

Drowsiness and Blackspot Detection System

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Abstract - Life is a gift but it is full of risk while travelling. Therefore, there is a need to take safety precautions in order to avoid accidents and to take immediate action after an accident occurs. The main objective is whenever a driver doesn't get proper rest, when they feel drowsiness while driving and this leads to accidents and it also provides emergency alert while the vehicle met with the accident. This particular issue demands a solution in the form of a system that is capable of detecting drowsiness and to wake up and come out of the drowsy state and automatically call and messages will be sent to the necessary persons/nearby hospitals if an accident takes place. The detection is achieved with the main steps; it begins with face detection using the famous Viola-Jones algorithm followed by eye-tracking and frequent yawning rate. By the template of correlation coefficient matching, the mouth and eyes are tracked. Whether the driving force is wide awake or asleep is identified via matching the extracted eye and mouth image with the externally fed template (open eyes, closed eyes, open mouth, and closed mouth) based on eyes opening, eyes closing, blinking, mouth opening and closing are recognized. If the driver falling asleep state remains above a specific time (the threshold time) the vehicles stop and an alarm is activated by the use of a specific microcontroller, in this prototype an Arduino and GSM to call and message are used.

Key Words: Viola-Jones algorithm, Vision Cascade Object Detector, Image Acquisition, Image Processing.

1.INTRODUCTION:

Detecting the degree of drivers' drowsiness incorporates a key role in reducing the quantity of fatal injuries in traffic accident. Recent statistics and reports show that 20 to 50 million people are killed or injured in car crashes in every place. Every year 90000 car accidents occur due to the drivers' drowsiness which was conducted by United States (NHTS). The countrywide toll road traffic protection administration estimates that drowsy driving was answerable for 72,000 crashes 44,000 accidents, and 800 deaths in 2013. Every year 6,000 lethal crashes occur due to drowsy drivers. Road safety Council of Germany Deutsche Verkehrswacht (DVR) states that 27% of fatal automobile crashes in toll road visitors is to momentary sleepiness. A Drowsy or sleepy driver is unable to find out when he/she will have an uncontrolled sleep. Recent statistics suggest that 1,200 lethal and 76,000 injuries are often caused by fatigue and drowsiness. Over 25% of highway traffic accidents are

caused as results of driver fatigue. With the rapidly increase in the quantity of accidents day to day. Therefore, would like to arise to style a system that keeps the motive forces focused on the road and reduce the danger of an accident by warning the driver of his/her drowsiness.

2.LITERATURE REVIEW:

Some efforts are reported inside the literature on the development of the non-intrusive monitoring drowsiness systems supported the vision. Malla et al. [4] develop a light-insensitive system. They used the Haar algorithm to detect objects [3] and face classifier implemented by [1] in OpenCV [2] libraries. Eye regions and mouth region are derived from facial region with anthropometric factors. Then, they stumble on the eyelid to live the volume of eye closure. Vitabile et al. [6] implement a machine to locate signs of motive force drowsiness supported an infrared digicam. By manipulating the phenomenon of bright pupils, an algorithm for tracking and detecting the driver's eyes has been developed. When drowsiness is detected, the system warns the driving force with an alarm message. Bhowmick et Kumar [7] uses the Otsu thresholding [8] to extract face place. The positioning of the eyes and the mouth is executed through finding the facial landmarks like eyebrow and visible face center. Morphological operation and Kmeans is employed for accurate eye segmentation. Then a group of shape features are calculated and trained using non-linear SVM to urge the status of the attention.

Hong et al. [5] define a system for detecting the attention states in real time to spot the driving force of the drowsiness state. The face region is detected supported the optimizing Jones and Viola method [3]. The attention area is obtained by an horizontal projection. Finally, a new complexity functions with a dynamic threshold to spot the attention state.

Tian et Qin [9] build a system that checks the driving force eye states. Their system uses the Cr and Cb components of the YCbCr color space. This technique locates the eyes and mouth of a horizontal projection function and the face of a vertical projection function. Will once the eyes are positioned on the system calculates the eyes states using a function of complexity.

Under the sunshine of what has been mentioned above, the identification of the driving force drowsy state given is usually gone by the subsequent stages:

1) Face detection,

- 2) Eyes Location,
- 3) Face and eyes tracking,
- 4) Identification of the eyes states.

3.PROPOSED METHODOLOGY:

Drowsiness or fatigue is one of the main factors that threaten the road safety and causes the severe injuries, deaths. A driver's fatigue can have multiple causes such as lack of sleep, long journey, restlessness, alcohol consumption and mental pressure. The main objective of the proposed system is to determine the driver's drowsiness while driving.

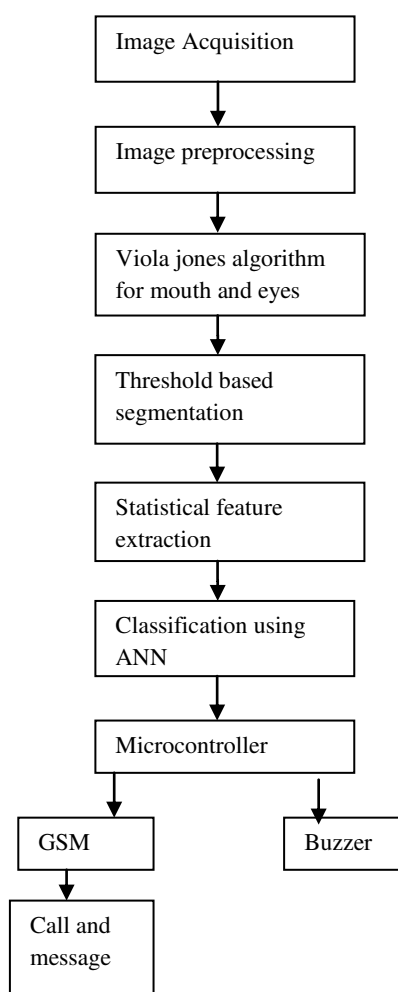


Fig1: Proposed system design

- The system detects the facial expression and blinking of eyelids
- To find eyes in the image and then crop the rectangular image from the original image.
- Convert Image Red Green Blue to monochromatic Image.
- Convert monochromatic image to Binary Image.

- If the drowsiness is detected data is serially send to microcontroller and microcontroller makes the buzzer to on and send the message to other end person using GSM.

TESTCASES	YAWNING	EYE CLOSER	RESULT
TESTCASES-1	YES	NO	ALARM
TESTCASES-2	YES	YES	ALARM
TESTCASES-3	NO	NO	-
TESTCASES-4	NO	YES	ALARM AND EMERGENCY ALERT

Tab 1: Decision making table

3.1.IMAGE ACQUISITION:

Face image of different size is collected. It can be a color image or black and white image .The collected image is given as input and it is used for further processing.



Fig 2: Sample images from dataset

3.2 IMAGE PREPROCESSING:

In preprocessing section, the input image might even be in many sizes, contains noise and it's aiming to be in many color combination. These parameters need to be modified in step with the requirement of the tactic. Image noise is most apparent in image regions with low amplitude like shadow regions or below exposed footage. There are a unit various varieties of noise like salt – and – pepper noise, film grains etc., of those noise area unit removed by practice filtering algorithms. Among the various filters, wiener filter is utilized. In preprocessing module image inborn area unit aiming to be processed for correct output. Pre-processing was done by practice some rule. For all footage the pre-processing got to be wiped out order that the result are obtained among

the upper manner. to go looking out the transformation between two footage specifically they have to be preprocessed to reinforce their quality and accuracy of result Noise removal practice filtering techniques for improve the efficiency of the tactic. Pre method may well be a typical name for operations with the photographs at the lowest level of abstraction every input and output is that the input pictures.

Four classes of image pre-processing ways in step with the scale of component neighborhood that's used for the calculation of latest component brightness:

- 1) Component brightness transformations
- 2) Geometric transformations
- 3) Pre-processing ways that use an area neighborhood of the processed component,
- 4) Image restoration that needs information concerning the complete image.

If preprocess aims to correct some degradation within the image, the character of a priori data is important:

1. Knowledge concerning the character of the degradation; solely terribly general properties of the degradation are assumed.
2. Knowledge concerning the properties of the image acquisition device, the character of noise (usually its spectral characteristics) is typically proverbial.
3. Knowledge concerning objects that are hunted for within the image, which can modify the pre-processing terribly significantly .If information concerning objects isn't out there earlier it are often calculable throughout the process.

3.2.1 VIOLA-JONES ALGORITHM :

The Viola-Jones algorithmic program could be a wide used mechanism for object detection. The most property of this algorithmic program is that coaching is slow, however detection is quick. This algorithmic program uses Haar basis feature filters, therefore it doesn't use multiplications.

The potency of the Viola-Jones algorithmic program are often considerably hyperbolic by 1st generating the integral image.

The integral image permits integrals for the Haar extractors to be calculated by adding solely four numbers. Detection happens within a detection window. A minimum and most window size are chosen, and for every size a slippery step size is chosen. Then the detection window is emotional across the image as follows:

1. Set the minimum window size, and slippery step appreciate that size.
2. For the chosen window size, slide the window vertically and horizontally with constant step. At every step, a collection of N face recognition filters is applied. If one filter offers a positive answer, the face is detected within the current widow.

3. If the dimensions of the window are that the most size stop the procedure. Otherwise increase the dimensions of the window and corresponding slippery step to consecutive chosen size and attend the step a pair of.

Every face recognition filter (from the set of N filters) contains a collection of cascade-connected classifiers. Every classifier appearance at an oblong set of the detection window and determines if it's sort of a face. If it does, consecutive classifier is applied. If all classifiers provide a positive answer, the filter offers a positive answer and therefore the face is recognized. Otherwise consecutive filter within the set of N filters is run.

Each classifier consists of Haar feature extractors (weak classifiers). Every Haar feature is that the weighted total of 2-D integrals of little rectangular areas hooked up to every different. The weights might take values ± 1 . Grey areas have a positive weight and white areas have a negative weight. Haar feature extractors are scaled with reference to the detection window size.

3.2.2 THRESHOLD BASED SEGMENTATION:

The simplest thresholding ways replace every component in a picture with a black component if the image intensity is a smaller amount than some fastened constant T, or a white component if the image intensity is bigger than that constant. Within the example image on the correct, this leads to the dark tree changing into utterly black, and also the white snow changing into utterly white. Matlab's default level is 0.5 but 0.15 value was used for this project.

The output image substitutes the following luminance for all pixels in the input image:

- Greater than threshold to 1(white)
 - Lesser than threshold value to 0(black)
- BLACK&WHITE Image (Threshold Value =0.16)



Fig 3: Segmented images

BLACK&WHITE Image (Threshold Value =0.32)



Fig 3: Segmented images

BLACK&WHITE Image (Threshold Value =0.08)



Fig 4: Segmented images

3.2.3. STATISTICAL FEATURES:

Statistics is that the study of the gathering, organization, analysis, and interpretation of information. It deals with all aspects of this, together with the design of information assortment in terms of the look of surveys and experiments. This is often which means of statistics. Statistical feature of image contains

- Mean
- Variance
- Skewness
- Standard deviation

3.2.4. CLASSIFICATION:

NEURAL NETWORK:

We use the Machine learning technique Artificial Neural Network for classifying the age exploitation extracted options. A neural network contains many output, hidden, and input nodes. Every node applies a operate some knowledge (could be softmax, linear, logistic), Associate in Nursing returns an output. Each node within the continuing layer takes a weighted average of the outputs of the previous layer, till Associate in Nursing output is reached. The reasoning is that multiple nodes will put together gain insight concerning resolution a haul (like classification) that a personal node cannot. The value operate differs for this sort of model -- the weights between nodes accommodates minimize error.

Artificial neural networks are extraordinarily crude digital networks of neurons primarily based at the neural shape of the brain. They process statistics one at a time, and learn via evaluating their class of the file (i.e., in large part arbitrary); with the known real type of the file.

The errors from the initial category of the first record are fed back into the network and used for further iterations to change the networks collection of rules.

4. RESULTS & DISCUSSION

Viola Jones algorithm is used to detect many faces and area of interested features like eyes, nose, mouth etc. Accurate detection of features increases rapidly when a camera of high specifications is used. We are implementing this system in a car, only the driver's face i.e., only one face is detected. When the drowsiness is detected then the data is serially sent to microcontroller and microcontroller makes the buzzer to on and send the message to other end person using GSM.

5. REFERENCE

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