ATCMTD

Advanced Transportation and Congestion Management Technologies Deployment

For more information, go to www.fhwa.dot.gov/fastact/factsheets/advtranscongmgmtfs.cfm

ARTIFICIAL INTELLIGENCE-ENHANCED INTEGRATED TRANSPORTATION MANAGEMENT SYSTEM EXECUTIVE SUMMARY

The ATCMTD Program awarded a grant to the Delaware Department of Transportation (DelDOT) in fiscal year 2018.

Project Goals

Under the ATCMTD grant, DelDOT enhanced its integrated transportation management system (ITMS) with artificial intelligence (AI) and machine learning to predict traffic flows; identify traffic anomalies; and generate, evaluate, and execute solutions and responses to traffic congestion.

The Fixing America's Surface Transportation (FAST) Act (Pub. L. No. 114-94) (2015) set goals for the ATCMTD Program. DelDOT set the following goals:

- Improved Safety
- Improved System Performance
- Reduced Costs
- Improved Real-Time Information
- Improved Mobility

Three Project Components

Infrastructure: Deployment of advanced sensors, video cameras, software, and connected and autonomous vehicles.

Operation: Development, deployment, and testing of the AI-based Transportation Operations Management System (AI-TOMS) software toolkit. DelDOT integrated most of its sensors and systems into the AI-ITMS under this project, and the development and testing of AI-TOMS continues. The testbeds included machine vision, controller-area network bus data, a dilemma zone system, signal phase and timing, and signal control.

Traveler information system (TIS): Updates to the DelDOT Web portal and mobile application to inform the public of advisories AI-TOMS generated. Select DelDOT Traffic Management Center staff members receive email and text alerts. As confidence in AI-TOMS grows, DelDOT intends to integrate AI-TOMS-generated alerts into the public-facing components of the TIS.

Note: The ATCMTD program was renamed the Advanced Transportation Technology and Innovation (ATTAIN) Program under the Bipartisan Infrastructure Law (BIL). For more information, click here.

Improved Real-Time Notifications

AI-TOMS provides automatic updates on road anomalies and congestion every 5 minutes. Data show that AI-TOMS sends out notifications via email before incidents are registered in the AI-TOMS database; these email alerts were accurate but do not yet recommend corrective actions. As DelDOT continues to develop AI-TOMS's incident notification capabilities, notifications to each component of the TIS will be designed to provide the intended audience with an appropriate level of information to make informed decisions.

Improved Accuracy

Although results do not meet identified accuracy goals, they demonstrate the potential for increased safety as additional intelligent transportation systems (ITS) devices are installed.

The average AI-TOMS freeway incident detection time was 14 minutes and 33 seconds, which exceeded the target time of 10 minutes; however, most of the delay in the average incident detection time was due to latencies within DelDOT's existing system and not from AI-TOMS. Regarding accuracy, AI-TOMS detected 87 percent of incidents on I–95 and 56 percent on Delaware Route 1.

69% of incidents were detected by AI-TOMS in the whole project area.

Detection accuracy was highest in areas with a high density of ITS devices. Accuracy was lowest during nighttime hours when an incident may not restrict capacity enough to be detected.

Future Innovation

DelDOT made progress toward deploying an AI-ITMS throughout the ATCMTD grant period. DelDOT successfully integrated more than 10 sources of near-real-time traffic data into the system, concurrently monitoring nearly 90 percent of ITMS devices statewide. By enhancing DelDOT's existing system, the AI-ITMS provides the foundation for further advanced technology, including machine vision. The system is designed to eventually act autonomously and to learn to improve over time. All efforts lead to the ultimate goal of operating a fully predictive and adaptive management system across modes, as shown in the AI-ITMS logo.

Figure 1. Illustration. Artificial Intelligence Enhanced Integrated Transportation Management System (AI-ITMS) logo.
Source: Delaware Department of Transportation.

For DelDOT's final report, please go to: https://ops-dr.fhwa.dot.gov/fastact/atcmtd/2018/awards/DelDOT_ATCMTD_Final_Report_april_2024.pdf.

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