Traffic Camera Dangerous Driver Detection (TCD3): Contextually Aware Heuristic Feature & OFA Density-Based Computer Vision with Movement Machine Learning Analysis of Live Streaming Traffic Camera Footage to Identify Anomalous & Dangerous Driving

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The goal of the TCD3 project is to identify anomalous and dangerous driving patterns from traffic camera feeds. Successful execution can improve road safety by assisting law enforcement catch dangerous drivers, who text while driving or drink and drive. TCD3's C++ software—in real time—uses Computer Vision to detect cars on the road, utilizes Machine Learning algorithms to identify cars exhibiting dangerous behaviors, and then notifies law enforcement of suspicious vehicles. The project overcomes several technical challenges such as detecting vehicles under different lighting conditions, tracking vehicles in different frames, and distinguishing random variations in a vehicle's path due to normal driving from anomalous variations due to distracted driving. A heuristic Computer Vision algorithm utilizes optical flow analysis, background subtraction, and feature extraction algorithms to reliably determine vehicle positions. A proprietary recursive matrix density-based method was created to clean sensor feeds, significantly improving detection accuracy, and greatly improving on current morphological methods. A test suite of doctored traffic camera footage was used to evaluate vehicle detection. Machine Learning was used for historical and active comparative analyses of vehicle paths to identify anomaly. Permission for large scale testing of the prototype on actual high fidelity traffic camera footage has been requested. Upon detection, the relevant video clip will be extracted and sent to law enforcement for further action. To increase affordability, processing speed, and scalability, a multi-node networked Spark-based supercomputing architecture is being investigated. TCD3 is multi-threaded for maximum resource allocation.

Awards Won:
Third Award of $1,000
International Council on Systems Engineering - INCOSE: First Award of $1,000