

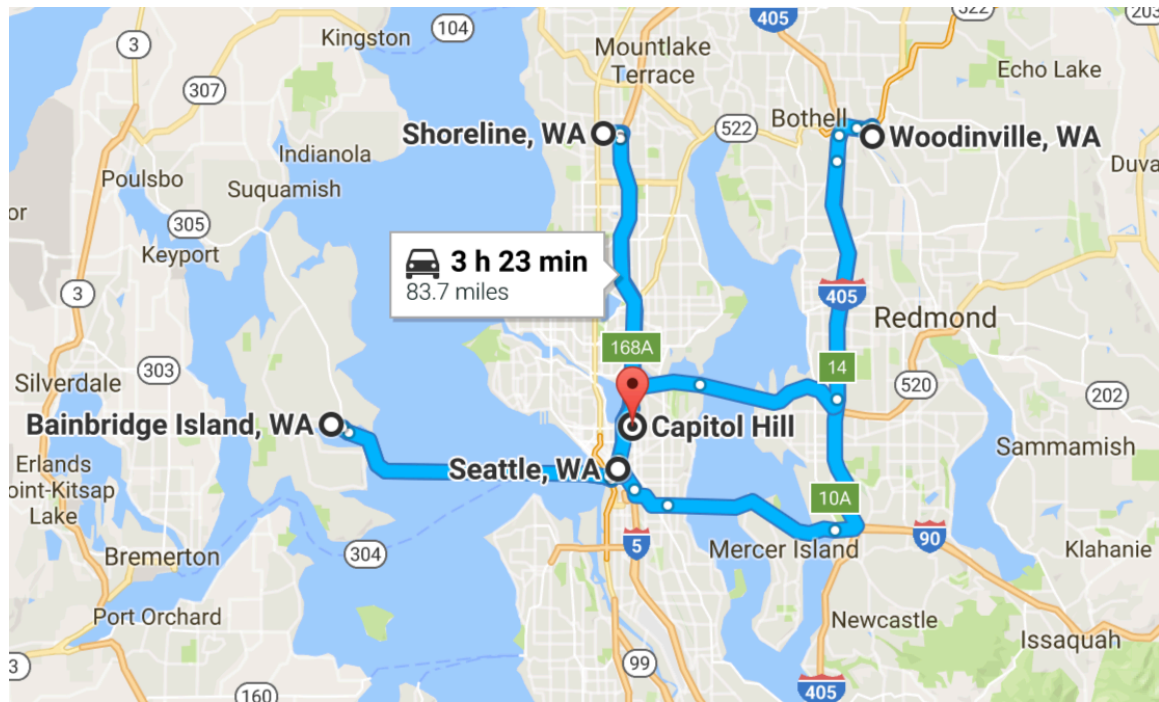
Peter Giseburt
petergg@uw.edu
Sam Smith
sss26@uw.edu

Our product is a path finding application for a path that includes multiple stops, which will tell you the most efficient or a highly efficient path between all the stops. This will be limited to the university district for reasoning that will be explained later. It can be used by food delivery services such as Jimmy Johns bikers or by drop-off services such as NightRide and Uber. Obviously, this can be highly useful for companies such as the aforementioned ones, but individuals can also find use in it when dropping people off or going to run errands. Through finding the most efficient paths and cutting down on travel time, this product can get people food sooner, get them home faster, and decrease general travel time. While Google Maps can give you directions on how to navigate between multiple destinations, it requires that you pick the ordering and doesn't have the ability to find the best path for you, while our product will. The current problem with services such as NightRide is that when multiple destinations must be reached, inefficient routes with unnecessarily long travel times are taken. This product has the potential of reducing traffic in the UW area, and can increase general productivity of both businesses and individuals.

Our product will need to have a map with locations you will be going to. It will need to have a way to enter addresses and talk to the internet about your current location and progress on the path. This requires that we have a live location service that constantly tracks your location, as well as a user-friendly mapping interface that makes it clear where you are and where you are going. Because drivers will need to see the route they are taking as they are taking it, it is pivotal that they have easy access to the route during their travel. As smart phones are the most widespread and commonly used tool for guided travel services, this product should be designed as a mobile application. Specifically, we will make an android app as android apps run on java code while iOS apps run on Objective C and/or Swift which fewer people are familiar with. Gathering all of the necessary data for determining the most efficient route through several locations is a monumental task, however we can use information from Google Maps to map out roads and their travel times during different parts of the day.

The most obvious concern is that what we are attempting to do is equivalent to handling the Travelling Salesman problem, which states that when trying to find the most efficient path through several destinations, the runtime is $n!$. There is no generally efficient algorithm that can handle this problem, so we must find ways to reduce runtime. However, our algorithm doesn't need to be instant, as it is assumed you will be traveling a large enough distance that there is a point to using our product. There is time for the product to find the best path while already traveling. It could either pick a first destination right away and take you to that and build the most efficient path from the remaining points, take you towards the cluster of

destinations if you did not want to commit to a destination before you got the most efficient path, or in the cases with minimal destinations you could just wait until the algorithm is done before you start the journey. Another way to reduce time is to reduce the n in $n!$. Certain users of this tool will not have large values of n when using it. By piggybacking on Google Maps' estimations for single destinations, we can reduce hundreds of streets between two destinations into a single weighted edge, which will vastly eliminate the data that our algorithm will have to deal with.



While this is Google Maps, our product will have a similar interface making it easy for a multiple destination path.