

Planning, Policy
and
Programming

December 2024

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

Task Manager:

Connor Campbell
Transportation Planner
Connor.campbell@dot.ca.gov

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

Developing a methodology for utility functions for truck drivers' actions

WHAT WAS 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 was vital 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 was important to keep the centrally generated routing instructions accurate and timely to provide the best road network solution.

WHAT WAS OUR GOAL?

The purpose of this project was to develop a methodology for estimating the utility functions of truck drivers based on their response to a centrally coordinated routing system.

WHAT DID WE DO?

Researchers completed the following tasks:

1. Developed a methodology to learn drivers' utility functions from a their responses to centrally coordinated routing instructions and incentives



DRISI provides solutions and knowledge that improves California's transportation system.

2. Evaluated the impact of using wrong utility functions
3. Developed a methodology to reflect changes and updating them
4. Used 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
5. Used a sensitivity analysis to examine the impact of utility functions and not obeying an instruction on the central coordinated routing system.

WHAT WAS THE OUTCOME?

The research team successfully completed the research project and helped further research on autonomous vehicles and computationally enhanced freight vehicle routing systems.

WHAT IS THE BENEFIT?

A benefit of this project to Caltrans and other entities is a better understanding of the utility of time savings for truck drivers using a centrally coordinated routing system. If developed more fully, it could lead to a more effective road network, reduced operational costs, less traffic congestion, reduced emissions, and improved air quality.

LEARN MORE

Research Final Report:

<https://escholarship.org/uc/item/6qb516n9>

IMAGES

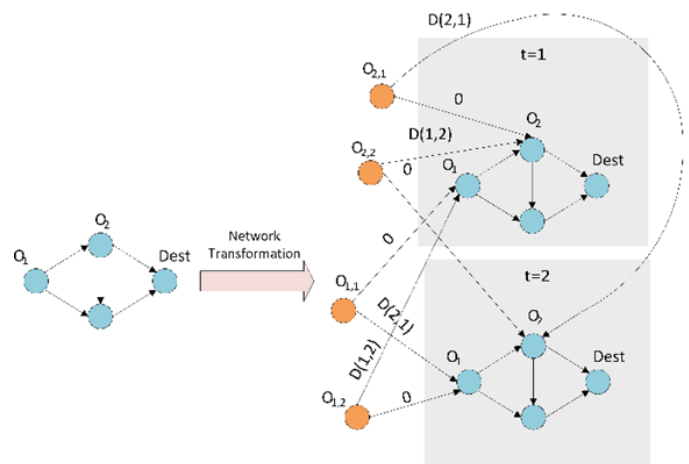


Image 1: Coordinated Freight Routing with Individual Incentives