Real-time Information Dissemination for Efficiency in a Robo-taxi System (RIDERS)

Recipient/Grant (Contract) Number: University of Massachusetts – Amherst, 69A3552348301

Center Name: New England University Transportation Center (NEUTC)

Research Priority: Promoting Safety

Principal Investigator(s): Dr. Monika Filipovska

Project Partners: University of Connecticut

Research Project Funding: $87,896 (Federal), $54,777 (Non-Federal)

Project Start and End Date: 1/1/2024 – 8/22/2025

Project Description: This project designed and tested a robo-taxi fleet strategy that treated vehicles as both mobility providers and mobile sensors. Using New York City demand data on a Manhattan road network, the team built a hierarchical control approach with two cooperating pieces: one rebalanced idle vehicles across zones, and the other chose routes that also filled gaps in traffic information. In simulations across weekday/weekend demand and multiple fleet sizes, the information-focused strategy collected far more link-level speeds while keeping passenger wait times and vehicle miles traveled comparable to a demand-only baseline.

US DOT Priorities: The work supported U.S. DOT priorities by advancing connected, data-driven fleet operations that improve traffic awareness and service reliability without added burden to travelers. Demonstrating how everyday operations can continuously refresh network conditions helps enable smarter routing, more resilient mobility services, and better use of roadway capacity.

Outputs:

- A hierarchical fleet management method that combined zone-level rebalancing with route choices that prioritize filling information gaps.
- An agent-based simulation environment using NYC taxi demand and a simplified Manhattan network to evaluate service and information coverage.
- Comparative results between an information-focused strategy and a baseline, reported for multiple fleet sizes and weekday/weekend demand.
- Project documentation summarizing methodology, datasets, performance metrics, and key findings.

Outcomes/Impacts:

- **Much richer network knowledge:** The information-focused approach generated orders-of-magnitude more link-level observations than the baseline (tens of thousands vs. a few thousand), closing real-time data gaps.
- **Service maintained:** Passenger wait times and total VMT stayed similar to the baseline across fleet sizes and demand patterns, showing information collection did not degrade service quality.
- **Operator benefits:** Reduced reliance on third-party traffic feeds and improved adaptability to changing conditions.
- **Public-sector relevance:** Fleet-generated data can complement fixed sensors and support congestion management, incident response, and planning–without additional roadway mileage.

Final Research Report: Final report is posted: https://www.umass.edu/neutc/projects/real-time-information-dissemination-efficiency-robo-taxi-system-riders