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Real-time Big Data video analytics for unorganized traffic environments

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Traffic on local roads has reached such a level that it is necessary to address the issue of traffic congestion and seek complex transport solutions for the city. Increase of the number of vehicles on the road becomes one of the key reasons for increasing traffic congestion. Traffic congestion is associated with massive financial and man-hour loss and therefore attempts to alleviate this has been of keen interest. The basis of almost all those approaches is traffic monitoring and analysis, leading to having an effective traffic management system. Most traffic management systems are applied in well-organized traffic environments such as highways, where driver discipline is high. But in unorganized urban environments as seen in Sri Lanka, road traffic behavior vary from the accepted standards. Driver and pedestrian indiscipline cause huge traffic congestions in urban areas. Hence in such a scenario, a system that monitors road traffic on different traffic environments is very useful. There are several existing techniques such as *Magnetic Loops, Microwave RADAR, Infrared Detectors, Ultrasonic Detectors* and *Camera Based Systems.* Traffic monitoring systems require short processing time, low processing cost and high reliability. Therefore, according to the literature, camera-based monitoring is the best-suited technique for traffic monitoring. Real-time video analytics are part of a centralized approach to modern traffic management which is defined as computer vision-based surveillance that provides algorithms for *object detection, tracking, classification* and *trajectory analysis* using real-time traffic surveillance video. It usually uses roadside cameras (CCTV) to obtain traffic information and transmit it to central servers, exhibiting real-time operability of big data.

In this study, several approaches and algorithms for moving object detection, based on temporal *differencing method, optical flow method, background filtering* are compared and a novel real-time vehicle detection and classification algorithm based on background filtering will be proposed and re-engineered in order to be applicable to challenging unorganized traffic environments. The solution will classify vehicles individually and their trajectories in real time in unorganized traffic environments in order to analyze the behaviors of the drivers as well as pedestrians on the road. We use *OpenCV* which is a library of programming functions mainly aimed at real-time computer vision, for implementing and testing algorithms. Data will be collected via pre-recorded video clips from Kiribathgoda junction in the western province, for the testing purpose and real- time CCTV surveillance video is going to be used as the input for implementation. A comprehensive data analysis is required to be conducted to address the higher processing requirement of such videos. The solution will be validated for performance subsequently. The final objective of this research is to come up with an optimum algorithm for vehicle detection and classification in unorganized traffic environments which would help to analyze the behavior of road users. The solution will lead to reduced traffic congestion in the country by enhancing the efficiency and effectiveness of traffic monitoring and analyzing systems.

Keywords: Traffic monitoring, Video analytics, Moving object detection, Big data