

Vehicle-Driver Passivity Detection System from Webcam with Live System in Action

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ABSTRACT

Every day number of accidents is occurring at every part of the world. In India, there is “1” death for every 4 minutes due to accidents. The saddest thing is that, 16 children die on Indian roads daily. The main reasons for these accidents are, due to sleepiness, due to over stress level, due to long travel. We can reduce these accidents up to some extent by using technology. The major accidents are occurred due to sleepiness of the driver. So, we try to prevent these accidents using alert system. By giving an alert to the driver when he falls asleep, the driver can wake up and stop his vehicle

Keywords: Passivity detection, Face detection, accidents prevention system.

1. INTRODUCTION

The passivity of the driver is one of the major problems for the accidents. The main reason for types of accidents is “lack of sleep”. Without, sleep no one can survive .so, sleeping is one of the basic need for a human. The second reason for these types of accidents is “stress”. Today, especially IT related people are undergoing more and more stress. When they undergo stress, they may drive in abnormal manner. So, in order to wake them up we maintain an alert system to prevent accidents. The third reason for these types of accidents are “travelling to long distance” by a single driver. Think, what if a single driver keeps on travelling to long distance, there definitely be a chance of accident. So, to prevent these accidents we need an alert system. When an alarm keeps on giving alert, we can decrease accidents and save lives. However, there may be any kind of reason for these types of accidents, but the innocent people who are passing opposite to them, they also losing their lives. The major vehicle production companies like Volvo and Mercedes-Benz they have their own alert system to react whenever the driver undergoes passivity. However, accidents are occurring due to “lack of awareness” many people are not using these alert system in their vehicles.

According to a survey, the Majority of the accidents (78.4%) are due to the driver fault .other (7.1%) of the accidents are due to fault of pedestrians or drivers of other vehicles, (2.8%) are due to civic bodies fault,(2.3%) are due to usage of unconditional vehicles and remaining (1.7%) of the accidents are due to poor weather conditions. Now, in this paper we are going to focus on the accidents which are related to driver fault (which is reason for most of the accidents). We are going to detect the face of the driver

through our webcam and identifies whether the driver is in conscious state or not. If the driver is not in conscious state then the detection system will find it out and gives an alert to the driver [3]. Many things which are not possible manually are done by using the technology. Yes, by using the technology we can find whether a person is sleeping or not. To identify the state of person we are going to use Python along with some packages (OpenCV ,TensorFlow, Keras and Pygame).The requirements to implement this are webcam, through which we are going to take the input and an alarm to give an alert.

2. LITERATURE SURVEY

The Driver Passivity is one of the main reasons for road accidents. In current survey it shows that out of 5 accidents one accident is due to drowsiness of the driver which is approximately 20% of road accidents and it increasing gradually in every year. This survey mainly states that the accidents are occurred due to passivity [1]. Driving a vehicle in a huge traffic road has become a nightmare because of the road conditions and poor weather conditions, Drowsiness of driver, drunk and drive are major reasons for road accidents. Due to less conscious we can't take care of ours while driving. To provide security to driver, the vehicles are assisted with automated safety system that alerts driver by using alarm. All vehicles should be equipped with eye blink sensor and alcohol sensor sequentially to evade these types of accidents.[1]Four main factors of driver passivity are sleep, work, time of day, and physical.

The Possible detection technique based on the vehicle could be deviation from the lane or the pressure on the acceleration portal. Also detection through pulse rate, heartbeat etc. falls under the physiological methods [2]. We mainly focus on the factors which are related to the eyes of the driver and detecting the state of drowsiness. The use of image processing in the following system is very important and necessary as it provides one of the best solutions to detect the drowsiness at earliest and spares time to work on avoiding the accidents [5]. Image processing is used in this system to process the images that are collected from the vehicle of the person driving the vehicle. We are also including one more feature in our project module that is Intrusion detection. This is an important feature for ensuring safety of the cars from the burglars [4]. Accidents due to passivity are increasing .This problem will increase day by day. So, we need to have an automatic system that can detect the face and give alarm [6].

3. METHODOLOGY

There are various ways to detect whether a person is in conscious state or not.

A. TECHNIQUES: The various techniques that are used are shown in Figure 1.

1. Image processing technique
2. EEG based technique
3. Eye analysis and facial expressions

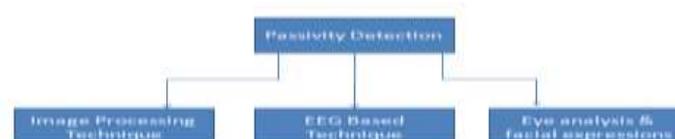


Figure1. Various techniques.

1. Image Processing Technique

In the image processing technique, the drivers images is captured before while sleeping and in normal state as well. These images are given input and then it will matches with the driver sleeping image and driver normal image. In this way we can detect that the driver is sleeping or not.

2. EEG Based technique

In the EEG based technique, we need to wear the electrode helmet which has lot of sensors. These sensors help to get the data and analyze that the driver is sleeping or not. This will give you the most accurate result but it is cost oriented.

3. Eye Analysis and Facial Expressions

In the eye analysis and facial expressions, we will use webcam to capture the driver face and process the image continuously. It is a continuous monitoring system. The image is taken as input and it will detect the face of the driver in the image. After detecting the face it will detect the eyes of the driver and find out the status (open or close) of the eye. If the driver is sleeping it gives an alert by ringing alarm. It is accurate and not cost effective.

B. Comparing and Choosing Best Technique:

Let’s compare and choose the best technique as shown in Figure 2.

SL.NO:	Technique	Limitations
1	Image processing technique	Not more suggestible (because , when background or driver changes it may not work effectively)
2	EEG Based Technique	It is accurate and more cost compared to eye analysis and facial expressions technique.
3	Eye analysis and facial expressions	It is accurate and not cost effective.

Figure 2. Comparing Various techniques.

So, eye analysis and facial expressions is chosen by considering the cost effective case and accuracy.

C. Implementation:

Implementation mainly involves schema design, use case diagram and Algorithm

1. Schema design:

Schema design as shown in Figure 3. involves that, the webcam is placed in front of the driver and it will capture the image. After capturing the image it will process and identifies whether the driver is sleeping. If he/she is sleeping then produces alarm.



Figure3. Schema Design

2. Data Flow diagram:

In this Data Flow diagram, the flow of process is represented as shown in the Figure 4. The face detection and passivity level detection are in continuous frame

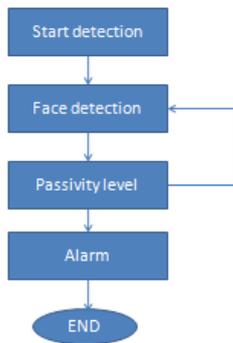


Figure4. Use case Diagram

3. System Architecture

System Architecture gives the overall flow of process as shown in the Figure5. The flow starts with Initialization of camera through which, the input data is collected from the camera. After the input data is taken, it will start detecting the face and eyes from the input image. If the person in the frame continuously closes for more than 15 seconds it will start giving alarm to wakeup. If the person is still sleeping then the score will be increasing and alarm is giving continuously until the score becomes zero. The alarm is stopped when the score reaches to Zero.

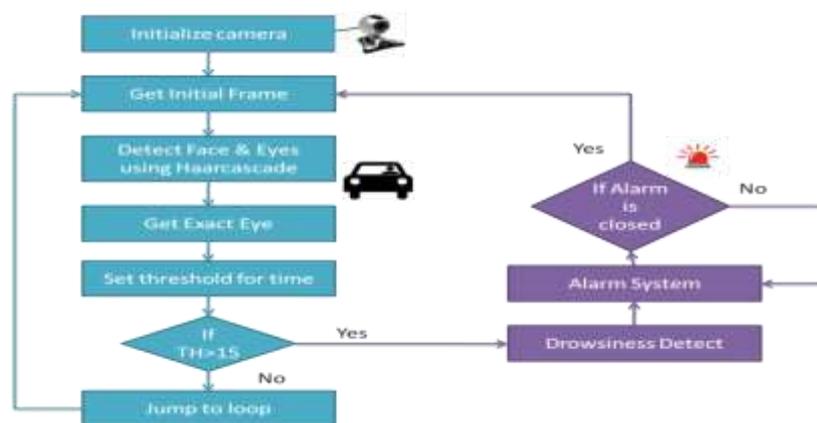


Figure5. System Architecture

4. Algorithm:

The Algorithm for Eye analysis and facial expressions is as follows:

START

STEP 1: Taking the image from camera (webcam) as input

```
cap = cv2.VideoCapture(0)
```

STEP 2: Now detect the face in the image by creating the ROI (Region of interest)

STEP 3: Detect the eyes in the image through the Region of interest (ROI)

STEP 4: Now, feed it to the Classifier to classify the eyes whether in open or close state

STEP 5: Now, calculate the level of passivity

STEP 6: If the driver is sleeping more than 15 seconds give an alert to the driver by ringing the alarm.

```
if(score>15):
    #person is feeling sleeping
    cv2.putText(frame,'DANGER',(270,height-250), font, 1,(0,0,255),1,cv2.LINE_AA)
    cv2.imwrite(os.path.join(path,'image.jpg'),frame)
    try:
        sound.play()
    except:
        pass
```

STEP 7: Ring the alarm until the driver wakes up.

END

Here we are using Opencv, TensorFlow, Keras, Pygame. OpenCV is used for detection the eye and face. TensorFlow as background. Keras for classifying the state. Pygame is used for ringing the alarm.

4. RESULTS AND DISCUSSIONS

The results and analysis of the eye analysis and facial expressions are shown in Figure 6.

SL.NO:	Type	Number of observations made	Accuracy
1.	Driver without spectacles	20	92.45%
2.	Driver with spectacles	30	82.59%
3.	Driver with Sunglasses	30	80.12%
4.	Driver with wearing Cap	20	90.23%
Total		100	86.3475%

Figure6. Results and Discussions

Here are the sample outputs

a. Case 1: When the driver is in open state that means the driver is not sleeping. It indicates that the driver is in open state and passivity level will be on “zero”

b. Case 2: When the driver is in Initial close state that means the driver is about to sleep. It indicates that the driver is in initial close state and passivity level will depend on how much passivity he/she has. Give an alert indicating that “PLEASE OPEN EYES DANGER (closed)”

c. Case 3: When the driver is in closed state that means the driver is sleeping. It indicates that the driver is in closed state and passivity will be detected and gives alarm indicating “DANGER” as shown in Figure 7.



Figure7. Outputs

5. CONCLUSION

Finally, there are number of accidents occurring everyday and number of people are losing their lives. By using this approach we can save some people lives. As our approach is not most cost effective we can adopt this method in our vehicles. This can save a valuable life

6. FUTURE SCOPE

When the driver is continuously sleeping and our system has given alert but the driver is not in a position to wake up then in this case we need to extend our detection. When the alarm is ringing but the driver has not taken any action then the computer in the vehicle has to take an action against it that means, the vehicle should be controlled by computer. The computer should connect to GPS Maps and by using indicator the vehicle has park to its left side. So, the driver and other vehicle drivers who are nearby will be in safe hands.

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