DRISI
CALTRANS DIVISION OF RESEARCH, INNOVATION AND SYSTEM INFORMATION

Research Results

Complete Street: Bicycle Network Connectivity Evaluation Methodologies.

Developed a reliable methodology that aims to measure bicycle network connectivity

Transportation Safety and Mobility

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Project Title:
Complete Street: Bicycle Network Connectivity Evaluation Methodologies

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WHAT WAS THE NEED?

Bicycling is among the most environmentally sustainable and economically affordable modes available. The popularity of bicycling activities strongly depends on the availability of well-connected bicycle networks. While the Complete/Connected Streets concept has quickly grown from an initiative to a widely accepted design principle, it is not always practical. Not every street can, nor needs to be, made complete for pedestrians and bicycles. Instead, it is equally important, if not more, that cities and towns ensure there is a complete network for bicycles and pedestrians where it is most needed, rather than various disconnected and isolated bike and pedestrian streets. For example, expending considerable resources reconstructing road geometry along a major thoroughfare to accommodate all modes will yield little value if the greater bicycle network fails to connect to this new link adequately. Existing methodologies to measure network connectivity are often purely academic, complex, subjective, or locally specific. This raises a further question of whether bicycle connectivity is measured relative to the available automobile or existing complete street network or independently.

WHAT WAS OUR GOAL?

The objective of this study was to develop and test a methodology for evaluating bicycle network connectivity. The intent was to provide a method simple enough to be implemented by local municipalities with minimal data and technical knowledge while still providing a robust measure that can be used in various larger and more sophisticated applications.

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WHAT DID WE DO?

This study developed and tested a reliable methodology for evaluating bicycle network connectivity. The study proposed two weighted shortest path graph algorithms: low-stress bike network connectivity (LSBNC), and designated bicycle network connectivity (BNC) algorithms. The weights of the algorithms were the function of slope, level of traffic stress, and link length. We tested the algorithms on the cities of San Francisco, Davis, Sacramento, and Hayward, along with Bay Area counties, using open street map (OSM) data and found that algorithms can produce meaningful quantitative connectivity scores. We converted our final connectivity algorithm to Python-based software that can be used to measure bicycle network connectivity easily without learning or knowing Python language.

WHAT WAS THE OUTCOME?

The developed methodology/tool of this study will help planners, engineers, and policymakers evaluate their network as well as transit stop connectivity. The obtained connectivity score will help to understand where the network is poorly connected and might need improvement of infrastructure.

WHAT IS THE BENEFIT?

This project represents an effort to develop a theoretical methodology that can measure bicycle network connectivity and ensure a well-connected network for users' safety and comfort in California. The developed methodology or tool will allow Caltrans to measure bicycle network connectivity and identify the portion of the network where connectivity is poor or good. Caltrans can integrate future bicycle demand propensity with connectivity score to make this an ultimate infrastructure decision-making tool. This systematic identification of the network will help Caltrans work on future infrastructure improvements to enhance network connectivity and re-evaluate the network to understand what level of connectivity is obtained.

LEARN MORE

Review the project final report:
Md Mintu Miah, Nicholas Fournier, Alexander Skabardonis, "Complete Street: Bicycle Network Connectivity Evaluation Methodologies," Researc Report, California PATH, University of California, Berkeley, December 2023

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