Project Proposal

Sam and Dhara

Our Goals

- Want to be able to see what our algorithm is doing live (data visualization!!)
- Explore a problem that exists in the real world
- Treat working on this project remotely as an opportunity to build good remote work practices
- Understand the connections between multiple layers of abstraction (e.g. the real-world problem, visual representations, code, and underlying CS proofs)

Initial Ideas

Out of a larger list of interests/ideas we picked 4 that we really liked!

1. Robotic Arm Motion ~ https://arxiv.org/abs/1810.04255
2. Automatic Circuit Layout ~ http://opencircuitdesign.com/

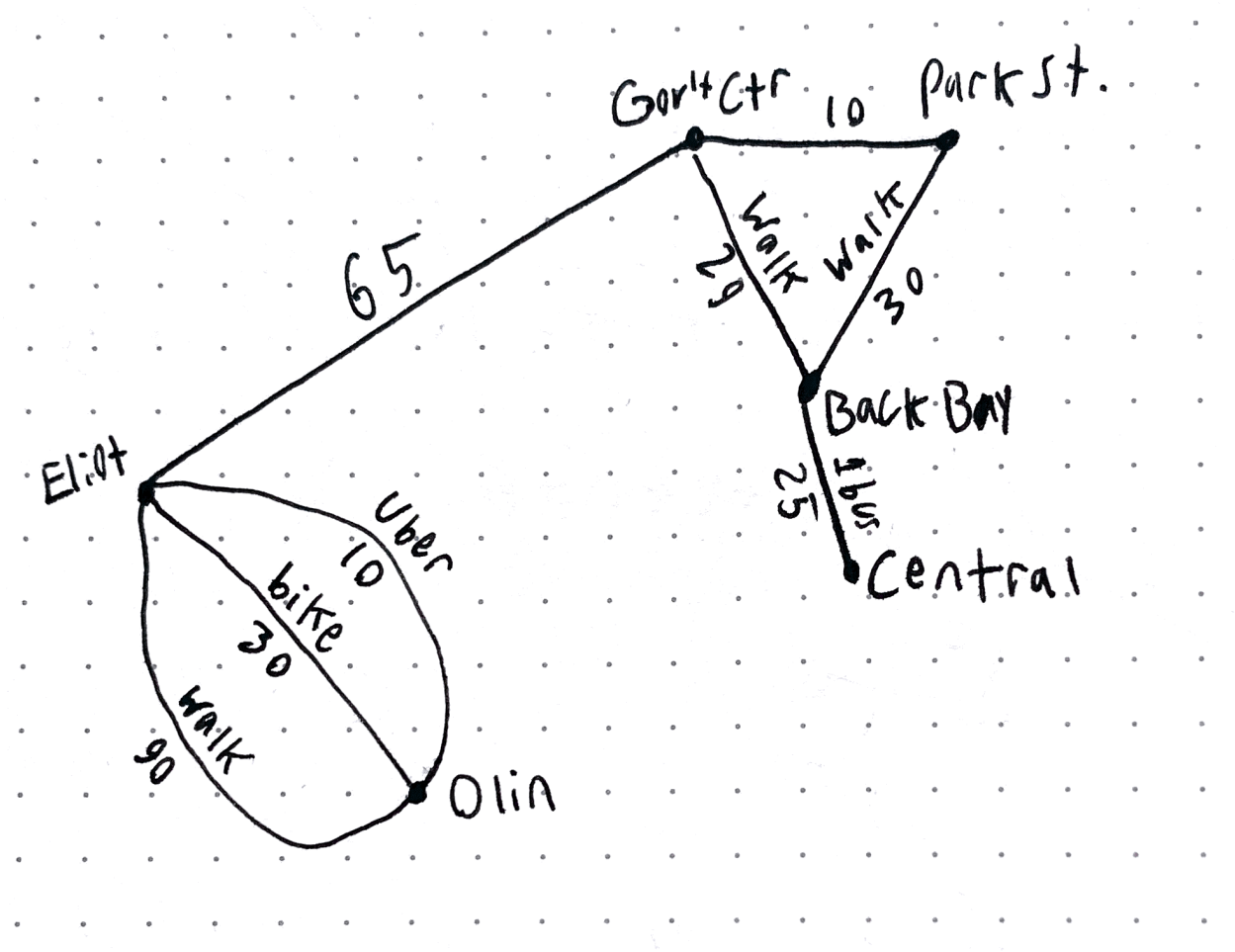
3. Intelligent queuing for jobs (e.g. CNC, lasercutter, 3D Printer) https://github.com/LaserQueue/LaserQueue *
4. Mapping/transit directions ~ https://www.isis.vanderbilt.edu/sites/default/files/smartcomp2016.pdf

* This is Sam's project from a few years ago, which uses a simplistic implementation of priority-based queue ranking. We would use something more advanced, maybe a topological sort based on order of part assembly/priority, if we implemented this.

Current Direction

Currently, we are leaning towards implementing a mapping/transit routing system. This problem can be well-scoped for shortest-path algorithms, because it consists of determining a physical shortest path. We also want to add more rich information to the graph we design, like the cost and time range for each service, and perhaps even the variations in timing. Since a lot of pathways off campus have a wide range of timings, we want to factor that into our planning.

As an MVP, we would implement a datastructure that tracks multiple pathways off campus through hubs like Eliot and the Commuter Rail, with edge weights representing average timings. We can pick the shortest path from the "Olin" node to some programmed other nodes like "Central Square," "Boston Common," and "Natick Mall." As a stretch goal, we'd return a list of options with time ranges that update based on likelihood of, for example, missing a train.



A simple subset of the Boston // Olin transit graph

References

1. Real-time and Predictive Analytics for Smart Public Transportation Decision Support System

   https://www.isis.vanderbilt.edu/sites/default/files/smartcomp2016.pdf

2. Dynamic travel time prediction using data clustering and genetic programming

   https://www.sciencedirect.com/science/article/pii/S0968090X14000588