TN TDOT Department of Transportation

Development of an Intelligent Traffic Monitoring System Based on Artificial Intelligence

Problem Description

TDOT provides essential services to support transportation operations on Tennessee highways. Among these services is the critical incident management service, one of the Transportation Management and Operations (TSM&O) strategies that significantly impact traffic flow in Tennessee. Coordinated action between all four regions managed through the various TDOT Traffic Management Centers requires better insights and analysis of the performance and operational awareness of the interstate highways and the surrounding roadways. The major challenge with the lack of information and real-time insights is the delayed detection of incidents and the inability to manage the response successfully and on time. The question that faces the team and TDOT is the following: can we use advanced sensor fusion techniques to obtain reliable insights from a collection of heterogenous sensors and achieve similar insights that may be gathered through expensive but high-resolution camera arrays?

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PROJECT SCHEDULE:
August 2022 to July 2024

Research Objectives

To solve the challenges described in the previous section, the goals of this project are the following:

- A technique will be developed that can provide sensor fusion at scale and identify outliers.
- Show that the system can dynamically adapt and reconfigure to changing situations across space and time on the highways.
- Design a low-cost hardware design that can be used to deploy sensor algorithms at scale through the region and can even integrate the upcoming low-cost lidars and low-resolution cameras within a box that integrates single computing boards, power supplies, weather-proof enclosures, and graphical processing units.

Potential Implementation and Expected Benefits

The outcomes of the research will enable a wider and more reliable reach for intelligent traffic monitoring systems. A self-adaptive and low-cost traffic monitoring system will give TDOT personnel access to real-time traffic data and insights by overcoming critical barriers of sensor fusion and data analysis. The learning-based artificial intelligence engine is a versatile solution that can be deployed anywhere, at any time, and for any level of sensing (from high resolution cameras to no sensors). This solution will provide flexibility and reliability for TDOT traffic operations and will benefit all Tennessee communities and maximize road safety across urban areas as well as resource-constrained rural areas by increasing situational awareness regardless of the level of sensing equipment available.

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