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Driver Fatigue Accident Prevention Using Eye Blink Sensing

Venkitesh Ramu S[1], Hano Jacob Saji[2], Rahul Sasimohan[3]

[1]Student, Dept. of Electrical and Electronics Engineering, Mar Athanasius College of Engineering, Kothamangalam
[2]Student, Dept. of Electrical and Electronics Engineering, Mar Athanasius College of Engineering, Kothamangalam
[1]Student, Dept. of Electrical and Electronics Engineering, Mar Athanasius College of Engineering, Kothamangalam

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Abstract - *The increase in number of traffic accidents is a serious threat to the society. The exhaustion of driver is one of the main reason for causing road accidents. The driver is unable to take sudden decision while they are sleepy and his ability of vehicle control and natural reflex reduces due to drowsiness. This kinds of accidents can be easily prevented by implementing a fatigue prevention system. The system detects the present state of the driver and warns the driver if he/she is found drowsy. The system uses facial recognition techniques to find the drowsy state of driver. The hardware fitted in front of the driver will monitor the rate of opening and closing of eye through video processing. It will examine each frames and if it goes beyond a critical value the system is indicate fatigue state and alert the driver. The speed of vehicle is controlled when drowsiness is detected*

Key Words: **Traffic accidents, Drowsiness, Facial recognition, video processing**

1. INTRODUCTION

According to a report presented by Ministry of Road Transport and Highway Government of India in 2015 the country saw 5.67 lakh road accidents which is more than one accident per minute thus we can infer that road accidents are increasing rapidly year by year. Some of the reason for road accidents are vehicle condition, weather condition, careless driving, drowsiness of driver etc. Majority of driver driven road accidents are caused due to drowsiness of the driver. The proposed system is based on eye closure count and yawning count of the driver. By monitoring the eye and the mouth it is believed that the symptoms of driver fatigue can be detected early enough to avoid a car accident. The speed of the vehicle can be controlled by controlling fuel injection to solenoid valve

2. SYSTEM ARCHITECTURE

The proposed system has following three phases-

1. Capturing: Eye Camera mounted on the dashboard is used for capturing the facial image of the driver. The infrared cameras are implemented to work efficiently even during night.

2. Detection: The analysis of the captured image is done to detect the open/closed state of the eyes. The driver's current driving behavior style is deduced using inbuilt HARR classifier cascades in OpenCV. The extraction of face images from the video and the facial features especially of the eye region and mouth region are done via the efficient face detection method

3. Correction: This phase is responsible for doing the corrective actions required for that particular detected abnormal behavior. The corrective actions include in vehicle alarms and displays. The Raspberry pi single board computer which is connected serially to the PC performs the necessary corrective actions.

2.1 Stages in video processing

The primary focus is given to the faster drowsiness detection and processing of data. The number of frames in which the eyes are kept closed is monitored and then counted. If the number of frames exceeds a threshold value, then a warning message is generated on the display showing that the drowsiness is detected. All these objectives have been well satisfied by choosing the system using appropriate classifiers in OpenCV for eye closure detection

In this algorithm first a driver image is acquired by camera for processing. In OpenCV, the face detection of the driver is carried out first followed by eye detection. The eye detection technique detects the open state of eye only then the algorithm count number of open state in each frame and and calculates the criteria for detection of drowsiness. The display and buzzer connected to the system perform actions to correct the driver abnormal behaviour. For this system, the face and eye classifiers are required. The face detection and open eye detection have been carried out on each frame of the driver's facial image acquired from the camera. The variable Eyestotal is assigned to store the number of open eyes (0, 1 and 2) detected in each frame

The variable Drowsycount is assigned for storing the number of successive frames in which the eyes have been kept closed (0, 1, 2, 3, 4, etc.). Initially, Drowsycount is set to 0. When both the eyes are in an open state, Drowsycount is 0. Drowsycount gets incremented when Eyestotal <2. For an eye blink, Drowsycount value gets incremented to 1. If the eye blink occurs for more than 4 frames, i.e. Drowsycount >= 4, then the criterion for drowsiness is satisfied. The display shows, please take some rest. Tickstart shows the real time duration in which eyes have been kept closed.

2. BLOCK DIAGRAM

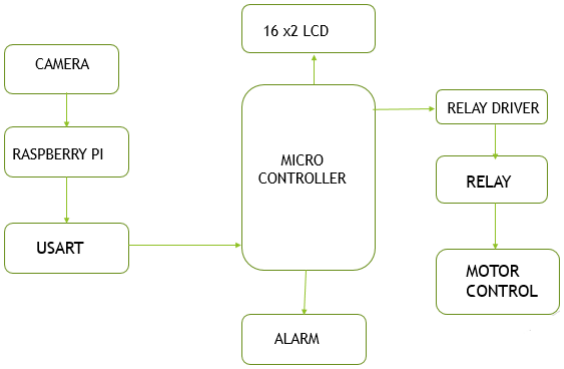

Fig -1: Block Diagram

The block diagram consist of following components:-

1. Raspberry Pi: It is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. It's capable of doing everything you expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games.

2. USART: A USART(Universal Synchronous Asynchronous Receiver Transmitter) is a microchip that facilitates communication through a computer's serial port using the RS-232C protocol.

3. Camera: The camera used here is 15 mega pixel usb camera with auto focus.it is kept in front of driver and connected raspberry pi.

4. AtMega32: It is the microprocessor used for implementing pulse width modulation and also for controlling the buzzer

5. Relay:It is used to reduce the speed of the vehicle when the driver is found drowsy. It is driven by a relay driverr.

4. FLOW CHART

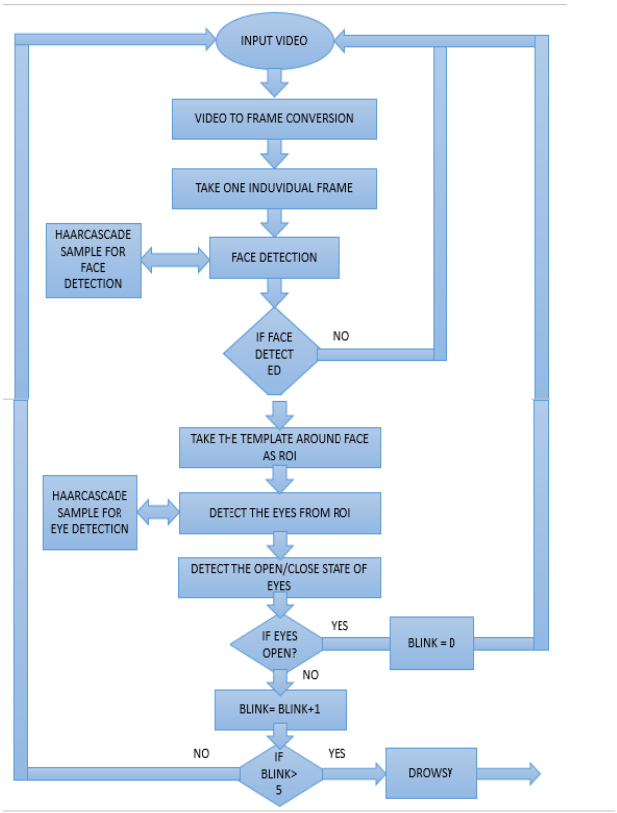

Fig -2:Flowchart

The flow chart of the proposed system is shown in the figure. The input video is converted into frame and an individual frame is taken at a time. The face detection is done using haar cascade samples for face detection. If face is not detected next frame is taken and the step continues till face is detected. After the successful detection of face template around the face is taken as ROI and eyes are detected from ROI using Haar cascade samples for eye detection. Then opened or closed state of eye is detected. If eye is open the blink is set to zero and process is continued and if eye is closed the blink is incremented until it reaches threshold value 5.If it reaches threshold value 5 driver is found lazy and the system is alerted.

3. SIMULATIONS

At the instant when the switch is open, the motor is at its normal state and in rotation. In this case, the microcontroller does not receive any input from the camera module indicating it to stop the rotation At the instant when the switch is closed, a signal is sent from the usb camera module to the microcontroller, by means of serial communication

through USART.Once the signal is detected the motor stops its rotation

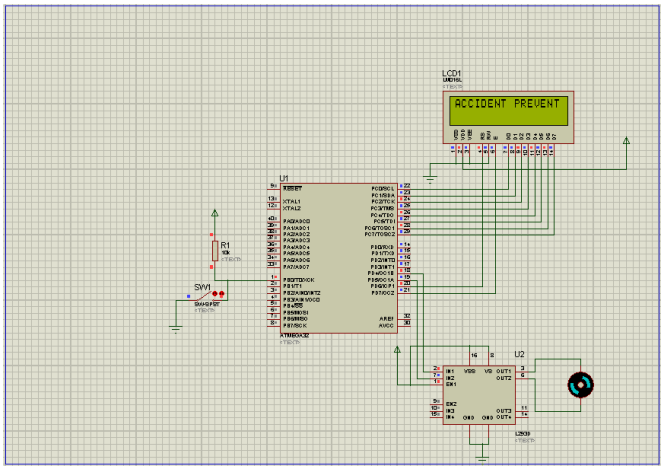

Fig-3: When switch is open

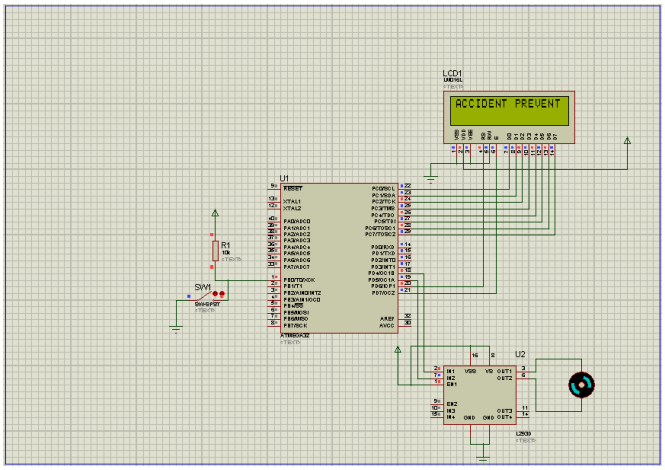

Fig-4: When switch is closed

6. FUTURE SCOPE

This system only looks at the number of consecutive frames where the eyes are closed. At that point it may be too late to issue the warning. By studying eye movement patterns, it is possible to find a method to generate the warning sooner. Using 3D images is another possibility in finding the eyes. The eyes are the deepest part of a 3D image, and this maybe a more robust way of localizing the eyes. We can automatically park the car by first using Automatic braking system, which will slow down the car and simultaneously will turn on the parking lights of the car and will detect the parking space and will automatically park the car preventing from accident. Using Pressure sensor on the steering alarm or Automatic braking System can be set in case of drowsiness. By using wire-less technology such as Car Talk2000 If the driver gets a heart attack or he is drunk it will send signals to vehicles nearby about this so driver become alert

7. CONCLUSION

The road accidents are rapidly increasing day by day. One of the main reason for road accidents is carelessness caused due to tiredness of driver. In this project an effective fatigue detection system has been devised wherein the state of eyes and face has been continuously monitored using video processing techniques. If found drowsy a signal is send to the micro controller which will reduce the speed of the motor by pulse width modulation technique. This prototype has proven to be a cheaper and an effective method for accident prevention caused due to drowsiness

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