Multi-City, National-Scale Direct-Demand Models of Peak-Period Bicycle and Pedestrian Traffic

**Summary**

Background: Pedestrian and bicycle traffic estimates are essential inputs for transportation models and analyses. Direct demand models, although effective to generate these estimates, are very city-specific and not transferable. Additionally, they require count data as inputs, which are rare in cities that have limited resources to collect non-motorized traffic counts. This necessitates a set of multi-city, national-scale direct-demand models of bicycle and pedestrian traffic in the continental U.S.

**Objective:** To develop a modeling tool that can be used nationwide in different jurisdictions to assess the spatial patterns of bicycle and pedestrian traffic.

**Methods:**
- Compiling a national-scale database of peak-period bicycle and pedestrian traffic counts.
- Tabulating various land use, demographic, and transportation network predictor variables at each count location.
- Developing direct-demand models to estimate spatial patterns of bicycle and pedestrian traffic.

**Expected Results:**
- More generalizable results about how certain aspects of the built environment are correlated with bicycle and pedestrian traffic.
- A potential solution is to develop multi-city models with generalizable results that may be applied to jurisdictions with few resources with more confidence.

**Work Plan**

The project includes four tasks undertaken by a team at Portland State University and a team at Virginia Tech. We will use the traffic count data from the National Bicycle and Pedestrian Documentation Project (NBPDP) and from additional cities where count data are available. We will then incorporate with Census & ACS data, TIGER shapefiles, EPA's Smart Location Database, and various local GIS data for land use and transportation networks. Base-case direct demand models at the national scale will be built based on those data.

1. **NBPDP traffic count data aggregation**
   - Team: PSU
   - Outcomes: Cleaned count data of major U.S. cities.

2. **Tabulating predictor variables**
   - Team: VT
   - Outcomes: land use, transportation network characteristics, neighborhood characteristics.

3. **Base-case Direct-Demand Models**
   - Team: VT
   - Outcomes: First direct-demand models at the national-scale.

4. **Alternative model specifications**
   - Team: VT
   - Outcomes: Alternative 1: Bicycle facility data
   - Alternative 2: Spatially dense traffic counts

**Previous Work**

We will employ the method used in Hankey & Lindsay (2016) to estimate non-motorized traffic in Minneapolis, MN.

In their models, pedestrian and bicycle traffic were spatially estimated at the city block level using a stepwise linear regression method. This allowed for varying the scale of land use and transportation variables (e.g. industrial area, population density, bicycle facilities, retail area, open space, transit stops). These models were then compared with reduced-formed models that obtain similar results with fewer predictor variables.

Using a similar approach, we will develop base-case models that include only predictor variables that are available at a national-level. We will then compare them with a set of models that include local context variables to demonstrate how locally-specific information aids in the estimation process.

**Timeline**

This project will be implemented from December 2015 to May 2017, with the preliminary work performed during the first four months. The major work started from May 2016, where the PSU team processed traffic count data. The VT team will continue the work from August 2016, and will submit the final report in May 2017.

**Preliminary Count Database by City and MSA**

The preliminary count database contains data from major cities. More cities will be added to the database. (*) MSAs

**Reference:**