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2021 RESEARCH PROJECT STATEMENT

Research Topic:

Multisource Data Fusion for Real-Time and Accurate Traffic Incident Detection via Predictive Analytics.

Research Budget and Timeline:

- \$120,000-\$150,000
- 12-21 months (of which final 3 months are for review)

Problem Statement and Objectives

Traffic incidents are a leading contributor to non-recurring congestion and secondary crashes. Each year congestion and crashes together cost the US over 1 trillion dollars. Once traffic queues are formed, it is very difficult to dissipate them and return traffic to normal operations. This is especially true for highway segments where traffic demands are near capacity, and where any disturbance may lead to long queues and stop-and-go conditions. Therefore, real-time and accurate incident detection plays a critical role in Traffic Incident Management (TIM) and congestion mitigation. The sooner incidents are detected, the sooner safety personnel can respond to the incidents and clear them from the roads thereby allowing traffic lanes to re-open and the system to recover as well as less secondary incidents to be caused.

The ability to quickly detect and respond to such non-recurring events can help to significantly improve travel time reliability. MassDOT through its Highway Operations Center (HOC) and other departments has access to traffic information from multiple sources and is in process of developing a "traffic desk" graphical user interface to leverage these and other data sources.

The objectives of this research are:

1. Identify data sets in MassDOT current environ as well as data sets from other sources and providers that can be harvested to support real time incident detection.
2. Investigate how data from these and other sources can be merged for accurate and real-time traffic incident detection and improved travel time reliability.
3. Investigate how divergent datasets such as WAZE event reports and probe-based data could be converged to add confidence to multisource incident detection.
4. Develop guidance for the setting of "trigger points" to alert HOC Operators as to interruptions on the roadway. These "trigger points" must be sensitive enough to detect events, and yet refined sufficiently as to not create "false positives".



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- Different roadways will have different “trigger points” based upon temporal and spatial conditions such direction, time of day and year.
5. These “trigger points” will be tested on the platform that MassDOT is in process of creating. This is a new tool to blend data from various sources that can create alerts in throughput of a specific section of corridor based upon:
 - a. When any segment of roadway drops below a set percentage of free flow speed.
 - b. When any segment of roadway drops below percentage of historical average.
 - c. Current speed falls below a set threshold.
 - d. Current traversal time thru a segment of roadway below a set threshold.

Anticipated Outcomes and Deliverables

The proposed research will assess the current traffic incident detection methods employed by MassDOT and develop new tools for improved traffic incident detection.

This research will address the fusion of information from multiple sources of different temporal and spatial scales, such as traffic data collected from loop detectors, information from the MassDOT Real Time Traffic Management (RTTM) system, and information available through third-party vendors (e.g., Waze, Google, INRIX) as well as currently as yet identified sources. The reliability of the various data sources will be evaluated. This may involve advanced data analytical methods such as deep neural networks, machine learning and artificial intelligence. The proposed new tools must be able to advise as to the “set points” on for trigger operator alerts on the new traffic desk platform. These findings will be evaluated on selected highway segments during a 90-day pilot.

Deliverables:

Phase I

1. Development of method to set trigger points.
2. Initial Report

Phase II

3. Support in establishing and validating “trigger points” in a 90-day pilot program of Data Fusion- Real-Time Traffic Incident Detection*.
4. Final Report and Presentation based upon results of deliverable 3.

*MassDOT may provide the platform for fusing the data, most likely to be future CATT Lab RITIS product currently in development. However, researchers are welcome to submit other options for validation for review.