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VIVIFY: DRIVER'S DROWSINESS DETECTION AND ALARMING SYSTEM

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Abstract— The system is Cross-Platform Mobile Application using Face Detection with Machine learning detecting fatigue of driver, which will help in preventing road mishaps. Every year road accidents due to human error cause an increasing amount of deaths and injuries globally. Driver's drowsiness is recognized as an important factor in vehicle accidents. Preventing drowsiness among drivers is a necessity to get an accurate result about the driver's fatigue level and provide a warning to the driver to help them avoid drowsiness and ensure safe driving not only for them but also for others who are in the vicinity of the vehicle area while driving. This app offers a method for scanning the facial landmarks and after detecting the face use the required landmarks for eye tracking. This will allow the vehicle to be in complete control of the driver. The system uses the front camera of the mobile phone that points towards the driver's face or the dashboard camera and monitors the driver's face to detect fatigue. In case, the drowsiness is detected an alarm is used to warn the driver and the alarm is then switched off manually with an idea that the alarm will be providing an alert until the driver is wakeful. For this purpose, a deactivation button will be used to deactivate the alert or alarm. There will be more features in the system such as sending SOS if something happens to a vehicle at an isolated place. The app also provides helpline numbers, in case of any emergency situation the driver can contact the required authorities as and when required. The app comes with a detailed list of road safety measures to remind the driver about the rules and regulations to be followed for a safe ride. Vivify can also be used for navigation purposes using the map feature in the app. Flutter will be used for a native and user-friendly interface of the system. This will allow the app to be available for both android as well as IOS devices. Minimal use of the hardware will ensure smooth processing. This system can be used for different scenarios like for cab services, on-road cargo service, and late-night travelers.

Keywords— flutter, fatigue level, face detection, drowsiness detection, fatigue level detection

I. INTRODUCTION

Drowsy driving is a significant variable in an expansive number of vehicle accidents. In a country where road accidents claim three lives every minute according to a report which also stated that there is a need to educate the

people who drive regularly especially at nights about the importance of sleep and taking breaks whenever required. In a recent study, it was stated that nearly 40% of road accidents are due to drowsiness in drivers which makes them vulnerable to take necessary steps to avoid accidents. Drowsiness increases the impairment caused by alcohol and lack of sleep. People who have to travel a lot after night break for example truck drivers, people going for trips, the military personnel who have to send their supplies on time and the people who are returning from work after a long day and have to face their city traffic which is also exhausting at times.

Drowsiness occurs due to work stress and fatigue which can occur due to lack of sleep, medications, alcohol, or even because of a tiresome long journey. Also, an alternative reason that can be contemplated is the dullness of driving on

expressways or in jam-packed traffic. According to the data published by the ministry of road transport and highways about 1,47,900 people lost their lives due to road accidents in 2017. These road accidents were caused by poor infrastructure of the roads, poor conditions of the vehicles and the amount of load the vehicles carried, and most of the accidents were caused before daybreak. Therefore it is visible that the drivers were feeling drowsy as they were traveling for hours without taking breaks and were not mentally prepared to face such challenges while traveling through difficult terrains. It has been stated that 30% of all traffic accidents have been caused by drowsiness. The persistent construction of highways and the upgrading of vehicle operation have made it feasible for drivers to benefit from enjoyable and restful driving. But still, there are many cases of road accidents due to drowsiness among drivers. Therefore a need for an ideal solution for detection of drowsiness is a must which not only detects fatigue with accurate precision but which is also cost-effective and user friendly to everyone. Therefore an idea of developing an app was formed which can be used by all irrespective of whether the user is using an android device or an IOS device.

II. LITERATURE SURVEY

Many analysts have worked over the years on systems for driver's fatigue detection, focused mainly on drowsiness, with various techniques. Producing an accurate result for fatigue detection has been challenging for many years. Hence techniques were developed with the purpose of detecting drowsiness.

We have seen many technologies in the field of hardware that required sensors, cameras, Arduino Uno processors, and led sensors, etc. The approach in [1] using the Drivers Monitoring System to monitor the attention of the driver on the road, also checking drivers state whether fatigue level. The Drivers Monitoring System has a CCD Camera placed on the steering column which is used for eye tracking via infrared LED detectors. Drowsiness detection is used to check the drowsiness level of the driver by tracking the eyes, whenever the eyes are closed or lower than the threshold value for a specified time it alerts the driver with an alarm that is closed manually, this helps to bring the driver's attention on the road. Using Deep Neural Network techniques to implement the drowsiness detection and driver monitoring system in an Android Application.

The approach in [2] using various deep learning algorithms like Face detection using Haar-like Classifier Cascades and Eye detection using template matching. Face detection using Haar-like Classifier Cascades used in object detection and face detection that uses digital Image features used for detecting the facial landmarks of the driver. Eye detection using template matching is used to detect if the driver's eyes are open or closed. The techniques are implemented in Android devices. The approach in [3] using Arduino UNO Microcontroller, IR detector (to measure eye blinking rate), Accelerometer (to detect 'head-nodding'), Thermistor (to measure breathing rate), IR LED and Phototransistor (to measure heart rate).In this low-cost hardware were used to make it a cost-effective and to increase the accuracy we need to use good hardware.

There are a lot of better hardware-based implementations of the drowsiness detection, as explained above but the software-based implementation lacks accuracy and effectiveness. In the approach in [4] using the EPCIS implementation, LSTM implementation, Smartphone Warning implementation, the system was based on GS1 standards with Machine Learning to warn the driver before losing the conscious state. If we use high-level hardware we will get a high accuracy output for a device, for the approach of [5] using Used Raspberry pi 3 Model B & Raspberry pi chamber/case and fan, Haar Cascade Classifier, Opencv and Dlib Libraries. Raspberry pi is the 3rd generation model with WLAN and Bluetooth connectivity, Haar Cascade Classifier same as used in [2] making it a better version for it, using OpenCV and Dlib Lib for facial detection and Landmark detection.

III. PROPOSED TECHNOLOGY

Most of the previous technologies developed for drowsiness detection mainly required hardware components which made them unaffordable to everyone. Also, the system becomes complex when a user has to set up the hardware components every time they use it. Therefore we came up with an idea of a mobile app that only requires a smartphone with basic features. The app was developed using Flutter which is a cross-platform application, using which any application can be installed in android as well as ios devices. All the plugins which are used in Flutter are developed using Java, Objective C and Swift. Any user who wants to build their own plugins can easily develop them for Flutter. The app also uses Google Firebase which provides multiple features by various APIs. The app uses machine learning features and its attributes using the Machine Learning Kit from Google Firebase. A user can use the navigation to reach its destination by using a module called Map provided in the app. Map API is accessed using the Google Cloud Platform. The app was built on Android Studio which is one of the most popular Integrated Development Environment for developing android apps and also after the release of Flutter in 2018 it is now one of the common platforms for Flutter as well. Android Studio comes with a feature of a virtual emulator that provides a simulation of an android device. We made an Android emulator on which we built our app during the development stage.

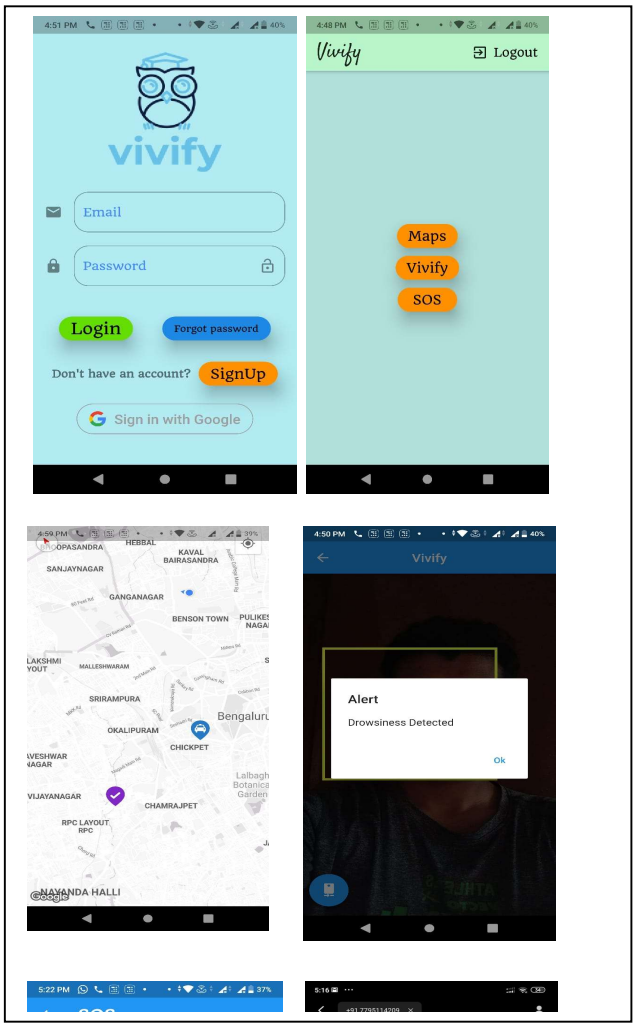
A. Architectural Design

After installing Vivify on any smartphone the user has to enter the credentials for login in the smartphone. If the user is not registered then they can use the signup option to register themselves. After providing the email and password and verifying its email the user is registered and can login to access the features of Vivify. The user stays logged in until it is he/she uses the logout option. Vivify uses the Map API for providing the user with navigation features in the map.

The Drowsiness detection feature can be accessed from the Vivify module. The app uses the ML Kit's face detection API which is used to detect faces in any image by using the facial landmarks. These facial landmarks can be used to get information which are used for various applications like sentimental analysis, drowsiness detection etc. ML Kit provides predefined methods which can be used to calculate the drowsiness which are the leftEyeOpenProbability and the rightEyeOpenProbability. These methods provide information about the status of the eye whether the eye is open or closed.

The SOS module in the app can be used to send a message which consists of coordinates of the user's current location. This message is sent on a number which is provided by the user after the successful login in the app. The SOS module also consists of helpline numbers which have all the emergency contact details. The user can report a complaint regarding any accident related queries in the report option provided in the SOS module.

The step by step working mechanism of the vivify app can be summarized as follows:



- he driver after opening the vivify app in his phone needs to keep the distance from the driver's eyes for about 50-60cm, about one hand's length from where the scanning of the face can be done easily.
- The camera continuously detects the face of the driver.
- After detection of face the facial landmarks are used for eye detection using the methods for left eye leftEyeOpenProbability and for the right eye rightEyeOpenProbability.
- The methods are used to calculate the average distance between the coordinates of the upper part of the eye and lower part of the eye vertically.
- The average distance is compared with the threshold value for each image frame.
- If this distance is not equal to or greater than the threshold value for 5 consecutive image frames then the driver is said to be in the drowsy state.
- This allows the app to give an alert in the form of an alarm.
- The alarm will be deactivated as soon as the driver is awakened or can be shut manually by the driver.
- The app will run and keep monitoring the driver as
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- long as the driver wants and also can run in the background.

B. ER Diagram

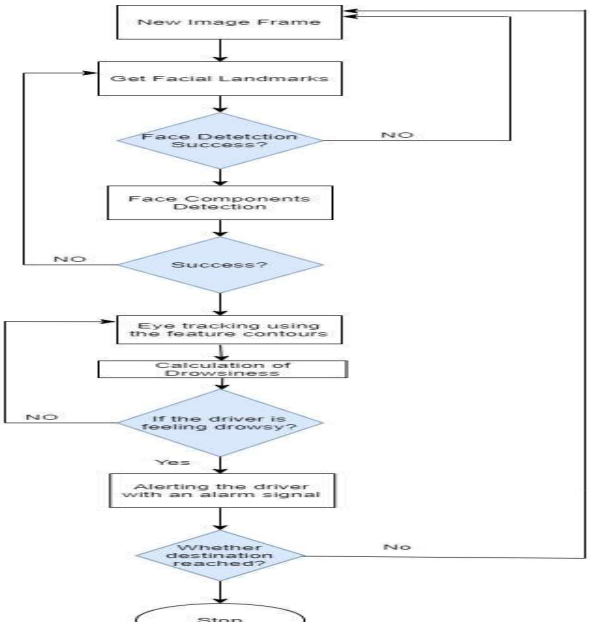

Figure:The above figure shows the architecture of Vivify.

RESULT

CONCLUSION

The primary motive of this project is to provide a Facial Drowsiness Detection System and a method that detects the driver's drowsiness in real-time. Other approaches have used Hardware-based and cognitive analysis to detect the drowsiness of the driver. However, some techniques are inaccurate and depend on the cognitive characteristics of the surrounding environment. In contrast to the beforehand determined issues, we have proposed a system that implements a non-interrupted technique for determining the driver's fatigue. Our system consists of a module that continuously keeps scanning for facial landmarks. This method will be useful to people in the car rental and driving business such as On-road Cargo Service and Cab Services. The purpose of our project is to help to solve real-life problems in a very cost-effective way.One of the challenges in designing a cost-efficient drowsiness detection system is how to obtain proper drowsiness data. The app keeps track of the eyes of the person driving the vehicle using its landmarks which are pre-defined in Firebase ML Kit. It alerts the driver whenever the driver feels drowsy and closes his/her eyes for a few seconds and the alarm is blown which alerts the driver. As a result, the overall accident ratio decreases. Hence, our project if commercially developed will help in saving the precious life of the driver and money spent on its vehicle.

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