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IOT based Drowsiness Detection System for Road Safety

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Abstract--- *In the current situation, the vehicle utilization rate is expanding. Thus, the quantity of mishaps is additionally expanding. As per look into, most of the mishaps are because of driver's recklessness. Every year, among them all out number of deaths 1.24 million deaths happened because of the vehicle mishap. In India, the underlying drivers of these mishaps are because of the inebriated driver, drowsiness, and severely structured speed breakers. There is n006F viable system to forestall these main drivers. Our proposed framework gives a proficient, practical and constant answer for forestall vehicle mishap. In this paper, we proposed a framework that is completely non-meddlesome and constant. Our proposed framework utilized the eye conclusion proportion as info parameter to recognize the drowsiness of the driver. On the off chance that the eye conclusion proportion break down from the standard proportion, the driver is alerted with the assistance of a ringer. For our framework, a Pi camera is utilized to catch the pictures of the driver's eye and the whole framework is consolidated utilizing Raspberry-Pi. At long last sms alert send to the proprietor's Mobile.*

Keywords--- *Drowsiness Detection, Raspberry-Pi, Camera Module, IOT, EAR..*

I. INTRODUCTION

It has been a known worry that, there is an exponential increment in car utilization with relating increment in populace [1]. It is a difficult long term hardship for drivers to take significant distance driving. It is hard for them to focus on driving on the whole outing except if they have extremely solid self discipline, tolerance, and tirelessness [2]. During the schedule year 2010 in India, there were near 5 1akh street mishaps in India with 1.5 lakh individuals slaughtered. Though in 2011 the quantity of deaths diminished to 1.42 lakh [3]. Every strategy has preferences and detriment. Since picture preparing procedures are non-contact, driver can't be upset. Estimating the eye flickering recurrence and eye conclusion length is for the most part used to decide the level of tired driving [4]. The drowsiness expectation in the driver is finished by watching anomalous head or body movement utilizing outline distinction calculation [1].If the unusual movement is distinguished, it tends to be anticipated that driver is in strange condition for example tired. Then again, another strategy to check the driver weariness is observing the state of being and outward appearances of the drivers, which remote sensor systems can't process and transmit these data with sufficient exactness and a decent review. Consequently it is exceptionally basic to build up a proficient drowsiness detection framework [5]. A review says about 21% of the street mishaps are caused because of drowsiness [6].

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The point of this paper is to build up a model of driver drowsiness detection framework. This framework for the most part centers on observing of the driver's internal heat level and eye flicker rate. It additionally screens the heart beat pace of the driver. These variables are estimated utilizing the fitting sensors. The microcontroller contrasts the sensor esteems and the reference esteems gave. It alerts the driver if these qualities are out of the reference esteem go. Also, the GSM module sends the message to the concerned individuals to tell about the driver.

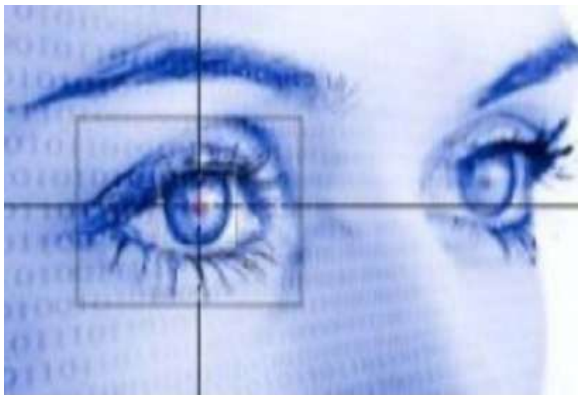

Figure 1: Human Eye Detection

Eyes are not balanced on face. What's more, there are a lot of uses of eye detection. Here, the eye detection is utilized to check the driver exhaustion, for example regardless of whether the driver is languid or not. There should be a flickering time in this strategy. For instance if the driver shuts his eye for more than 10 to 15 seconds, a caution indicating red alert will gleam. By utilizing object detection roundabout district of natural eyes are identified [3].

The paper is sorted out as follows. Section 2 spotlights on different research techniques in drowsiness detection. Section III presents the review of the proposed structure. Section IV depicts the outcomes and examination lastly; pertinent end and future works are given in Section V.

II. BACKGROUND STUDY

Anilkumar, C.V., et al. [1] Due to the human mistake's while driving, mishap rates are expanded and furthermore there is no wellbeing for the driver and traveler. Henceforth through ceaselessly checking the driver by identifying drowsiness and heart beat rates and furthermore alerting him when he is going amiss from his typical situation, mishaps rates can be limited. To play out this one of the productive strategies utilized are movement detection for drowsiness expectation and R-top detection calculation to tally heart beat rate. For outlining the driver's express, a model is taken for the reproduction reason. The outcomes got can be executed for developing a smart car which can identify the driver exhaustion, therefore expanding wellbeing and security of the driver, correspondingly the mishap rates might be diminished.

Katyal, Y., et al. [3] presents an ongoing path detection and driver weakness or driver drowsiness detection framework, which can adequately distinguish the inconsistency while driving. The framework utilizes Hough Transform to identify paths out and about just as tacks the eyes to distinguish in the event that they are open or shut. The Hough change utilized is straightforward and quicker for sufficient detection of paths of the street. For eyes

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detection, first presto jones technique is utilized to identify face, at that point picture division is done, Otsu thresholding is performed and Canny edge detection is done, the outcome got is then applied with Circle detection Hough Transform, to distinguish the eyes. This is an idiot proof strategy for distinguishing the eyes, and the precision is exceptionally high.

Kim, D., et al. [4] drowsiness is identified with eyes development, for example, eyes open, eyes shut. Drowsiness can be disclosed that identified with eyes open and eyes shut. Alpha action Changes by drowsiness and alpha action Changes by eyes open and eyes shut related with one another. In spite of the fact that eyes open and drowsiness were seen in inverse patterns, at some point happen simultaneously. For this situation, in this paper referenced about changes of alpha waves in drowsiness with eyes open. In drowsiness the alpha happened, for example, announced examination. The creators are affirmed that alpha expanding shows up before alpha changes by eyes shut and eyes open. Subsequently, the expansion of alpha in drowsiness with eyes open like ordinary drowsiness could be distinguished.

Manu, B.N. [5] presents the constant execution of drowsiness detection which is invariant to brightening and performs well under different lighting conditions. Connection coefficient format coordinating gives a super-quick approach to follow the eyes and mouth. The proposed framework accomplishes a general exactness of 94.58% in four experiments, which is most noteworthy in contrast with the ongoing techniques. A high detection rate and diminished bogus alerts ensures that this framework can productively lessen the quantity of fatalities consistently.

Omidyeganeh, M., et al. [7] introduced a combination based technique to all the more cleverly screen driver drowsiness. Exhaustion may make the driver respond gradually and builds the danger of crash. By observing the conduct qualities of the driver and deciding his mindfulness express, the creators are can evade potential dangers on account of drowsiness. The creators are utilized a combination based strategy to drowsiness detection. Both yawn and eye conclusion detection plans are utilized to make the framework hearty, while the calculations are straightforward and can be applied to business applications. The other advantage of our strategy is that it is free of the subjects and there is no compelling reason to prepare the framework.

Tabrizi, P.R., et al. [9] proposed another calculation for eye state examination, which the creators are consolidated into a four stage framework for drowsiness detection: face detection, eye detection, eye state investigation, and tired choice by PERCLOS parameter. The creators are resolved eye state in two stages, by methods for the change projection bend in the vertical heading of the eye zone and examination of the separation between the two eyelids and iris range. Our proposed framework for drowsiness detection was basic, non-nosy and without the requirement for preparing information at any progression or uncommon cameras. Likewise, it was protected in examination with IR illuminators.

III. PROPOSED METHOD

The proposed structure is shown in Figure2. At first a camera secures the video of the driver. At that point this video is separated into outlines. The beneath sections give a depiction of the technique followed once the casings are procured.

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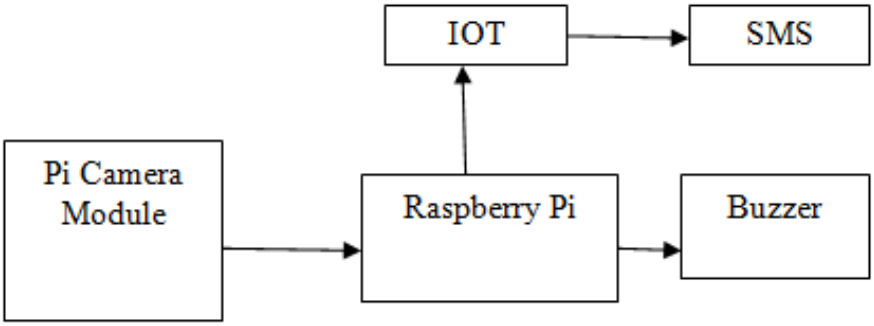

Figure 2: The Proposed Framework (Block Diagram)

a) Raspberry Pi 3 Model B

The Raspberry Pi is a microchip that is intended for the Linux working framework. In our proposed framework, Raspberry Pi 3 Model B is utilized with Raspbian OS incorporated into it.

b) Pi Camera Module

The Raspberry Pi camera module can take superior quality video alongside still pictures and can bolster 1080p30, 720p60, and VGA90 video modes

c) Buzzer

The signal is utilized to produce blare sound when a voltage is provided. For our proposed framework, the ringer is utilized as an alert to produce ceaseless signal when the driver is recognized with drowsiness.

d) Detection of Face

In our proposed framework the Raspberry Pi was incorporated with the Pi camera module so as to constantly filter for the essence of the driver.

e) Preparing the Face Indicator Classifier with the Pictures in the Dataset

After the fruition of building the preparation dataset, it was then used to remove the highlights. The motivation behind acquainting the vital picture was with diminishes the calculations for an offered pixel to an activity including only four pixels. Once processed, any of these Haar-like highlights can be figured at any scale or area in consistent time. For computing each component, the entirety of pixels under the white square shape is deducted from the aggregate of pixels under the dark square shape. When the highlights were separated, include choice procedure was executed to choose the significant highlights. So as to dispose of the foundation locales of the picture, the course of classifiers is utilized with the goal that more estimation can be centered on face-like areas instead of the foundation districts.

f) Deciding the Eye Aspect Ratio (EAR)

Before deducting that a driver is tired, the eye aspect proportion (EAR) is determined to distinguish the driver with drowsiness.

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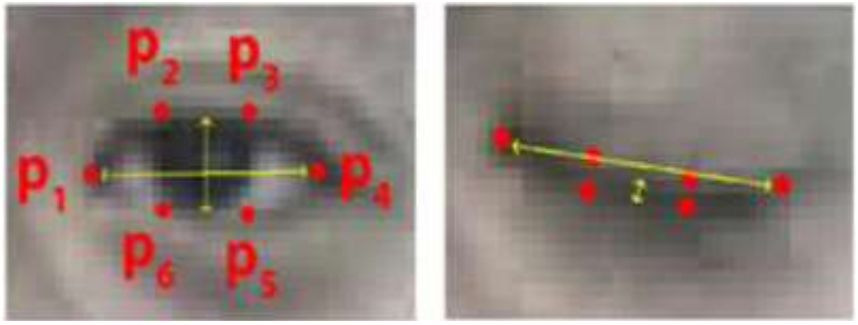

Figure 3: Sample EAR

At the point when the facial milestones are identified, the pictures of these countenances are changed over to grayscale design. This is done on the grounds that the intrinsic unpredictability of dim level pictures is lower than that of the shading pictures [3, 1, 2]. When the facial tourist spots of the driver were recognized, the eye districts are extricated utilizing the 6 (x, y) - directions of the eye structure as appeared in Figure. 3.

Figure 4: Sample Image for Driver open Eyes

Figure 5: The Image of Driver with Closed Eyes

We presently characterize the eye perspective proportion work which is utilized to process the proportion of separations between the vertical eye tourist spots and the separations between the level eye milestones. So as to compute separation, the Euclidean Distance of the eye area is utilized.

$$D(P,Q) = \sqrt{\sum_{i=1}^{n}(Qi - Pi)^2} \qquad (1)$$

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Where D (P, Q) is the Euclidean distance between points P and Q. In Cartesian coordinates Pi and Qi are two points in Euclidean n-space.

g) Notifying the Owner

The Raspberry Pi is customized to work as a sluggish driving finder framework in which it identifies the drowsiness of the driver and alerts him with the assistance of a bell. On the off chance that he nods off for multiple occasions, at that point the framework sends a SMS alert to the proprietor for him to make further move. The subject, message substance, and proprietor telephone number are completely gone into the framework through python contents.

IV. RESULTS AND DISCUSSION

Drowsiness can be disclosed that identified with eyes open and eyes shut. Alpha action Changes by drowsiness and alpha movement Changes by eyes open and eyes shut compared with one another. In spite of the fact that eyes open and drowsiness were seen in inverse patterns, at some point happen simultaneously. Thus, the expansion of alpha in drowsiness with eyes open like typical drowsiness could be recognized. The most handy strategy to sluggish driving detection is commonly known as picture handling procedures. Its exactness and accuracy is lower than utilizing physiological sign. Since the picture handling procedures center around just eyes shut express, this framework can't identify drowsiness with eyes open.

On culmination of this work, our framework could effectively identify the drowsiness of the driver dependent on the eye aspect ratio (EAR). The accompanying figures show the trial aftereffects of how the framework could effectively perceive the eye milestones and afterward compute the EAR esteem when shutting the eyelids. The EAR worth can likewise be graphically spoken to over the occasions the eyes are kept open, as appeared in Figure. 6.

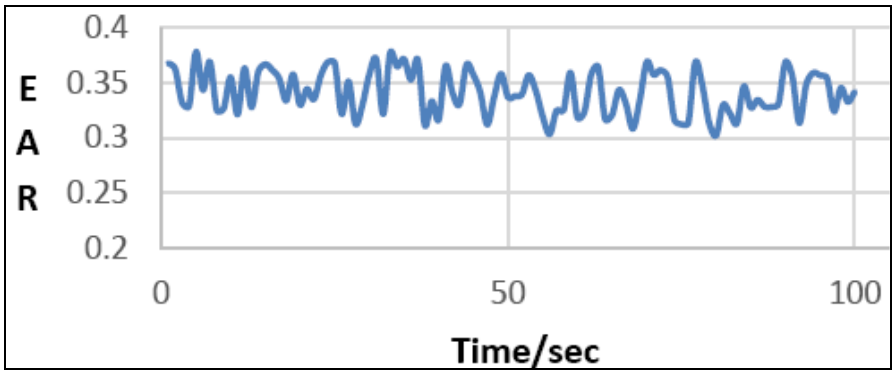

Figure 6: EAR Plotted when the Eyes are Open

The preparation dataset used to prepare the Haar Cascade classifier was not proper for a wide range of ecological conditions. It comprised of pictures that were taken distinctly in sunshine. Be that as it may, while completing the examination around evening time, it was seen that the Haar Cascade classifier couldn't distinguish the facial milestones from the video edges of the driver. Thus, the framework couldn't figure the EAR estimation of the driver's eye. This brought impediments for our framework as it could just fill its need during the light.

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V. CONCLUSION

The essential thought process of this examination is to give a drowsiness detection framework and a technique that distinguishes the driver's drowsiness continuously. Existing methodologies have utilized vehicle-based and mental estimations to recognize the drowsiness of the driver. Be that as it may, such methods are profoundly nosy and rely upon the physical attributes of the general condition. Rather than the previously decided issues, we have proposed a framework that actualizes a non-nosy strategy for deciding the driver's exhaustion. Our framework comprises of a Raspberry-Pi and a Pi camera module that constantly continues filtering for facial tourist spots. These tourist spots are confined utilizing facial milestone identifier and afterward the eye milestones are utilized to figure the eye aspect ratio (EAR). In the event that the EAR esteem diminishes from the limit esteem and the eyes stay shut for a really long time then the framework quickly alerts the driver with the guide of a ringer. Besides, to guarantee that the issue has been dealt with, a notice is sent to the proprietor of the vehicle through Sms when the driver snoozes off for in excess of two or multiple times. This technique is helpful to individuals in the vehicle rental and driving business, for example, truckers and taxi drivers. In any case, there is one issue that remaining parts to be tended to in the framework, which is its lack of ability to fill its need around night time.

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