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Driver Assistance Security for Accident Avoidance

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ABSTRACT:A new approach towards automobile safety and security with autonomous region based system is proposed. In recent time's automobile related crashes have really magnified to help vitalize this situation, the automotive sector is also working to resolve issues such as congestion and traffic accidents. In order to minimize these issues, the driver alert system has been incorporated by monitoring both the driver as well as the local environment. The objective is to assist the driver for safety and security to prevent accident during situations like while the driver is drowsy, external vehicle intrusion and any obstacle on path. The existing system used a wearable IR photodetector glasses for drowsiness detection, OFA (One Frame Analysis) and FSA (Frame Sequence Analysis) method for face detection, Canny edge detection method for object identification. In proposed system, camera captures driver's face to detect drowsiness using EAR (Eye Aspect Ratio) method, distance between vehicles and object or human is measured by ultrasonic sensor and Blind spot monitor using Background subtraction algorithm then either alert alarm or emergency stop will be executed. Therefore, the approach uses average, traditional distance recognition methods giving the benefits of requiring much less computational resources (memory, processor) and ensuring security. The outcome yields a safety travel on road**.**

KEYWORDS: Eye aspect ratio, Ultrasonic sensor, Background subtraction method.

I.INTRODUCTION

ADAS is one of the fastest growing areas in the automotive industry and has become an integral part of modern vehicle safety and driving comfort. A new approach towards automobile safety and security with autonomous region based system is proposed. In recent time's automobile related crashes have really magnified to help vitalize this situation, the automotive sector is also working to resolve issues such as congestion and traffic accidents. In order to minimize these issues, the driver alert system has been incorporated by monitoring both the driver as well as the local environment. The anaconda python software is employed for entire concept. In Proposed system camera is used to monitor driver's face thereby using EAR(Eye Aspect Ratio) method eye state can be analysed hence, drowsiness can be detected then alert message will be given. Camera fixed at front of vehicle can identify Object and Human using Haar cascade then using ultrasonic sensor distance from vehicle can be measured and necessary action can be taken either alarm triggers or vehicle slow down. During Blind Spot monitor, camera used to monitor vehicle's side environment if any vehicle is nearby then alarm triggers.

II. LITERATURE SURVEY

Adam Blokus and Henryk Krawczyk present binary classification algorithms named OFA (One Frame Analysed) and FSA (Frame Sequence Analysis) method for face detection in [1]. Given an input video sequence captured by the camera, all the frames are classified using OFA method. Intermediate result sequence of preliminary OFA classifications are done. The preliminary classifications sequence has to be adjusted with regard to the proximity and similarity of nearby frames. The output gives the final FSA classification of face.

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Wei-Wen Hu and Chun-Kai Wang present band-pass infrared (IR) light photo detector for drowsiness-fatigue-detection (DFD) in [2]. It detects IR light in the wavelength range from about 810 to 890nm. The rear lights of the vehicle will automatically be flickered and related messages will be uploaded to the cloud-based platform when the drowsiness or fatigue condition of the vehicle driver is detected. Normally the time of people blink is 0.2 to 0.4 seconds in normal frequency. When the speed of close eyes is become very slow even more than 1 to 2 seconds, thus we can sentence them into a drowsy status.

Shun-Min Chang, Chia-Chi Tsai and Jiun-In Guo present BSD algorithm using Gabor filtering and optical flow to detect vehicles in the blind spot region for both day-time and night-time applications in [3]. For the daytime scene, the Gabor filtering is used to detect the vehicles, inside lane line, and outside lane line. For the night-time scene we perform binarization on the image first, find the centre of gravity of the light-area, classify the light-area into 2 groups and judge it as a vehicle or not.

Guiming Shi1, et.al, present canny edge detection and adaptive frame difference method in [4]. The threshold value of three-frame difference method by using Otsu algorithm is selected. The boundary of current frame is obtained by using canny operator. Finally, the two results are integrated to process the isolated noise spot for moving target detection. The target is detected through the difference between adjacent two or three frames of the sequence images. Background subtraction gets the difference of the current image and background image, then extracts target by the threshold segmentation technology. Optical flow detect and extract the moving target from a single frame image without knowing any scene information.

G. M. Bhandari, et.al, present YCbCr Color Modelto detect face by detecting the skin colour and Texture in [5]. Skin detectors transform a given pixel into an appropriate colour spaces and then use a skin classifier to label the pixel whether it is a skin or non-skin pixel.RGB colour input is transferred to YCbCr, the resulting black and white image shows the face of the driver in white and background in black. An edge detection operator uses a multistage algorithm to detect a wide range of edges in images. Eye and mouth detection is done using Haar like features. A simple rectangular Haar like features can be defined as the difference of the sum of the pixels of area inside the rectangle. In yawning detection, when mouth start to open the threshold pixel value increases when compared to normal position of mouth.

N.Neshov and A.Manolova, presents Drowsiness monitoring in real time based on supervised descent method in[6].this paper decribes a method to detect the drowsiness level after the implementation of methods like eye tracking and mouth shape tracking. It also include the calculation of blinking rate of the driver.

Tzu Chi Lin, Syuan Ji, Member, IEEE, Charles E.Dickerson, Senior Member, IEEE, and David Battersby presents Co-ordinated Control Architecture for Motion Management in ADAS Systems in [7]. It attempts to provide increased safety and security measures to the passengers and the driver of the automobile vehicles. In order to facilitate the ADAS development a coordinated control architecture for motion management is developed.

H.kim,D.kim,I.shu,K.yi presents,Adaptive Nonlinear Model Predictive Controller for longitudinal motion of automated vehicles in [8]. It offers improved speed tracking facility and the performance is indicated through the parking scene and through the improvements made in the quality control.

. S.Dabral, S. Kamath, V.Appia, M.Mody, B. Zhang and U.Batur, present paper it provides safety automobile application for pedestrian detection and apply automatic braking in [9]. This paper also describe about existing and evolving trends and applications in the pedestrian detect and automatic brake applying system with all its requirements on this feature.

Jianqiang Wang, Lei Zhang, Dezhao Zhang, and Keqiang Li present to establish and generate the desired throttle depression and braking pressure, data analysis is taken. The system provide collision warning and automatic braking activation based on driver’s pedal deflection timing. To understand driver’s characteristics a self learning is proposed in [10].

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S. Sivaraman and M. M. Trivedi present tracking vehicle in monocular and stereo-vision, filtering analyzed, estimation based and dynamic modeling in [11]. This paper consist of research related and concerned about spatiotemporal measuring and some features based on road behavior.

A collision avoidance system includes forward collision warning system in [12]. It provides safety for automobile vehicle system to reduce on-road crashing. This can be implemented using radar and laser and also using camera for detection purposes.

III.SYSTEM DESIGN

Block diagram shown in Fig.1 consists of a PC camera that takes the image of the driver is used for face detection. The eye is divided into six coordinates and EAR (Eye Aspect Ratio)is calculated and sent to the controllerMQTT(Message Queuing Telemetry Transport) alerts the driver through laptop speaker.Camera 1 is used for pedestrian detection and camera 2 for side view detection. Ultrasonic sensor calculates the distance between the human and vehicle or object and vehicle and send to RPI. Depending on the distance calculation value, either the vehicle slows down or there is an emergency stop.

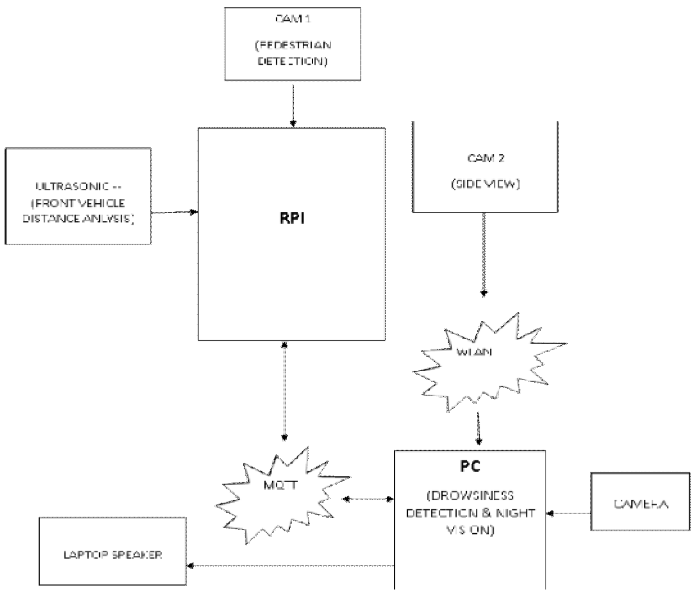

Fig.1 Block Diagram for ADAS

IV. MODULES WITH WORKING PRINCIPLES

A.DROWSINESS DETECTION

Drowsiness detection uses a camera placed at the dashboard. It monitors the driver's face shown in Fig.2. The facial landmarks is detected and eyes region is extracted using dlib (dynamic library). With the eye regions, the eye aspect ratio can be computed. The eyes of the driver are divided into six coordinates namely horizontal coordinates with two points and vertical coordinates with four points. Eye Aspect Ratio (EAR) calculates the open or close state of the eye. It indicates that the eyes has been closed for a sufficiently long amount of time. The EAR value for the left and right eyes are calculated separately. The average of both the values gives the resulting EAR. If the resulting EAR value is less than the fixed threshold value, the driver is alerted by alarm.

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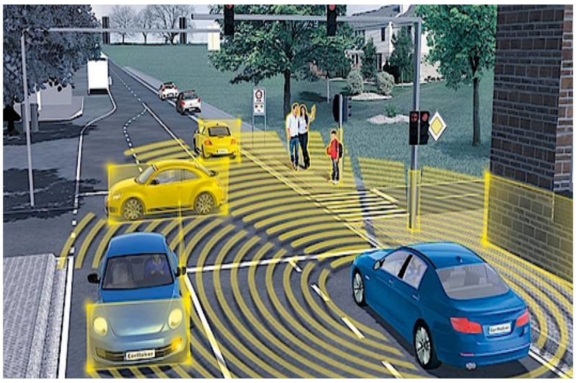
Fig.2 Drowsiness detection

B.OBJECT AND HUMAN IDENTIFICATION

The camera placed at the front of the vehicle captures the human or object. The Human is detected by its features using Haar cascade (Trained xml file). Theultrasonic sensor emits signals and calculates the distance from vehicle to obstacle or human shown in Fig.3 and Fig.4. The Threshold value is fixed for distance measurement. When distance measured is below the threshold value either the vehicle stops (if human is detected) or slows down (if object is detected).



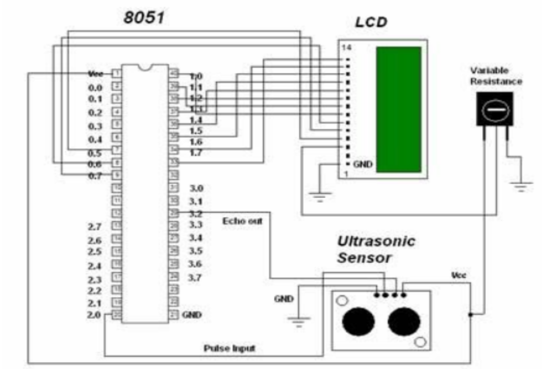


Fig.3 Object and Human identification

Fig.4 Ultrasonic sensor

C.BLIND SPOT DETECTION

Blind spot Detection (BSD) the camera is placed at the side mirror. The camera that captures the local environment of the vehicle is shown in Fig.5.BSD can able to tell the vehicle that comes next or close, by using the background subtraction method. This method captures (frames) each and every movement of the vehicle on the local environment, if it detects any vehicle that comes next means so the driver will be alerted through a voice command.

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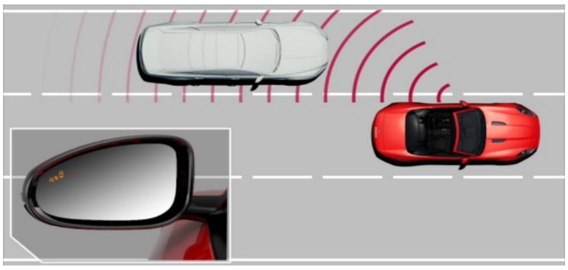

Fig.5 Blind spot detection

V.EXPERIMENTAL RESULT

In this present work, we report drowsiness detection, object and human identification and blind spot detection all this detection are mainly implemented for reducing the accident occurrence. In drowsiness detection, the Eye Aspect Ratio (EAR) that takes the eye frames in coordinates (horizontal and vertical frames) of the human, where normal human will blink 0.2 to 0.4 sec, if the human blink takes up to 1 or 2 sec means the driver is in drowsy state.

EAR = Vertical /2*horizontal coordinates

EAR= (Left EAR +Right EAR) / 2

When compared to existing system, the proposed system taking less number of frames to detect the drowsy state. Where this is more accurate than the existing system. In object and human identification, the existing system that identifies the object using the edge detection and human is identified using the shift time window. Where in proposed system the object is detected using the background subtraction method, this method is more precise to identify. The human is identified using the Haar cascade method which is fast, more accurate and less number of frames are taken to detect the human and object than the existed system shown in Table.1 and Fig.6. In blind spot detection, it uses the background subtraction method to find the vehicle that comes next which subtracts the background frames from the vehicle frame.

PARAMETER	EXISTING METHOD	EXISTING VALUE	PROPOSED METHOD	PROPOSED VALUE
EYE	IR Photo detector	40	Camera, EAR	30
HUMAN	Shifting Time	10	Haar cascade	5
OBJECT	Edge detection	30	Background subtraction	21

Table.1 Experimental result

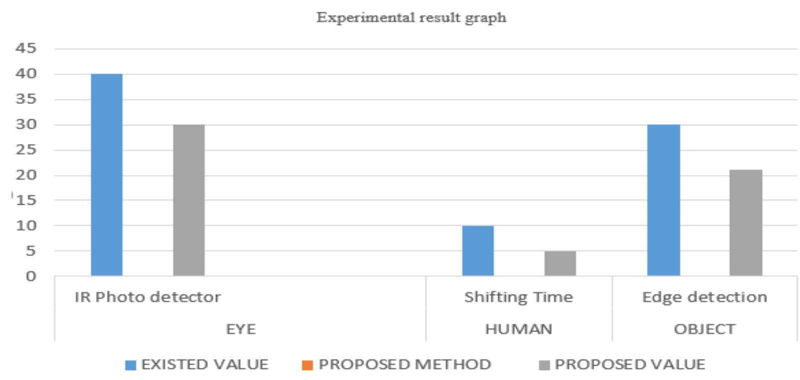

Fig.6Experimental result graph

VI.CONCLUSION AND FUTURE SCOPE

Thus from developed advanced driver assistance system will be able to reduce the occurrence of accidents under certain situations. So the driver can be assisted and alerted by detecting with precise value.

In proposed system further scope can be made for the real time application

- Determining time is less for all the features
- Providing more precise value
- Reduce the accident occurrence by applying it in all vehicles
- Less memory storage.
- Reduce the number of accident that occurs in daily time.

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