ENGINEERING/TECHNOLOGY

Modeling the Influence of Social Networks in an Individual's Travel Decisions

Student researcher: Victoria Mutran, Junior

As there is a continuous increase in populations of cities, it is essential to study how urban areas are utilized. Understanding individual travel patterns at the network level is therefore important to prevent overloads of transportation systems. In general, travel demand is induced based on a desire to perform certain activities. Furthermore, it is inadequate to study travel-related choices without understanding the underlying social connections of travelers and their influence. In previous studies, surveys were used to predict short-distance travels by analyzing social interactions. However, it is a challenge to gather a representative sample. In this project, data collected from location-based social network Foursquare allowed analysis of the relationships and travel patterns of the users from New York City, providing insights into the social network of 2.5 million people. The final number of edges (links between two users) is 11,966,066. The analysis includes degree distributions (number of friends per user), spatial distributions (distances to friends), spatial clustering (number of connections for users in the same city), and spatial community network (groups of friends in the same city). These parameters will allow a further analysis of activity patterns in relation to friendships by comparing users' travel-related decisions with the characteristics of their social connections. The focus of this project was to provide data to develop analytical tools to describe social influence in travel behavior. Future research will develop a mathematical model to characterize this influence. Once

the analysis is finished, this work can be used to predict travel behaviors, informing transportation planning and analysis. Also, the model will help predict the influence of social network on decision making in addition to the other effects of location-based social networks in urban areas.

Research advisor Satish Ukkusuri and graduate advisor Samiul Hasan write, "Victoria was an outstanding, enthusiastic researcher in our group. She contributed significantly in planning and designing a data collection effort in which she collected and analyzed information about individual social network and travel behaviors. Her work will be crucial to our future analysis and modeling efforts."

Visualization of the social network analyzed in this project generated using Gephi software. The dots represent the nodes (users) of this social network, and their colors and sizes vary with the number of connections of each user, ranging from 1 to 2,762 friends.

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