The Collaborative Synergy: Using GIS Modeling and Walkway Network Analysis to Rearticulate and Assess Demand for Pedestrian Service Improvements and Walkability in Arnold Creek

Project Description
This project blends a variety of GIS modeling, network analysis, and public participation GIS tools and techniques to identify and assess deficiencies in pedestrian transportation service. Our approach involved creating a GIS walkway network model that could be used to identify and evaluate the impact of infrastructure improvements on the walkway network for residents. Specifically, we attempted to create a GIS walkway network model that:

- Realistically reflects the population, paths, and destinations connected to the pedestrian transportation system
- While accurately measuring the network's impedances
- Provides a platform which allows citizen concerns and proposals to be articulated and evaluated in a GIS format
- Produces meaningful outputs that demonstrate the quantifiable impact of proposed infrastructure projects.

Methodology
Setting up the GIS walkway network model
The primary dataset used to create the GIS walkway network model was created by various agencies of the City of Portland and was collected through the city's property database. This dataset included information on streets, sidewalks, and other walkable areas.

After establishing these original routes, nodes, and destinations, the next step was to create a raster version of the network model. This was accomplished by using the Node Verification tool that is a part of Open Source applications.

Once verified, the walkway network was generated via an automated tool that "unfolds" the streets centerlines and creates the entire street network in a raster format.

The walkway network model was then weighted and showed various factors, such as distance, automobile traffic, and, in some cases, the presence or absence of sidewalks.

GIS network analysis of barriers and impediments
After the walkway network was weighted, we applied various GIS spatial analysis tools to identify and assess barriers that could be considered.

Specifically, after rasterizing the vector walkway network model, we assessed factors that could be considered to highlight barriers and obstacles. We also evaluated the network's connectivity and analyzed the potential impact of infrastructure improvements on walkability.

Survey Results: Desired Improvements
Survey Results: Desired Improvements
Survey Results: Deficiencies
Survey Results: Destinations

Study Area
The Arnold Creek neighborhood is a bedroom community of 2,000 residents in Portland, Oregon. The development pattern consists of mostly low-density single-family housing with a disconnected street pattern that favors minimal automobile traffic within the neighborhood and high walkability through pedestrian transit corridors. The neighborhood is dominated by wide streets and sidewalks, and relatively few vehicles used for parking.

GIS network analysis of barriers and impediments
Confounding a geo-survey analysis
We used an online survey to collect spatial information from Arnold Creek residents. The survey gathered information about walking routes, unique attributes such as distance, and potential obstacles to walking.

Survey Results: Deficiencies
Survey Results: Desired Improvements
Survey Results: Destinations

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Author contact
Toni Ilves and John Todaro
Department of Geography
Portland State University
Portland, Oregon 97207

Data Sources
Census.gov (http://www.census.gov)
Open Street Map (http://openstreetmap.org)
Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

References