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CALTRANS DIVISION OF RESEARCH, INNOVATION AND SYSTEM INFORMATION
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Research Notes

TPF-5(519) - Expansion: Enhanced Traffic Signal Performance Measures - Pooled Fund Study

Continued/Expanded Research on Enhanced Traffic Signal Performance Measures.

Traffic Operations

MAY 2025

Project Title:
Traffic Signal Systems Operations and Management

Task Number: 4397

Start Date: January 1, 2023

Completion Date: June 30, 2026

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WHAT IS THE NEED?

The previous Pooled Fund Project TPF-5(377) was led by Indiana and included participation from the Federal Highway Administration (FHWA), California, Connecticut, Georgia, Minnesota, North Carolina, Ohio, Pennsylvania, Texas, Utah, and Wisconsin. That project developed methodologies and tools for using high-resolution vehicle trajectory data to compute enhanced traffic signal performance measures. Similarly, TPF-5(377) is now simulating a second generation of commercial implementation of trajectory-based traffic signal performance measures. The previous TPF-5(377) ended in June 2023. Therefore, a new pooled fund study was created to expand on the enhanced Traffic Signal Performance Measures research.

Pooled Fund Information:

- Indiana Department of Transportation (DOT) – Lead State for Pooled Fund Study (PFS)
- 10 Participating State Departments of Transportation or Agencies
- Full Members: California DOT, Connecticut DOT, Georgia DOT, Minnesota DOT, Mississippi DOT, North Carolina DOT, Ohio DOT, Pennsylvania DOT, Texas DOT, Utah DOT
- California Department of Transportation's (Caltrans) current commitment:
  - FY 2023/2024 $40,000
  - FY 2024/2025 $120,000

WHAT ARE WE DOING?

1. Identify available commercial probe data sets and

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procure one month of probe data for each participating state.

2. Perform penetration analysis of connected vehicle data to understand how it varies by state.
3. Update performance measure analysis techniques to examine how a mix of commercial vehicles and passenger cars impacts a traffic signal operation.
4. Identify transit agencies in participating states that have AVL/connected bus data available to share with the research team.
5. Integrate trajectory data and high-resolution data to characterize how performance measures such as split failure and arrival on green vary depending on whether they are calculated using trajectory data or traditional high-resolution data.
6. Integrate trajectory data and high-resolution controller data for multi-modal analysis.
7. Prepare final report.

WHAT IS OUR GOAL?

A pooled fund effort that focused on the following areas:

- Broadening performance measures to additional modes that are impacted by traffic signal systems, particularly transit and pedestrians.
- Identify use cases for enhanced probe data beyond the current trajectory and hard braking/ acceleration data.
- Conduct Integrated Analysis of High-res Controller Data and Trajectory Probe Data

These initiatives would complement and expand the past work the multi-state team has done in the area of enhanced traffic signal performance measures using connected vehicle data.

WHAT IS THE BENEFIT?

This effort will provide guidelines for Caltrans and other agencies to improve signal system operations. The intent is that agencies adopting the resulting recommendations will achieve a 10-15% reduction in motorist delay and emissions.

WHAT IS THE PROGRESS TO DATE?

- Continue to strengthen private sector partnerships for collecting and analyzing enhanced probe data for traffic signal performance measures
- Continue outreach activities to share findings with a broader audience and solicit participation in this pooled fund
- Continue development of cloud-based analysis procedures.

WEBSITES

https://www.pooledfund.org/Details/Study/751