CX 4230, Spring 2016: Projects 2-B & 2-C

For the last two parts of Project 2 (parts B & C), you will implement a discrete event simulator for an emergency evacuation scenario on the Georgia Tech campus.

- *Project 2-B* is an intermediate checkpoint, due **Friday, March 4 at 11:59 PM AOE.**
- *Project 2-C* is te final submission, due **Sunday, March 13 at 11:59 PM AOE.**

The main reason for the intermediate checkpoint is to force you to make progress, rather than waiting until the last minute.

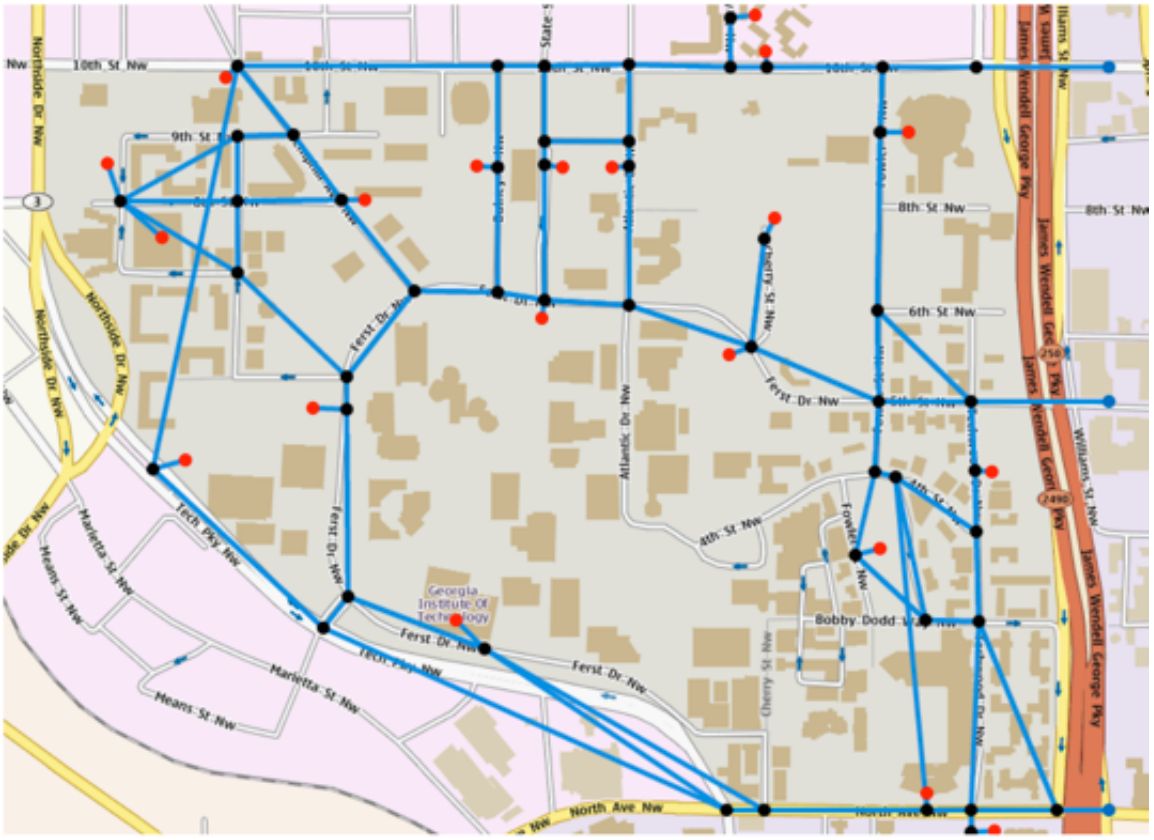
You may work individually though you are **strongly encouraged** to work in pairs.

Problem Statement: Campus Evacuation

Your task is to design a conceptual model and implement a simulator that could be used to study traffic management plans for evacuating the Georgia Tech campus.

The specific scenario is as follows. A couple of your “friends” in Chemistry are goofing around (as chemists are wont to do) at an off-site lab, directly west of campus. They cause a hazardous chemical spill, which releases a dangerous smoke plume around noon on a Wednesday when classes are in session. All individuals who are on campus at the time must be evacuated by traveling eastward, over the North Avenue, Fifth Street, and Tenth Street overpasses of the I75/I85 highway. Assume that once an individual has crossed the overpass bridge, they are out of harms way and their travel beyond that point need not be modeled.

Your task is to create and test an evacuation plan, in which officers direct traffic at select intersections. (You can decide where to place officers and by what policy they should direct traffic.) You should compare this plan to the case in which the traffic lights at all intersections go to “flashing red” mode, and cars choose the direction of travel. How much faster is directed travel (by the officers) compared to free-choice travel (cars decide on their own)?



(http://i.imgur.com/F2YlzKc.png)

Figure: A simplified representation of the GT road network. Red dots are parking lots, black dots are major intersections, and blue lines are the paths to be simulated.

Constraints

For this study, you must develop and use a discrete event simulator based on a conceptual model based on queueing networks. You may use any programming language you wish to implement your simulator.

The simulation must be stochastic, i.e., use random numbers to model unpredictable elements of the system. You may use an existing random number generator library, or develop your own. As part of the simulation study you must validate your random number generator using a suitable statistical test.

You are free to use software components available on the web or through other (legal) means, with the constraint that source code for any software you utilize must be available and turned in along with the code that you develop, with attribution to the source. You may **not** use software or results developed by other students in the class for this problem. You may use a general-purpose discrete event or agent-based simulation software package if you wish, but you may not use a pre-existing traffic simulation package. In all cases, you must document and cite the source of any software you use; failure to do so will be

considered plagiarism, and subject to disciplinary measures. Further, you must fully understand any software you use and be able to articulate the merits and limitations of this software, and justify its use in your study.

Resources

To help simplify your task, we've prepared a simplified road network of the GT campus. You can find the data and a brief R script to visualize it here: https://bitbucket.org/gtcx4230sp15/gt-world (https://bitbucket.org/gtcx4230sp15/gt-world)

What to Submit

Project 2-B. You will submit both a short document and at least a partial code implementation of your simulator. Put these materials in a **private** repository on the Georgia Tech GitHub site (https://github.gatech.edu) and add Jordi (`jwp3`) and me (`rvuduc3`) as contributors. On T-Square, submit the URL of your repository. You need only create one repository per team.

The document should be either a PDF or plaintext (preferably Markdown) containing a brief, formal writeup of your conceptual model and an overview of your software implementation. The software does not have to be fully functioning but there should be a quick demo of whatever you have working that we can easily run.

Project 2-C. Your repository should be updated to include the final code implementation and a brief writeup summarizing your results, including your tests of the random number generator you used and an output analysis.

Other remarks

This assignment is, by design, somewhat open-ended. A detailed, realistic study of an actual evacuation scenario would require far more time than what is allowed here. You will not have all the information you need, so you will have to make assumptions and approximations. Nevertheless, time constraints and missing important information are the reality in most real world studies! Do your best.

You final grade will be determined, in part, by the effort you put into this study. While it is fine to import software from other sources to solve the problem, such time-saving activities should be compensated with more time spent in other aspects of the study,

e.g., the experimentation or data collection portions, relative to other groups that choose to develop their software entirely from scratch.