GIS and Transportation Access
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As the planning research community broadens its consideration of transportation accessibility from concerns limited to addressing issues of modal choice and the road system, to one that incorporates landuse and individual behavior; it is important for planners to develop effective comprehensive methodologies for understanding transportation accessibility that consider socio-economic factors (McCray et al, 2004). GIS offers a powerful and creative means of applying the complex qualitative and quantitative data necessary to address issues related to transportation accessibility.

This bibliography focuses on examples of the application of GIS, demonstrating the use of various methodologies seeking to inform transportation access related research. The papers included in this bibliography offer the planner a set of tools that are uniquely suited for transportation planning issues through the visualization of: existing spatial and temporal constraints, individual attitudes towards space and time; and the application of various data models. Visualization and modeling of complex spatial and temporal data offers planners a valuable tool in the informed planning, monitoring and evaluation of transportation polices. The application of GIS with regards to transportation accessibility has not been lost to the planning research community and the number of researchers using these techniques continues to grow.

Literature Cited:


Annotated Bibliography


This study spatially examined auto ownership and average total annual mileage per household for three metropolitan areas (Chicago Los Angeles and San Francisco); finding that both vary in response to neighborhood urban design and socio-economic characteristics in each area. In all three cases, average auto ownership was found to be a function of the neighborhood’s residential density, average per capita income, average family size and the availability of public transit. The average annual distance driven per car was also determined to be strongly related to residential density, income, household size and public transit, and to a lesser extent- the degree of the pedestrian and bicycle friendliness of the community. The similarity of these relationships among the three metro areas, despite their differences in geography and age, suggests that similar relationships may be consistent throughout the United States or worldwide. The study
highlighted the dependence of average annual driving mileage on the policy-related variables of residential density, transit access, and pedestrian and bicycle-friendliness.


This paper describes the strategy utilized by the City of Rockville, MD to address congestion by the promotion of alternative modes of transportation by improving public transit service options. By applying GIS, laptops, Pocket PCs and GPS technologies, City staff evaluated existing transit service, using three performance goals: 1) maximize walk-accessible transit service to City residents, 2) increase the number of residents within a 10 minute travel time to a Metrorail station using local bus service, and 3) maximize the transit frequency of service. Staff assessed City pedestrian and transit networks to calculate Rockville’s performance for these measures.

Using GIS, laptops, Pocket PCs, and GPS technologies, the City was able to collect, refine, and evaluate information critical to assessing its pedestrian and transit networks. These technologies were useful during the data compilation stage, and also permit staff to continue to apply this information to address transportation issues and problems as they arise.


This study focuses on the use of GIS in transportation to improve accessibility. The authors report on the development of GIS software that uses space-time-accessibility measures (STAMs), which reflect the benefits that the individual receives from the transportation system. Space-time-accessibility measures are easily interpreted with respect to changes in accessibility. These space-time-measures are also comprehensive since they take into consideration the locations and travel rates imposed by the transportation system in the context of an individual’s daily activity schedule.

At the “front-end” the developed GIS software supports the STAM approach by serving as a spatial database management system that maintains all the spatial data including: line coverages representing transportation networks and point coverages representing mandatory and flexible activities for the individual. The GIS software also maintains the STAM model parameter information and the computational tools needed to calculate them. On the “back-end” the GIS software supports on-screen visualization and the output of quality cartographic products and STAM model results.


This study examined two important components of public transit planning accessibility: of access and geographic coverage, with the recognition that the two elements can at times conflict with one another. The authors apply two complex mathematical modeling approaches for addressing accessibility concerns which consider both access and geographic coverage in an integrated fashion, with the aim of optimizing accessibility. Bus transit service in Columbus, Ohio was used to illustrate the utility of these models in
public transit planning. Initially, stop and route data necessary for the models were provided by Central Ohio Transit Authority for the analysis. The researchers found the quality and accuracy of these data to be lacking when applied to the proposed models. To address this, researchers acquired stop locations and the associated route structure the use of GPS receivers and geo-rectified aerial photography. Census data at the block level as well as employment data were also used as inputs to the models. These mathematical models were solved using specialized software and the results are then exported and read into ArcView 3.2 for analysis and display. For urban areas striving to promote use of public transit, the ability to evaluate and improve transit accessibility is valuable. Application results associated with the model driven analysis of the transit route illustrated the performance benefits possible through the use of the developed modeling approaches in concert with GIS.


The paper explored a desktop GIS application that can automatically generate isochrones for travel by public transport (In this paper an isochrone refers to a line joining a set of points at equal travel time from a specified location). The authors find that isochrones provide an easily understood method for examining accessibility by public transport. The authors report that the most useful function of the desktop GIS application is the immediate location of the generated isochrones in relation to any other available data in the region of interest. This means that numerous accessibility problems are immediately capable of straightforward analysis using standard overlay techniques. The isochrone generating GIS application is found to successfully deal with a complex the public transport system of a large city (Glasgow), consisting of: bus, rail, and subway services.


This paper takes a look at the impacts of public transportation on labor participation or employment. The author describes a study analyzing the locations and characteristics of workers with varying levels of access to public transit. The study makes use of census data, a variety of GIS generated spatial measures and a two-stage least squares regression to estimate the relationship of access to public transit with labor participation levels for: Portland, Or and Atlanta, GA. The results suggest that access to public transit is a significant factor in determining average labor participation rates for the two cities examined.