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Evaluating the Representation of Roadway Networks in GIS

Presenter

James L Sullivan

Research Analyst

UVM Transportation Research Center

james.sullivan@uvm.edu

Co-Presenter

Roadways in or around a metropolitan area or state have long been represented in GIS by a system of links and nodes in the tradition of network science. This representation allows researchers and practitioners to capitalize on the methods of analysis used in the network science field to examine issues associated with routing, accessibility, and vulnerability on the roadway network. Even outside of the traditional travel-demand modeling framework, where this type of representation is most prevalent, network-science measures of centrality and connectivity like between-ness, closeness, degree distribution, clustering, and vulnerability are being translated into useful metrics of roadway network performance and function. However, these types of metrics and the methods used to develop them, rely on extremely accurate or even exact representations of roadways in the study area. This implies that the roadway system of links and nodes possess the correct topology and connectivity. The road networks used for transportation planning, though, often utilize abstractions and/or aggregations of the actual roadway network within the study area (you might want to include a reason why). For example, minor roads are frequently omitted from roadway networks, neighborhoods and towns are represented in aggregate by single nodes, and travel entering/leaving the network is typically abstracted by "dummylinks". Few studies in the transportation research field have focused on how these types of newer types of analyses associated with network-science methods. Methods are proposed in this study to test the extent and resolution of a roadway network, allowing planners and researchers to answer some of the following questions:

1. What should the footprint of the network be? How far should it extend beyond the study area? What is the optimal cut-off?
2. Which roadways should be included? What methods can be used to identify roadways that do not need to be included?

Bio(s):

Jim Sullivan began his career as a Research Analyst at the UVM Transportation Research Center after completing the Master's Degree program in Civil and Environmental Engineering at UVM in May 2009. Prior to his degree program at UVM, Jim worked in the private sector in consulting for 13 years and he currently holds a professional engineering license. Since joining the TRC, Jim has contributed to projects in the research areas of land-use / transportation modeling and transportation energy / system efficiency. His modeling research has included application of integrated-modeling platforms to Chittenden County, Vermont for testing and validation and implementation of the Network Robustness Index (NRI) in applications to passenger transport in Chittenden County and bulk-milk-transport in northwestern Vermont. His transportation efficiency research has included development of idealized transit networks for the state of Vermont based on the conflicting interests of energy-efficiency and social equity. Jim currently works on projects related to the statewide travel-demand model for Vermont, a new model of non-motorized travel, a new tool for measuring carbon sequestration from land-use change, the first attempt to measure idling behavior of private motor-vehicle owners in Vermont, and a new tool to spatially measure community-livability for seniors. His previous consulting experience includes project management and engineering related to RCRA and CERCLA compliance, groundwater and surface water pollution assessments, remediation design, and construction management.