INNOVATION / TECHNOLOGY DEPLOYMENT SUMMARY

Optimize ITS Infrastructure to Detect Freeway Incidents

CHALLENGE

Tarrant County in the Fort Worth District faces a critical safety issue: 141 fatal pedestrian crashes occurred on its access-controlled highways between 2016 and 2022 (Figure 1). Current traffic management systems rely on data from distantly-spaced sensors, which can fail to promptly detect traffic slowdowns or increases in traffic volumes. The challenge? Utilizing existing cameras and Intelligent Transportation System (ITS) devices to quickly detect anomalies and potential hazards, such as crashes, blocked lanes, stranded vehicles, or pedestrians near the roadway. Accomplishing this with existing or limited additional equipment and minimal investment could significantly improve safety, incident response, and traffic management.

SOLUTION

To address the significant lag between the roadway sensor data visible to traffic management center (TMC) operators and reports from drivers about traffic slowdowns and potential hazards, this innovation uses video analytics and image processing to quickly detect pedestrians, stalled vehicles, incidents, and other anomalies on district roadways. The system then alerts TMC operators in real time and activates a warning message on upstream digital message signs to alert approaching drivers (Figure 2 and Figure 3).

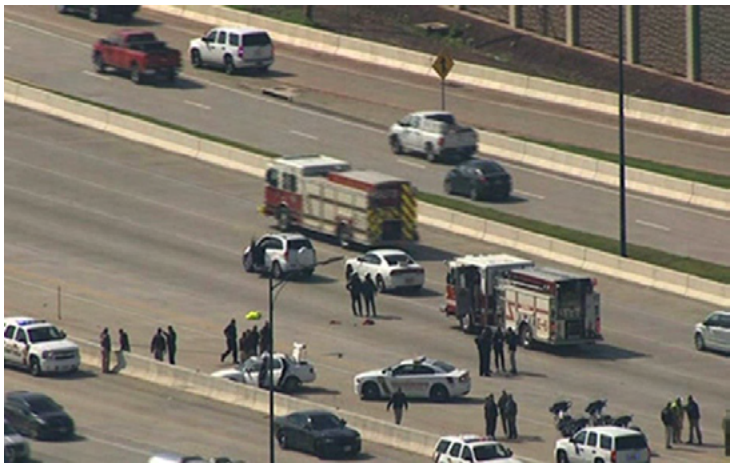

Figure 1. Pedestrian crash

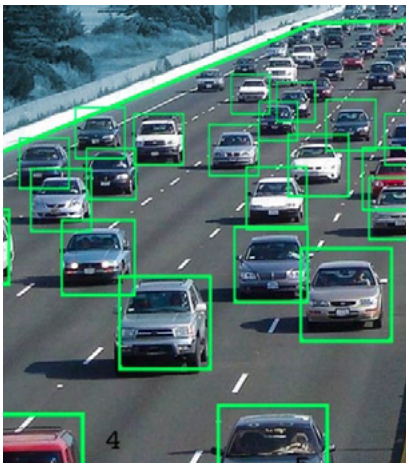

Figure 2. Video analytics

TxDOT GOALS

- Deliver the right projects
- Focus on the customer
- Foster stewardship
- Optimize system performance
- Preserve our assets
- Promote safety
- Value our employees

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PROACTIVE APPROACH

This system moves beyond relying on motorists to report disabled vehicles or pedestrians on the shoulder or roadway. To quickly identify changes in traffic patterns, potentially indicating a traffic incident or pedestrians attempting to cross the roadway, the district added video analytics to the data captured by its existing cameras and sensors. The system proactively detects anomalies and sends real-time alerts to TMC operators, allowing them to quickly activate digital message sign (DMS) two miles upstream to warn approaching drivers, potentially saving lives.

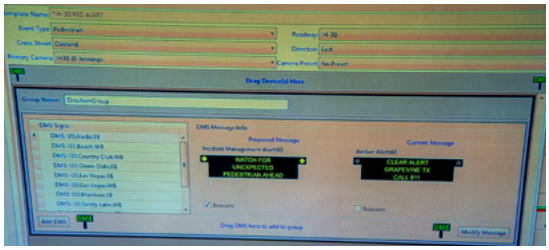

Figure 3. DMS message alerting drivers to watch for an unexpected pedestrian ahead.

BENEFITS

This innovation substantially improves overall traffic management by enabling rapid detection and real-time notification of potential roadway hazards. In addition to reducing crashes caused by roadway anomalies, the project improved traffic incident response times in the Fort Worth District, potentially saving lives.

KEY TASKS

- Use video analytics and image processing to detect anomalies on the freeway in the test section.
- Develop a prioritized plan for future implementation on freeways in Tarrant County.
    1. **Leverage Existing Infrastructure:** Use existing cameras and sensors to minimize costs.
    2. **Pilot Deployment:** Implement the system on a test section of the freeway.
    3. **Hazard Warning:** Deploy radio-controlled message signs to display warnings upstream of detected anomalies.
    4. **Evaluation and Expansion:** Conduct performance tests and develop a plan for broader implementation across Tarrant County freeways.

DATA SOURCES

Data for this project comes from TxDOT's CRIS-Crash Records Information System database and ITS video images.

Resources

Fort Worth District (txdot.gov)

ITS Map: Fort Worth District incidents

Automatic Incident Detection (piarc.org)

Crash Data and Analysis: CRIS Query Tool (txdot.gov)

Contact

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