DRISI

Caltrans Division of Research, Innovation and System Information

Research Results

Improving Livability Using Green and Active Modes: A Traffic Stress Level Analysis of Transit, Bicycle, Pedestrian Access, and Mobility

This research will build a model of the bus run time that will help reduce delays and improve efficient bus operations.

Modal

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Project Title:
A Tool to Evaluate and Optimize Multi-Modal Transit Access

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WHAT WAS THE NEED?

State of the art transit service planning and operational analysis tools are moving towards geographic based modeling. With the increasing availability of transit operational data, it is imperative that analysis tools that make use of this data be available and easily accessible. It is possible to perform a fine-grained analysis and optimization in order to enhance transit service. A geographic aware optimization model with non-motorized service area access is the object of this research to model transit service area with a more detailed parcel level demand estimation using walk and bicycle access.

WHAT WAS OUR GOAL?

The objective of this research is to develop, apply, evaluate, and enhance a geographic based evaluation and optimization model for transit service using an advanced algorithmic based model and GIS tools. Find ways to improve the state of the practice through lessons learned by comparing algorithmic models built on advanced geographic modeling and network analysis.

WHAT DID WE DO?

The research developed a geographic aware optimization model with non-motorized service area access. The object of this research is to model a transit service area with a more detailed parcel level demand estimation using walk and bicycle access.

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Important features of this method include:

- Synthesized separate data sets from transit agencies, municipalities and other sources (State/Federal) to produce effective land use factors.
- Determined service area for walk access and bike access to transit. Investigated an overlapping service area and estimate demand. Reviewed existing research and developed a model.
- Modeled transit access using local streets for bike and walk modes. Where data was available, modeled the entire street network using traffic stress classification according to safety, (using the classified network model produced from the MTI Project 1005 – A Tool to Evaluate Bicycle Networks) with parcels as origin and transit stops as destinations.
- Computed operational impacts for total time that includes impacts on access time, ride time and operating time.

The case study areas included two transit routes in Oakland, California, and Denver, Colorado. An enhanced network model for access was used that included pedestrian and bicycle access. The existing network was enhanced with walk access paths (sidewalks and pedestrian walkways) Other newly constructed bicycle and pedestrian infrastructure was also incorporated into the existing dataset in-order to model both pedestrian and bicycle access (complete non-motorized transport mode). An enhanced transit service area model was used to determine transit service area for non-motorized access. The research compared several evaluation and optimization strategies with a view to provide service improvements at a competitive cost.

WHAT WAS THE OUTCOME?

The relative effectiveness of alternatives to driving (i.e. buses, bicycling, and walking) depends on how well streets are designed to serve the modes. The key research findings are:

- Higher Low Travel Stress (LTS) (3 and 4) networks around transit routes are uncomfortable and unattractive for bicycling and walking, severely limiting access and the effective catchment area of the transit service.
- When the two modes share the same network, LTS 1 and 2 can shift the relative attractiveness of once complementary mode pairings (e.g., a bicycle/bus-transit mode choice) toward becoming directly competitive and substitutable with each other (e.g., walk/transit, bicycle/transit to bicycle only mode).
- Outside a 1 mile buffer area of a transit stop, the bicycle-only mode becomes more attractive, depending on transfer penalty, availability of safe parking, on-board accommodation, cost, as well as the bicyclist's independence and self-determination regarding the characteristics of their trip (on-demand, route choice, trip chaining, opportunity to exercise, etc.).

WHAT IS THE BENEFIT?

TThe benefit of the research concluded two policy recommendations.

- Improve transit mobility by reducing travel time. Implement transit operational efficiencies such as stop consolidation, transit-only lanes, and transit priority at intersections, in conjunction with pedestrian and bicyclist comfort and safety improvements at transit stops (bulb outs, safe crossings).
- Improve transit service area safe access for pedestrians and bicyclists over a minimum of one mile network distance. The research recommends planning for LTS 2 levels (LTS 1 is too restrictive on the mobility of transit, and LTS 3 and 4 create uncomfortable environments for bicycling and walking). Recommend accompanying these with enhancements to help integrate networks of pedestrian and bicycle routes throughout the metropolitan area.