DRISI

CALTRANS DIVISION OF RESEARCH, INNOVATION AND SYSTEM INFORMATION

TRANSFORMING IDEAS INTO SOLUTIONS

Research Notes

Learning Drivers' Utility Functions in a Coordinated Freight Routing System Based on Drivers' Actions

Improving mobility, safety, and environmental outcomes through experimental routing systems

Planning, Policy and Programming

NOVEMBER 2023

Project Title:
Learning Drivers' Utility Functions in a Coordinated Freight Routing System Based on Drivers' Actions

Task Number: 3381

Start Date: June 1, 2023

Completion Date: August 31, 2024

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WHAT IS THE NEED?

The development of a centrally coordinated routing system for trucks is a promising upcoming technology. Such a routing system would produce routing instructions based on making the road network more effective instead of decreasing a truck driver's cost for a certain route.

Given that the efficiency of the road network depends on what truck drivers do, it is vital that the central routing system monitor each truck driver's actions by developing utility functions. Since utility functions may change over time due to various external factors, the constant monitoring and fine-tuning of these utility functions based on the actual actions of truck drivers is important to keep the centrally generated routing instructions accurate and timely to provide the best road network solution.

WHAT ARE WE DOING?

Researchers will complete the following tasks: 1) develop a methodology to learn drivers' utility functions from their responses to centrally coordinated routing instructions and incentives; 2) evaluate the impact of using wrong utility functions; 3) develop a methodology to reflect changes and updating them; 4) use data and testing equipment that reflects traffic on a large road network, Ports of Los Angeles/Long Beach, inland ports and warehouse locations to evaluate the effectiveness of the proposed method; and 5) using a sensitivity analysis to examine the impact of utility functions and not obeying an instruction on the central coordinated routing system.

WHAT IS OUR GOAL?

The purpose of this project is to experiment with utility functions of truck drivers based on their response to a centrally coordinated

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routing system. This allows researchers to test the potential of an experimental central routing system to achieve statewide goals in the freight sector.

WHAT IS THE BENEFIT?

A benefit of this project to Caltrans and other entities is proof-of-concept for a system that would promote a safer, more effective road network, reduced operational costs, less traffic congestion, reduced emissions, and improved air quality. Another benefit is to help Caltrans better understand the utility of time savings for truck drivers.

WHAT IS THE PROGRESS TO DATE?

A kick-off meeting was August 7, 2023. The estimation of utility function was completed. The next step is to develop a centrally coordinated system with fixed utility functions and incentives. A progress meeting has been scheduled for December 8, 2023, for the panel to discuss draft deliverables.

IMAGES

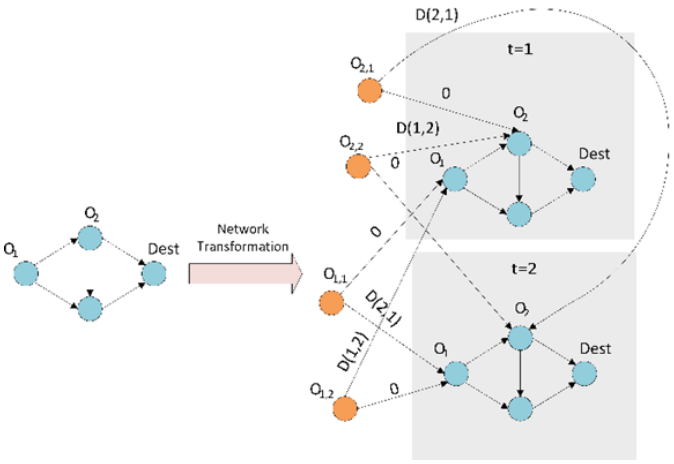

Image 1: Coordinated Freight Routing with Individual Incentives