MEMORANDUM
DATE: January 17, 2019
TO: Dr. Dan Ames
FROM: Emily Andrus, Camille Lunt, Bruce Wang (Team Go On Green)
SUBJECT: 514 Project Proposal

Introduction

The purpose of this memo is to propose Team Go On Green's idea for the 514 Web Application project. The title of the proposed project is Go Connected. Described below are the following: brief background and aim of the web application, data requirements, general overview of the workflow, a brief description of the user interface, as well as account and licensing information. A brief plan of project leadership and additional resources will also be provided.

Background and Aim

All three team members (Emily Andrus, Camille Lunt, and Bruce Wang) are interested in careers in the transportation engineering field, and thus pay special attention to the different modes of transportation available to them and their effectiveness. As college students, network connectivity (defined in this case as the ease of getting from one location to another within an urban area) is especially on the minds of the team members as they seek ways to save money, stay safe, and be healthy. In Provo, examples of different modes of transportation include driving, walking, biking, and taking public transportation (including city bus, bus rapid transit, and commuter rail).

The idea for this project stemmed from an internship experience that Emily had this past summer while working for a transportation engineering firm. During the internship she became familiar with a guidebook published by the Federal Highway Administration (FHWA), titled "Measuring Multimodal Network Connectivity" (2018) and used its principles to complete a network connectivity study of the bicycle and pedestrian facilities of a section of Boise, Idaho. Go Connected will be based on "Measuring Multimodal Network Connectivity." More information about this guidebook will be included in the appendix of this proposal.

The aim of the proposed web application is to allow the user to determine the network connectivity rating for any defined urban area (at the neighborhood, city, or metropolitan area level). This will aid the user in planning for many different situations. For example, imagine the user is taking a trip to a conference he wishes to attend. He would want to know what type of

transportation he should plan. Can he get around via public transit or should he rent a car? Or imagine a young professional choosing where to live at the start of her career. How "bikeable" is the location of her dream job? Can she get around effectively without having to buy a car? Having a web application to answer these questions can help both of these people (and many others) make decisions more easily about the modes of transportation that are most readily accessible to them.

Data Requirements and Analysis

Data required for this project could include, but is not limited to, the following:

- City boundaries (The cities we choose should have enough data that will support our calculation and evaluation.)
- Roads (city road network, urban roads, residential roads, commercial roads, etc.)
- Network quality
- Density (population, network)
- Access (route access)
- Transit (transit type: public transit, bicycle, walking, etc)
- Land parcels (type, land use, etc.)
- Travel cost (travel distance, travel time, delay time, money cost, comfort, safety)
- Bike lanes
- Sidewalks
- Terrain

Analysis and evaluation on the above data would include the following:

- Least cost path calculation
- Score weighting
- Overall rating

General Overview of the Workflow

The general data mentioned above would be used to calculate five different measures of connectivity for transit, bicycle facilities, and pedestrian facilities. These measures include: network density, network quality, network completeness, route directness, and access to destinations. Any or all of these measures could be used to measure connectivity and can be

adapted. The FHWA Guidebook offers a general outline but can be changed and added to as needed by the user. Each measure of connectivity could be calculated using a recommended method or by a method not mentioned in the Guidebook, but for the purposes of creating a web application, the methods recommended in the Guidebook will be used.

Each dataset will be analyzed using the five connectivity measures. Network density is calculated using the number of street-miles of transit route, bike lane, or pedestrian facilities per square-mile of road. Network quality is a subjective measure based on the use. At its most basic, network quality could be defined by saying high quality is where there are additional facilities, and low quality is where there are no additional facilities outside of the road itself. Quality can also be based on lane or sidewalk width, or if additional data is available, the actual quality of pavement or asphalt. Network completeness is measured using the percentage of road that has a transit route, bike lane, or pedestrian facility. Route directness is measured as the amount of out-of-direction travel as a percentage of the shortest path. In other words, route directness defines the shortest path from an origin to a destination and then measures how far off of that path one must travel to go from origin to destination. This is then represented as a percentage (actual travel distance divided by the shortest path length). Finally access to destinations is measured by the number of homes and/or jobs that are accessible from the different modes of transport.

Once ranges for each measure are established the ranges can be reclassified into a scale of 1-5. The reclassified values can be used to create a weighted average of scores and create an overall connectivity rating.

Description of the User Interface

Upon opening the web application, the user will see a zoomed-out map. There will be a search box where the user can search for his or her location of interest. Options will auto populate that suggest options of cities and metropolitan areas pre-programmed into the web application.

After selecting the area of interest, the user then will be directed to click on their desired origin and destination. The user will also get to select their trip purpose: work, school, shopping, or exercise, as well as check one or more of the following modes of transportation for analysis: walking, biking, and riding public transit. After selecting the area, purpose of trip, and mode(s) of transportation, the user may click the compute button.

The user will then be able to view the determined connectivity ratings for the selected modes as well as some additional information about the area (e.g. transit fares, travel time, delay time) if available. The user will also be able to see the individual ratings for the five measures of connectivity: quality, completeness, density, route access, and route directness.

Account and Licensing

An account on GitHub has been created with the username of GoOnGreen. The source code will be saved onto GitHub using this account.

An MIT license will be used to license the source code for the web application. MIT licensing allows others to use the code written for this web application and provides protection to the authors of the code.

Additional Information: Project Leadership and Other Resources

The following three section leaders have been decided: Emily as the design leader, Camille as the GIS leader, and Bruce as the User Interface leader.

The idea and methodology for this project are adapted from the FHWA's Guidebook for Measuring Multimodal Network Connectivity, published in February 2018. This guidebook can be found on the US Department of Transportation;'s website here:

https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_connectivity/