Let's run - Real Time Constrained Routing

Alex Cheadle, supervised by Dr Nicolas Wu

University of Bristol

Introduction

There are major benefits to running as a group, but organizing runs with friends or attending run clubs at a set time is a hassle. What if there were an easy way to do this? Imagine: when you wanted to go for a run - if you could just hit a button on a mobile application, which could then route you to run with others. It's like a virtual and real time run club! This project investigates the theory behind this idea, namely to develop a method to route runners to run with others.

Progress

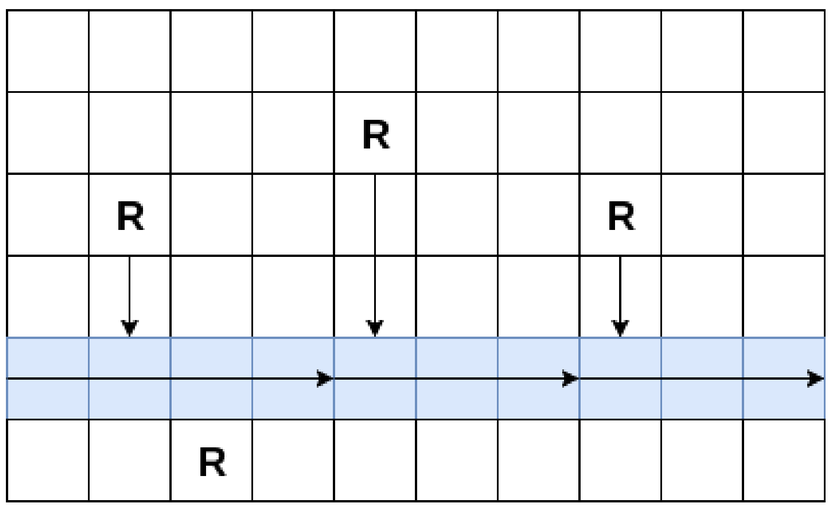
- Designed a theoretical model of runners
- Converted OSM map files to graphs for runners to run on
- Built a Client Server system to visualize the runners using Python, Flask, OpenLayers, Javascript
- Created several formal models of routing runners
- Defined multiple scores - what should a successful routing maximize?

ToDo

- Extend the formal model from a grid approach to a graph, developing techniques to choose the best path.
- Evaluate the system against alternative approaches, a simple greedy search. Can compare different branches of the method with the different scoring metrics.

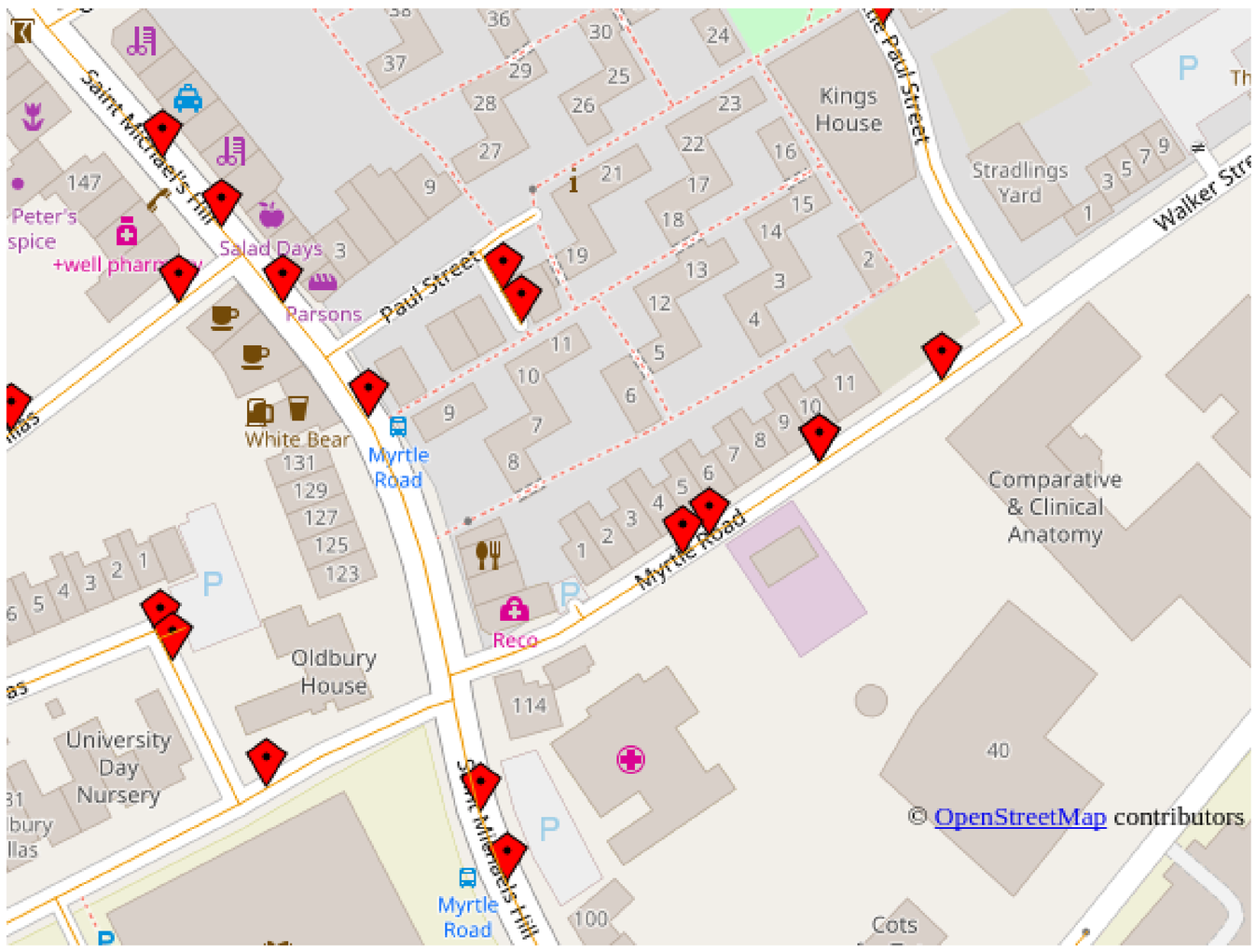
Modeling

By reducing the problem down to simpler versions, we can solve sub problems and have better control over assumptions when introducing complexity. Below we can see a snapshot of a simple model, with 4 runners able to move one cell per time step.



We can set the running path in this simple model, allowing runners to join others on the path. Now, we can solve a simpler problem - maximizing the amount of overlapping runs on the path.

Visualizing Runners with OpenLayers



Above we can see a visualization of the model. One time-step is viewed, with the red markers representing the individual runners in the system. They have all got a path set to route them to another runner.