Real-Time Driver Assistance using ML and OpenCV for Mobile Platform

Batch No : 8

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Abstract

- A real-time driving assistant application for mobile platforms. Taking into consideration the limited memory and processing power provided by current mobile platforms, the proposed method has been developed to be simple and robust.

- Vision-based driving assistants have been developed for decades. Their results are almost ready to be equipped in conventional vehicles. Most of the existing methods are targeted at the embedded market, but not at mobile platforms.

Existing System

- Almost all vehicle accidents are caused by human error, which can be avoided with Advanced Driver Assistance Systems (ADAS). The role of ADAS is to prevent deaths and injuries by reducing the number of car accidents and the serious impact of those that cannot be avoided.

- Focused on Embedded System rather than mobile platform, primarily used in Cars.

- Implementing the system for mobile platforms which safety-critical applications.

Proposed System

- An application with the ability to run in real-time conditions covering multiple functionalities such as collision warning, traffic Sign detection, off-road warning(lane departure), vehicle detection or pedestrian detection.
- The inspiration behind this project is the Advanced Driver Assistance Systems (ADAS) system mostly found in cars, ADAS being an embedded system lacks portability, and the proposed system primarily focuses on two-wheeler vehicles and is portable to a large extent.
- Developing a Vision-based driving assistant for mobile platforms.

Details of the tools for Implementation

- Components needed -
  - OS – Android
  - Development Environment – Android Studio
  - Language – Java/Kotlin
  - Libraries – OpenCV and Qualcomm HetCompute SDK
- The operating system used is Android, development environment is Android studio, Java or Kotlin can be used to develop the application and use of OpenCV or FastCV to detect objects in image and classify them accordingly, use of Qualcomm HetCompute SDK a heterogeneous computing SDK for efficiency and making app real-time.

Feasibility Study

- Challenges involved in developing an application that will involve computer vision and artificial intelligence, while also incorporating design and third- party APIs.
  - Intensive Processing Tasks
  - Machine Learning
  - Limited Data
  - Delay Between Obtaining Data and Producing Results

Literature survey

- Previously existing system includes ADAS and some of the works of self driving cars, research papers used are
  - SAE J3016 automated-driving graphic
  - Garret O. 10 Million Self-Driving Cars Will Hit The Road By 2020
  - Jesmanczyk. Traffic Sign Detector
  - And some quick google searches yielded very informative elements

Outcomes:

- Modern functionality to two-wheelers and older cars by only using Android Mobile Device.
- These functionalities are lane detection and whether the driver is drifting away from it, speed limit detection, traffic sign, audio alerts and Object Detection.

References:

- SAE J3016 automated-driving graphic.
- Garret O. 10 Million Self-Driving Cars Will Hit The Road By 2020.
- Jesmanczyk. Traffic Sign Detector.
- Alerting drowsy distracted drivers using dual cameras smartphones," in MobiSys, H.-H. Chu, P. Huang, R. R. Choudhury, and Zhao, Eds. ACM, 2013.
- Pyramid Transformer for Traffic Sign Detection (https://arxiv.org/abs/2207.06067)