deaths per billion hours traveled, or (3) deaths per billion kilometers traveled[1]. Which one do you like (*i.e.*, match your idea of "transportation risk") the most? Why?
2. (12pts) Please list and briefly explain two reasons that people may not choose the transportation method with the lowest fatality risk (defined by themselves) to travel.

The question will be graded by qualitative grading. We expect that most students will get 90% points but not 100% points.

3 Finite State Machines (22pts)

The original drop-out condition of NTU is to fail 50% or more credits in one semester and then fail 33% or more credits in any of the following semesters. The updated drop-out condition is to fail 50% or more credits in one semester and then fail 33% or more credits in the "next" semester. The finite state machine of the original drop-out policy is shown in Figure 1, where the state-transition happens at the end of each semester.

1. (6pts) Please update the finite state machine to match the updated drop-out policy.

[1] Check the link to Wikipedia for the statistics of the United Kingdom in 1990—2000.

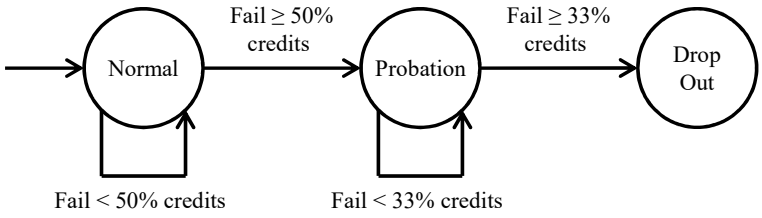

Figure 1: The finite state machine of the original drop-out policy.

2. (6pts) Student A fails 33% or more credits at most twice within any six consecutive semesters. Student B fails 33% or more credits at most once within any two consecutive semesters, which also implied that Student B fails 33% or more credits at most three times within any six consecutive semesters (note that the implication of the other direction is not true). Given the updated drop-out condition, which student is more likely to be dropped out from NTU? Please explain.

3. (10pts) Please add one more state "graduation" and the corresponding transitions to the updated finite state machines. If needed, you can add some assumptions to justify your finite state machine.

4 Formal Verification (24pts)

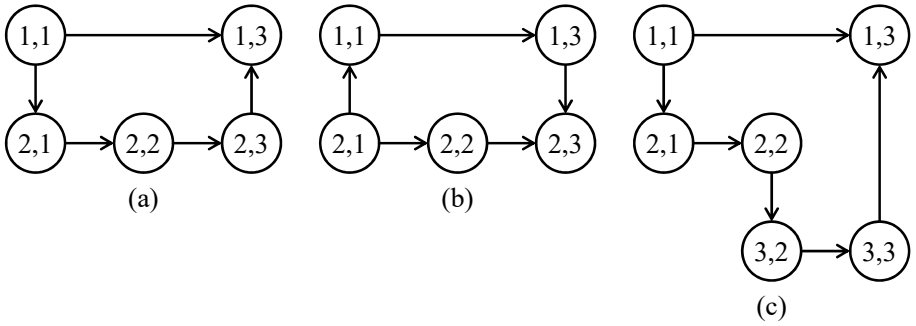

Figure 2: The conflic graphs of intersection management.

Given the definition of a conflict graph in the lecture, please answer if each of the following conflict graphs has a deadlock. If there is no deadlock, please explain the passing order. If there is a deadlock, please explain why there is a deadlock.

1. (8pts) Figure 2(a).

2. (8pts) Figure 2(b).

3. (8pts) Figure 2(c).