A Smart Dash Camera System to Report Traffic Violations

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Abstract

Traffic accidents kill 4,621 people and injure 25,561 in Saudi Arabia. Traffic violations reflect a large number of traffic accidents; in 2019, the number of traffic violations surpassed 50,000,000.

Saudi Arabia has a system to detect violations such as speeding and crossing red lights, but not drifting, driving in the opposite direction, or overtaking, as these occur on roads outside the range of these systems. Taking advantage of visual data such as live stream videos of the dashcam and combining it with computer vision technology, which is a field of artificial intelligence (AI) that enables systems to derive meaningful information from digital videos, can reveal a technology that has not yet been initiated in Saudi Arabia.

The proposed methodology consists of developing a mobile application linked to the driver's dashcam to obtain the live stream and detect violations, such as drifting, driving in the opposite direction, and overtaking. The traffic violation system consists of a pipeline of two different modules that analyze the video frames: vehicle detection and traffic violation detection modules. The system was implemented using the data collected by “RASD” team.

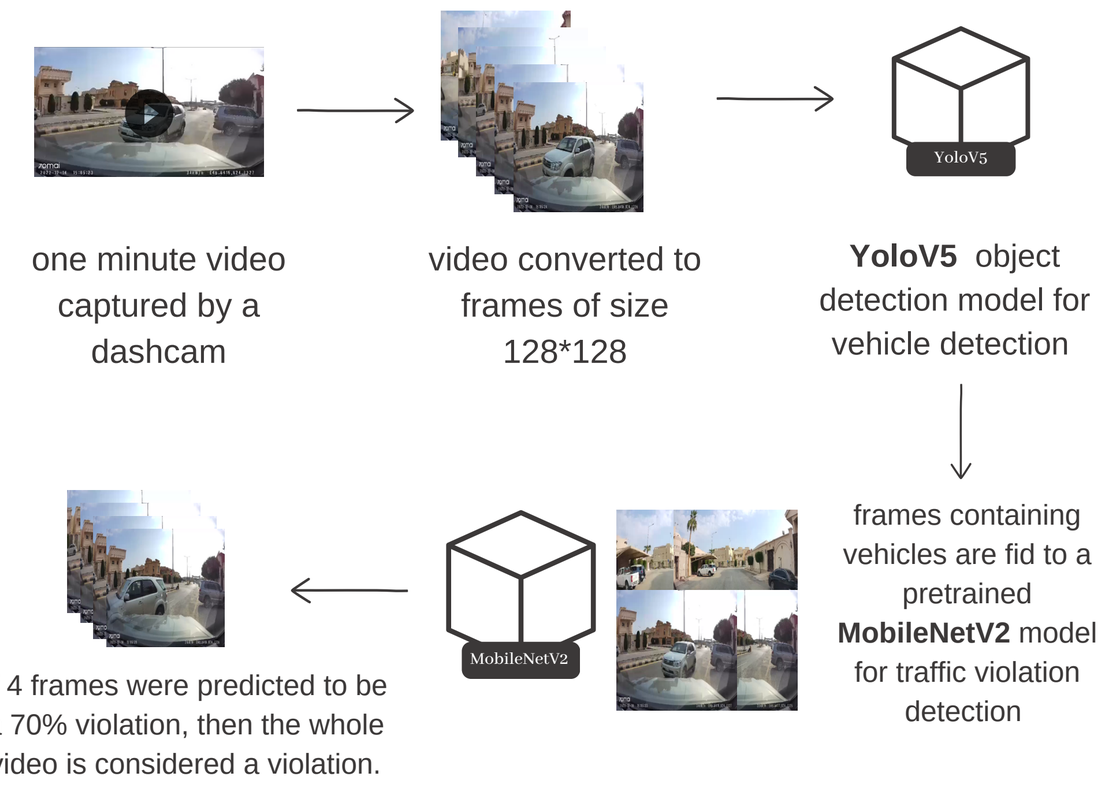
Objectives

- Embed a detection system in drivers' vehicles to expand the General Department of Traffic's coverage over the roads.
- Provide clear evidence of violations to preserve the driver's time and rights.
- Offer a ready-made report to ease the process of reporting violations to authorities.

Dataset

The dataset used was collected from Twitter and our dashcams. Then manually annotated as a violation and normal traffic videos by three humans, with 76.16% agreement. The dataset contains 348 violations and 348 normal videos.

Methodology



one minute video captured by a dashcam

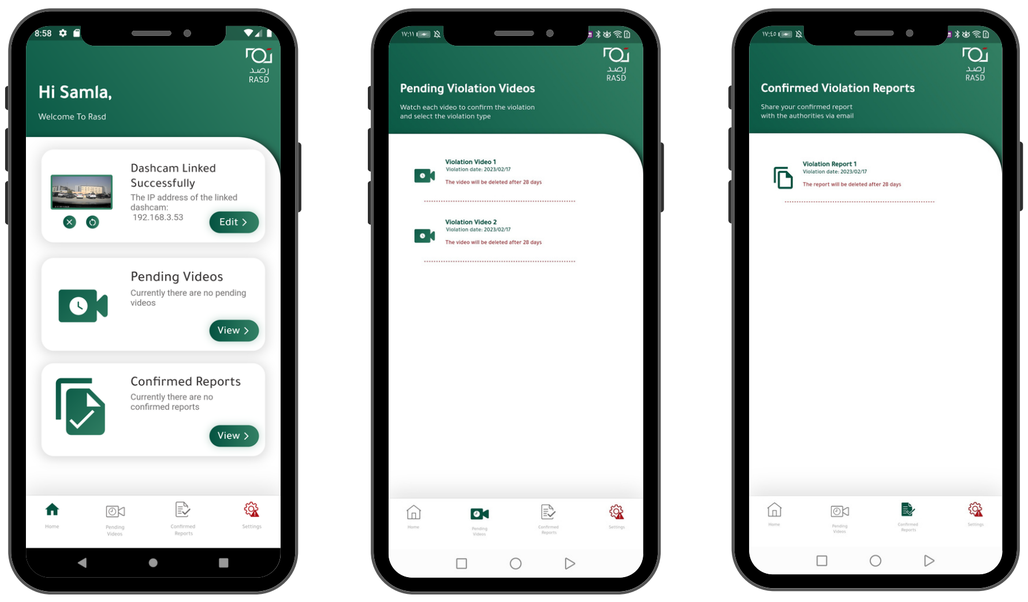
video converted to frames of size 128*128

YoloV5 object detection model for vehicle detection

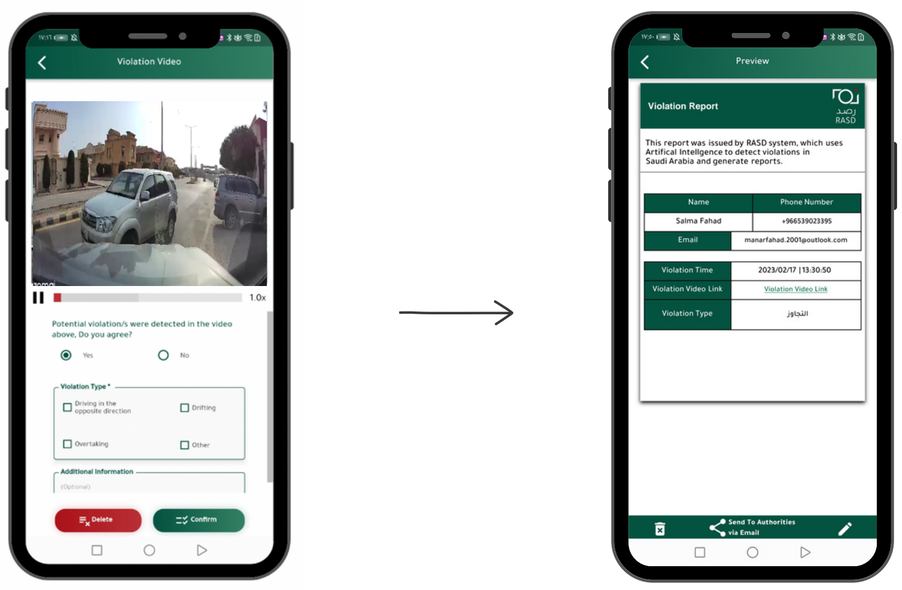
frames containing vehicles are fid to a pretrained **MobileNetV2** model for traffic violation detection

If 4 frames were predicted to be a 70% violation, then the whole video is considered a violation.

Interfaces



Results



Video sent to driver's mobile for confirmation of violation.

The report is generated after confirming