Automatic Driver's Situation Recognition|ADSR

Probed by

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Introduction

Statistics for the year 2011 estimated the number of daily deaths in the Kingdom due to car accidents as 20 deaths per day, (1) as well as behind deaths and disabilities in the world. It is expected that in 2030, car accidents will be the fourth cause of death worldwide. Also, Saud University conducted a study that used a detailed questionnaire to study the prevalence of drowsiness among drivers and its impact on accidents. The study was conducted in three regions, "Al-Wusta, Eastern and Western" on a sample of private car drivers whose number exceeded 1200 drivers, and the information was collected for six months, and the average age of drivers was 32 years. The study showed frightening results, as (33%) admitted that they were about to fall into at least one accident due to drowsiness during the study period (6 months), and (12%) of the drivers who were involved in a real traffic accident admitted that the cause of the accident was drowsiness during the study period. Leadership. A frightening result revealed by the study. (64%) admitted that they felt very drowsy as a result of their concentration while driving at least once during the study. (2)

Another poll conducted in Britain showed that 11 percent of drivers admitted to falling asleep at least once while driving. A study conducted by the National Committee for Sleep Disorders in the United States showed that drowsiness while driving was one of the causes of 36% of fatal accidents, while a report published by the Department of Transport and Environment in Britain showed that 20% of fatal accidents and serious accidents resulted from drowsiness while driving. The survey showed that only a fifth of drivers stop their cars to snooze when they feel very drowsy.

Researchers in the United States have found that one in 30 drivers on long roads feels very drowsy while driving, and statistics from the National Traffic and Security Administration in the United States have shown that drivers drowsiness while driving is the main cause of more than 100,000 accidents annually.

The second reason, which is no less dangerous than drowsiness, is the driver's distraction while driving. The most distracting driver is his use of a mobile phone while driving, a study revealed a high rate of traffic violations among drivers in the city of Riyadh and the reason for their use of mobile phones. (3)

As well as eating and drinking while driving, and a study conducted by the "Mas" women's car insurance company found that about 20% of female motorists admitted to wearing make-up during driving periods at least and applying foundation cream, while 3% of them admitted that they caused a collision with a pedestrian because makeup. (4). Many of the accidents that occur with women may be caused by distraction due to preoccupation with applying makeup.

Riyadh, Qassim, Makkah, Jeddah and Madinah are the most Saudi cities Traffic accidents are caused by drowsiness and distraction while driving. (5). And to reduce the problem of accidents caused by sleep or distraction while driving. We aim to build a system that detects driver drowsiness by measuring the number of eye blinks that increase when drowsy, as well as predicting the driver's distraction while driving. using deep learning.

Questions/Needs

- Apart from yawning, how to detect the driver's drowsiness via his facial expressions?
- What type of things that distract drivers while they drive?
- What are the most dangerous distractions that cause accidents?
- Designing a mechanism to find the relationship between facial features and idleness that leads to distraction?
- Analyze the behaviour of drivers to find causes of accidents.

Methodology

The method built in this work to detect Drowsiness and a Distraction for Drivers works on two main systems that are Convolutional Neural Networks (CNN) and Algorithms used. Convolutional Neural Networks are Deep Learning algorithms which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. Algorithm is used in this method for recognition and detection as it can recognize if the driver is drowsy or not and another Algorithm if the driver is Distracted or not, with high accuracy. The proposed

methodology works in a number of phases and in the model, overview is given a general model of driver states.
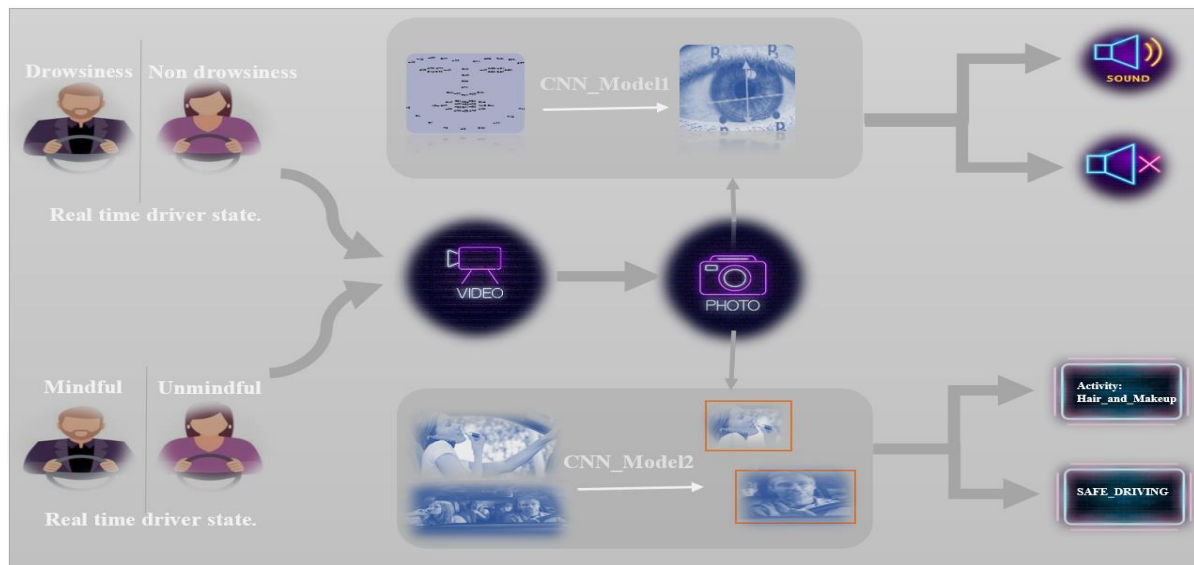
Model Overview

Figure1: General model of the driver states detection system.

Driver state Detection Dataset

- **The first dataset** used for the model is created by state farm in Kaggle. It gives us driver images, each taken in a car with a driver doing something in the car (texting, eating, talking on the phone, makeup, reaching behind, etc). The data comprises around 102,152 images of people under different conditions.

- **The second dataset** is MRL Eye Dataset, the large-scale dataset of human eye images. This dataset contains infrared images in low and high resolution, all captured in various lightning conditions and by different devices. We use it to Detect Driver Drowsiness. The data comprises around 7500 images of the human eye under different conditions.

Tools

- **A lap came** through which we will capture images.
- **python** (3.6 version recommended).
- **OpenCV** (face and eye detection).
- **TensorFlow** (keras uses TensorFlow as backend).

- **Keras** (to build our classification model).
- **Pygame** (to play alarm sound).
- **Darknet framework** (open-source framework that supports Object Detection and Image Classification tasks in the form of CNN).

References

(1) The prevalence of drowsiness as a risk factor among motorists involved in traffic accidents; A local study on a sample of drivers in the Kingdom of Saudi Arabiahttps://prod.kau.edu.sa/centers/spc/jkau/Data2/Review_Artical_ar.aspx?No=3574

(2) University Center for Sleep Medicine and Research at King Saud University College of Medicine.

(3) The prevalence of seatbelt and mobile phone use among drivers in Riyadh, Saudi Arabia: An observational study.https://www.sciencedirect.com/science/article/abs/pii/S002243751730823X?via%3Dihub

(4)A study conducted by the "MAS" women's insurance company.

(5) Ministry of Interior—Kingdom of Saudi Arabia. Available online: https://www.moi.gov.sa