Road Enforcement Monitoring System based on Vehicle Type Recognition using Sparse Filtering Convolutional Neural Network with Layer Skipping Strategy (SFCNNLS)

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ABSTRACT

Road Enforcement Monitoring System (REMS) is one of the traffic monitoring systems to monitor the enforcement of a specific route for public transportation in cities. The aim of this system is to automatically and efficiently monitor the enforcement to ensure it is adhered by the traffic users. This aim is difficult to be achieved in current practice that relied on human observation by the authorities. Due to that, we proposed to combine REMS with vehicle type recognition (VTR) method known as Sparse-Filtered Convolutional Neural Network with Layer Skipping-strategy (SF-CNNLS). The purpose of using this method is to recognize and classify the vehicles that use the specific route. It is to prevent any vehicle other than public transportations use that route. The output from VTR will be used by REMS to trigger an immediate message to the authorities for further action. The major challenge of our method is to differentiate taxi and bus as public transportations with car and truck. This is because these vehicles have almost similar features. We tested our method with a self-obtained video that captured from a mounted-camera to observe if the challenge is able to be overcome. For the initial stage, the test is deployed on 4 major vehicle classes; car, taxi, truck and bus. The highest accuracy is obtained from car class with 92.5% and an average accuracy is 81.76%. Based on the test, we proved that our method is able to recognize and classify the vehicle classes although the vehicles are sharing almost similar features.

Keywords: Vehicle Type Classification; Convolutional Neural Network; Deep Learning; Computational Intelligence