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Exploring the Opportunities and Challenges in Implementing Traffic Anomaly Detection for Real-World Applications

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Abstract

Objective

Federal and state crash data reveals that the percentage of wrong-way crashes (WWC) that prove to be fatal or near-fatal is as high as 25%, far exceeding the fatality rate for all vehicle crashes. Such alarming figures are driving much research attention towards an investigation into the implementation of preventive measures of wrong-way driving (WWD) crashes. Studies are being targeted at an early detection of the occurrence of such events, which aid in successfully alerting the driver as well as the other vehicles around. The use of technology has been explored. Accordingly, closed-circuit television (CCTV) traffic surveillance cameras have been deployed on a real-time basis to detect WWD vehicles with the help of deep learning and machine learning models. This project aims to explore the opportunities and challenges for implementing traffic anomaly detection on a real-world application. In other words, this study aims to improve the deep learning and machine learning algorithms that are used for detection. The successful implementation and running of a large-scale CCTV network can be used for a nationwide as well as statewide safety improvement program.

Method

As part of this study, as many as 100 cameras will be deployed to send messages that help detect stalled vehicles on the road as well as respond to an event on the road in a timely manner. Wrong-way detection using CCTV will be conducted in two steps. Detection and tracking of all the vehicles passing the camera will constitute the first step, with YOLOv3 as the detector and a tracking model based on the Kalman filter. The NVIDIA DeepStream Toolkit will be used in the second step for detection and tracking.

Expected results

The large-scale implementation of a network of cameras will help identify the challenges associated with it in terms of running the model, detection and object tracking. This will help address them in a timely manner.