

Transportation
Safety and Mobility

MAY 2019

Project Title:

Experimental Studies of Traffic Incident Management with Pricing, Private Information, and Diverse Subjects (Second Year)

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Task Manager:

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Experimental Studies of Traffic Incident Management with Pricing, Private Information, and Diverse Subjects (Second Year)

Develop a program to identify and address pedestrian safety problems in California, with the goal of reducing pedestrian fatalities and injuries.

WHAT IS THE NEED?

Existing Variable Messaging Systems (VMS) give unpredictable diversion responses when used to manage traffic incidents. Is there a way to have drivers react uniformly for everyone's benefit?

WHAT WAS OUR GOAL?

1. Show the results from UC Irvine are representative of behavior in the larger driving population
2. Investigate theoretically superior auction-based road pricing schemes
3. Make the driving simulator more realistic

Key goal of project is to implement an experimental platform that can be used to evaluate alternative schemes for managing traffic incidents and congestion

WHAT DID WE DO?

1. UCI successfully developed a platform that works well in our experimental economics laboratory with UCI undergraduate student subjects
2. UCI successfully transferred the platform to Amazon Mechanical Turk to test whether the results we obtained with UCI undergraduates also apply to a wider population

VMS Tested:

1. Incident Management:
 - Alternative VMS message wording
 - Diversion recommendations targeted at differential driver characteristics



Caltrans provides a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability.

- Tolls varying with incident severity
2. Congestion Management
 - Standard tolls
 - “Auctions” where entry to fast lanes is based on driver’s self-reported Value of Time

WHAT WAS THE OUTCOME?

1. Standard qualitative VMS is much better than no information, but can be improved with dynamic feedback
2. A road pricing mechanism with truthful value of time elicitation works better than traditional tolling schemes
3. Results do not change when experiments replicated on adult population using Amazon Mechanical Turk
4. We are still running experiments and will work over the summer to analyze data from this year’s work.

What worked:

- Simulator and incentives elicit reasonable driver behavior
- All types of messaging improve outcomes compared to no messaging
- Response to qualitative message was relatively smooth / predictable

What didn’t work:

- Subjects did not seem to respond to route pricing
- Targeted messaging had lower than expected compliance rates

Unclear:

- How to best leverage the potential of dynamic feedback
- Interaction between heterogeneous value of time and pricing
- Effect of individual characteristics

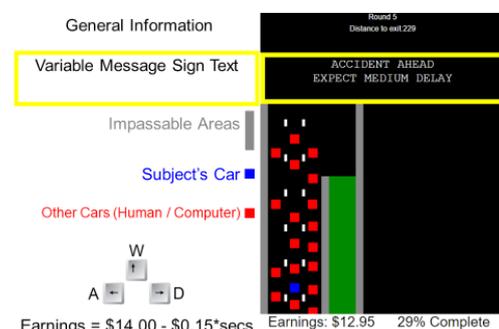
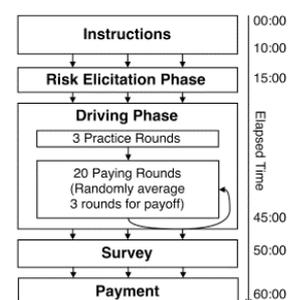
WHAT IS THE BENEFIT?

By expanding on the previous project this study’s scope goes beyond public Changeable Message Sign (CMS) into the domain of Private Traffic Information Systems (PTIS). The aim was to help system operators take advantage of the latest advancements in system-to-vehicle and vehicle-to-vehicle communications to aide their ability to efficiently manage non-recurrent traffic incidents. The study of a value of time (VoT) auction based approach to high-occupancy toll (HOT) lane management aimed to use HOT lanes more efficiently to enhance the performance of existing freeway capacity while minimizing the travel delay costs and maximizing satisfaction for users.

IMAGES

Experiment Design

- Up to 39 subjects per session
- Drive in real-time, same direction towards same destination
- Start with \$14.00 endowment that decreases at \$0.15 / second (value of time)
- Option of arbitrary distribution of endowments / depreciation rates



Types of Messaging

- In non-pricing treatments, we displayed a variety of messages
- In some treatments, the message displayed was changed on-the-fly as route utilization changed
- Examples of schemes considered:

Standard Description of Incident

ACCIDENT AHEAD
 EXPECT MINOR DELAY

Number of Lanes Blocked

ACCIDENT AHEAD
 1 LANE BLOCKED

Desired Diversion Rate

ACCIDENT AHEAD
 1 IN 10 CARS SHOULD EXIT

Targeted Driver Characteristics

ACCIDENT AHEAD
 IF YOUR CAR IS #1-4
 USE ALT ROUTE

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