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WARNING SYSTEM FOR DRIVERS TO AVOID ACCIDENTS

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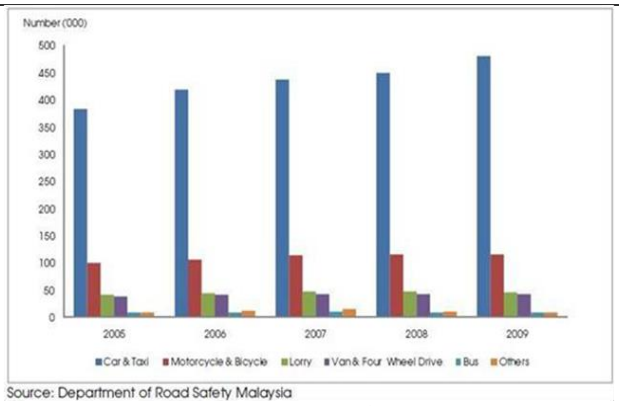
Abstract: This document is a complete report on the research conducted and the project made in the field of computer engineering to develop a system for driver drowsiness detection to prevent accidents from happening because of driver drowsiness. Drowsiness is one of the main causes leading to road accidents. They can be prevented by taking the effort to get enough sleep before driving or having a rest when the signs of drowsiness occur. Thus, it is not comfortable to be used in real-time driving. This project describes how to detect the eyes and mouth in a video recorded with the help of a camera. The report proposed the results and solutions to the limited implementation of the various techniques that are introduced in the project.

Keywords: Road Accidents, Driver Drowsiness, Camera, Prevent Accidents.

I. INTRODUCTION

Drowsiness is a state of near-sleep, where the person has a strong desire for sleep. It has two distinct meanings, referring both to the usual state preceding falling asleep and the chronic condition referring to being in that state independent of a daily rhythm. Sleepiness can be dangerous when performing tasks that require constant concentration, such as driving a vehicle. When a person is exhausted while driving, they will experience drowsiness and this leads to an increase in the factor of a road accident.



Source: Department of Road Safety Malaysia

Fig 1: Graph Representing Accidents in the past few years due to drowsiness

The development of technologies for detecting or preventing drowsiness while driving is a major challenge in the field of accident avoidance systems. Because of the hazard that drowsiness presents on the road, methods need to be developed for counteracting its effects.

The aim of this project is to develop a simulation of the drowsiness detection system. The focus will be placed on designing a system that will accurately monitor the open or

closed state of the driver's eyes and mouth. By monitoring the eyes, it is believed that the symptoms of a driver's drowsiness can be detected insufficiently early stage, to avoid a car accident. When a person is drowsy, they keep yawning to ensure that there is enough oxygen for the brain consumption before going to a drowsiness state. Detection of drowsiness involves a sequence of images of a face and the observation of eyes and mouth open or closed duration. This detection method is based on the time of eyes closed which refers to the percentage of a specific time.

By monitoring the eyes, it is believed that the symptoms of driver drowsy can be detected early enough to avoid a car accident. Detection of drowsy involves a pattern of images of the face and the observation of eye movements and blink rate.

This project is focused on the localization of the eyes and mouth, which involves looking at the entire image of the face, and determining the position of the eyes and mouth, by applying the existing methods in image- processing algorithm. Once the position of the eyes is located, the system is designed to determine whether the eyes and mouth are opened or closed, and detect drowsiness.

II. LITERATURE SURVEY

Rizul Sharma [1] proposed that it has been observed that when drivers do not take a break they tend to run a high risk of becoming drowsy. Study shows that accidents occur due to sleepy drivers in need of a rest, which means that road accidents occur more due to drowsiness rather than drink-driving. Attention assist can warn of inattentiveness and drowsiness in an extended speed range and notify drivers of their current state of fatigue and the driving time since the last break offers adjustable sensitivity and, if a warning is emitted, it makes the driver state conscious.

Sukrit Mehta et al [2] This paper is about making cars more intelligent and interactive which may notify or resist users under unacceptable conditions, they may provide critical information of real-time situations to rescue or police or the owner himself. Driver fatigue resulting from sleep disorders is an important factor in the increasing number of accidents on today's roads. In this paper, we describe a real-time safety prototype that controls the vehicle speed under driver fatigue. To advance a system to detect fatigue symptoms in drivers and control the speed of vehicles to avoid accidents is the purpose of such a mode. In this paper, we propose a driver drowsiness detection system in which one web camera is used for detecting the drowsiness of the driver. If the driver is found to have slept, the buzzer will start buzzing until the driver attains consciousness.

VB Navya Kiran [3] Detecting Driver Drowsiness Based on Sensors Researchers have attempted to determine driver drowsiness using the following measures:

- Vehicle-based measures
- Behavioral measures
- Physiological measures

A detailed review of these measures will provide insight into the present systems, issues associated with them, and the enhancements that need to be done to make a robust system. This paper reviews the three measures as to the equipment used and discusses the advantages and limitations of each. The various ways through which drowsiness has been experimentally manipulated are also discussed. It is concluded that by designing a hybrid drowsiness detection system that combines non-intrusive physiological measures with other measures one would accurately determine the drowsiness level of a driver. A number of road accidents might then be avoided if an alert is sent to a driver that is deemed drowsy.

Mahek Jain [4] - Eye Tracking Based Driver Drowsiness Monitoring And Warning System This project represents a way of developing an interface to detect driver drowsiness based on continuously monitoring eyes and ML algorithms. MicrosleeIn this project we design an application in which a webcam and buzzer are fitted. This entire setup checks the driver's consciousness. Now what happens here is first when the driver sits on the driver's seat, and when his/her face is captured and recognized using OpenCV and dlib libraries. This entire setup works in this way and checks whether the eyes are closed or not, if the eyes are not closed then it again checks for it, p is the short period of sleep lasting 2 to 3 seconds, which is a good indicator of fatigue state. Thus by monitoring continuously the eyes of the driver by using a camera one can detect the sleepy state of the driver and a timely warning is issued. The aim of the project is to develop an application that is very advanced related to driver safety on the roads using face recognition and image processing. This product detects driver drowsiness and gives warnings in form of alarms to avoid accidents.

III. PROBLEM STATEMENT

The project aims at detecting drowsiness while driving to alert the driver at the right time to prevent any mishappening. The project uses a web camera to predict whether a person feels drowsy or not based on whether the eyes are closed or open. The main aim of the project is to tell whether the driver is in a proper state to drive the car or not. The project has a direct application in the automobile industry, makes driving safer, and reduces the death toll caused by drowsy driving. It ensures the safety of the driver by detecting the cause of the accident by recognizing the face through face recognition and determining the face by monitoring the eyes of the driver, in the end, it states the conclusion that whether the driver is inactive state or in a drowsy state.

IV. OBJECTIVE

The project focuses on these objectives, which are:

- To suggest ways to detect fatigue and drowsiness while driving.
- To study eyes and mouth from the video images of participants in the experiment of driving that can be used as an indicator of drowsiness.
- To investigate the physical changes of fatigue and drowsiness.

To develop a system that uses eye closure and yawning as a way to detect drowsiness.

V. METHODOLOGY

The process of losing alertness at the wheel due to fatigue can be characterized by a gradual progression of facial features: Changes relating to the direction of the gaze of the driver, Changes in the position of the eyelids or the size of the eyes, Rapid changes in the rate of blinking and orientation and position of the head. Through analysis of the eye states, the system will be able to tell a drowsy driver from a normal driver. A video stream will be continuously obtained from the driver's faces and fed into a microcontroller for processing. Classifiers will then be used to classify the state of the driver's eye. If a drowsy driver is detected an alarm will be raised until the system notices the driver is alert.

The system was broken into small modules, these modules were developed independently and tested integration was done. During the unit, testing refactoring was adopted in order to optimize the units for their intended purpose.

After starting the video stream, we have to eliminate the lightning effects using the histogram equalization and Gamma Correction.

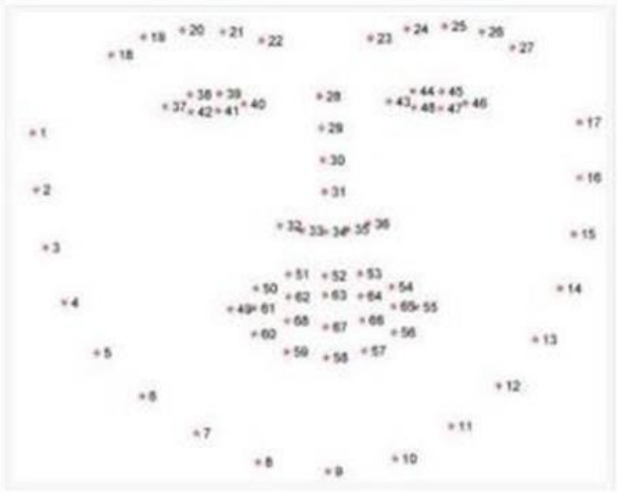


Fig 2: Face Recognition Landmark Diagram

This will explain the method that has been taken in order to reach the objectives of the project and a closer look at how the project is implemented. It is the analysis of each stage that will be faced in order to complete this project. Each selection and achievement of the method taken that has been implemented in this project will be explained for each stage until the project is successful.

This loop continues until the eyes are found closed. As soon as the eyes are found closed, it again goes for a second check, and again if the eyes are found closed then the buzzer is blown and it continues blowing until and unless it warns the driver. We over here set a condition if the eyes are blinking, then the driver is active, and in the opposite case when the eyes are blinking for more than one second or the eyes are closed then it will show a drowsy state means the driver is not in a condition to drive the car. The same process keeps repeating. In short, we can say whenever the driver feels drowsy his eyes start to blink for more than one second, this status is detected by the web camera and the buzzer is blown to make the driver conscious.

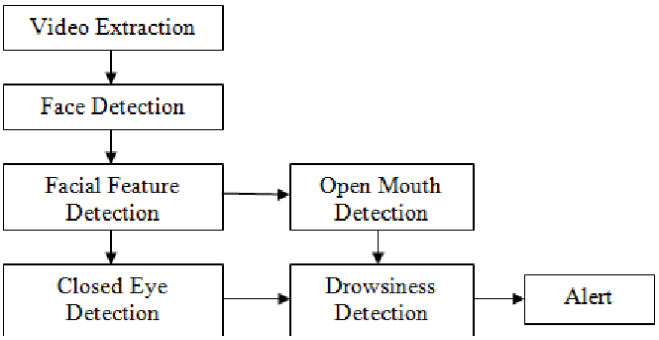


Fig 3: Figure Representing flow of the project

VI. SOFTWARE DESIGN & IMPLEMENTATION

Software design is a mechanism to transform user requirements into some suitable form, which helps the programmer in software coding and implementation. It deals with representing the client's requirement, as described in SRS (Software Requirement Specification) document, into a form, i.e., easily implementable using the programming language

Software Requirements Specification

- Python: Python 3 Libraries
  - Numpy
  - Scipy
  - Playsound
  - Dlib
  - Imutils
  - Pygame
- Operating System: Operating System Requirement
  - Windows or Ubuntu Hardware RequirementSpecification
  - Laptop with basic Hardware
  - Webcam

Requirement Analysis Python: Python is the basics of the program that we wrote. It utilizes many of the python libraries.

Python 3 Libraries *:*

- Numpy: Prerequisite for Dlib
- Scipy: Used for calculating Euclidean distance between the eyelids.
- Pygame: Used for sounding the alarm
- Dlib: This program is used to find frontal human face & estimate pose
- Imutils: Convenient functions written for Opencv.
- Opencv: Used to get the video stream from the webcam, etc.

OS: Program is tested on Windows 10 build 1903 and PopOS 19.04

Laptop*:* Used to run our code.

Webcam: Used to get the video feed.

VII. IMPLEMENTATION

This study implemented this source for reducing incorrect detection by exactly recognizing the drowsy and active when both eyes are located in each facial position according to the center of the face.

The figure shows a scene that detects whether the driver is active or drowsy. Therefore, it was possible to improve the prevention of drowsy driving by improving the algorithm for image processing as much as possible and efficiently detecting eye blinking.

Fig 4: Figure Representing Non-Drowsy Driver

Fig 5: Figure Representing Drowsy Driver

To keep the driver away from being drowsy we have imported a feature called mixer from the pygame library which plays an alarm sound to awake the driver.

VIII. CONCLUSION AND FUTURE SCOPE

The purpose of our project is to help solve real-life problems in a very cost-effective way. It alerts the driver to avoid any accidents in future reference. Whenever the driver feels drowsy and closes his eyes for more than a second, the buzzer is blown. As a result, it alerts the driver. As a result, the accident ratio decreases. Hence, our project if commercially developed will help in saving the precious life of the driver & money of the owner.

Future works may focus on the utilization of outer factors such as vehicle states, sleeping hours, weather conditions, mechanical data, etc, for fatigue measurement. Through its Driver Availability Detection system, sensors will scan the head and face to ensure that the eyes are open and the driver is alert before the car turns over the steering wheel.

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