Drowsiness Detection using Convolutional Neural Networks
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Abstract:
Drowsy driving causes, in the US alone, more than 80,000 crashes occur every year. These startling figures show how prevalent drowsy driving is. Fatigue has costly effects on the safety, health, and quality of life. As most of the systems which do drowsiness detection just use OpenCV to detect if the person is drowsy or not these systems use ratios like EAR (Eye Aspect Ratio) and MAR (Mouth Aspect Ratio) these systems aren’t very accurate. We are creating a system where we are training a dataset of 80,000 images with a Convolutional Neural Network. The accuracy of our model is 92%.

I. INTRODUCTION

Exhausted drivers who doze off at the wheel are responsible for about 40% of road accidents, says a study by the Central Road Research Institute (CRRI) on the 300-km Agra-Lucknow Expressway. In the US alone, more than 80,000 crashes occur every year due to drowsy driving. These startling figures show how prevalent drowsy driving is. Fatigue has costly effects on the safety, health, and quality of life. These include impaired cognition and performance, motor vehicle crashes, clouded judgements, and health consequences. Tackling these issues can be difficult when our values frequently do not align with avoiding drowsy driving. In a 24/7 society, with an emphasis on work, longer commutes, and exponential advancement of technology, many people do not get the sleep they need. Effectively dealing with the drowsy-driving problem requires fundamental changes to societal norms and especially attitudes about drowsy driving, and this is an effort to detect these drowsiness events, using AI. According to the National Sleep Foundation, about half of U.S. adult drivers admit to consistently getting behind the wheel while feeling drowsy. About 20% admit to falling asleep behind the wheel at some point in the past year— with more than 40% admitting this has happened at least once in their driving careers.

II. LITERATURE SURVEY

[1] Transportation is widely used to allow user travel conveniently from place to place, for a personal or official purpose. Travel during peak hour or holiday, exposes the driver to traffic jams for several hours, thus causing the driver to feel drowsy easily due to high concentration and lack of rest. This situation contributes to the increasing percentage of car accidents due to car driver fatigue is the primary origin of the car accident. In this paper [1], the writer proposes an image detection drowsiness system to detect the state of the car driver using the Eye Aspect Ratio (EAR) technique. A developed system is used to detect and analyse continuously the state of eye closure in real time. This system is able to recognize whether the driver is drowsy or not, with the initial, wearing spectacles, dim light and microsleep condition experiment conducted successfully giving 90% of accuracy. This situation can increase the vigilant of drivers significantly.

According to B.C.Tefft[2], results showed that an estimated 6% of all crashes in which a vehicle was towed from the scene, 7% of crashes in which a person received treatment for injuries sustained in the crash, 13% of crashes in which a person was hospitalized, and 21% of crashes in which a person was killed involved a drowsy driver. If these proportions are applied to all reported crashes nationwide, results suggest that an average of 328,000 crashes annually, including 109,000 crashes that result in injuries and 6,400 fatal crashes, involve a drowsy driver.

III. EXISTING SYSTEM

The most of the prevalent systems that detect drowsiness with the reference of code use XML based filters eg. Haar Cascade classifiers in OpenCV. A few Other systems use mathematical formulae like EAR (Eye Aspect Ratio) and MAR (Mouth Aspect Ratio). Lane positioning of the car: Implemented by many cars, here, the position of the car, w.r.t lane is continuously monitored. When the driver drives slowly or in a zig-zag way, or abruptly stops/speeds up the car, an alert is generated.

IV. PROPOSED SYSTEM:

The System we propose is a deep learning approach. A SINGLE LAYERED CNN MODEL is constructed in order to predict the outcome. Rather than having a dependence on the probability, we depend on the dataset and the neural network where the weights are determined. With the current efficiency being 92% the efficiency can be increased by increasing the size of the dataset.

V. SYSTEM ARCHITECTURE

- We are using OpenCV’s video capture function to capture the image of the person.
- OpenCV classifier, filters and selects only the eyes of the person ignoring all the other details. We are using this to improve the accuracy of the classification.
The CNN we have created is trained using 80,000 images which predicts if the eye is open or close with a 92% accuracy.

**OpenCV Cascade Classifier**
- To capture the eyes of the person the algorithm first captures the faces that exist in the image and then try to capture the eyes present in those images.

**In the project we are taking 25 images per batch and in those 25 images we predict how many frames the eyes are closed for a person. If the number of frames in which the person has closed his eyes is more than half the batch size then we will play a loud sound.**

**Figure 2. HAAR Cascade Classifier Architecture**

**VII. CONCLUSION**

We have reviewed the various methods available to determine the drowsiness state of a driver. Although there is no universally accepted definition for drowsiness, the various definitions and the reasons behind them were discussed. The various ways in which drowsiness can be manipulated in a simulated environment.

The various measures used to detect drowsiness include:
1. Subjective
2. vehicle-based
3. physiological
4. behavioral measures;

These were also discussed in detail and the disadvantages of each measure were discussed. Although the accuracy rate of using physiological measures to detect drowsiness is high, these are highly intrusive. However, this intrusive nature can be resolved by using contactless electrode placement. Hence, it would be worth fusing physiological measures, such as ECG, with behavioral and vehicle-based measures in the development of an efficient drowsiness detection system. In addition, it is important to consider the driving environment to obtain optimal results.

**VIII. REFERENCES**

