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DROWSINESS DETECTION SYSTEM USING MATLAB

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Abstract - *Human life in invaluable. in the modern life the humans are tend to travel a lot from one place to another for the works, business or tours. The majority of the drivers are in long journey or the many ours. It will cause them to get less sleep. Which will cause the driver less efficient driving. It may cause the accidents.*

Hence we propose the drive assistance to detect the driver drowsiness and help to alert them. The use of the viola jones algorithm will help to track the human face. It extracts the human face parts like eyes, mouth to check the activity by sobel edge method. If unwanted activity is observed over 2 frames than the alert message given to the driver to help him to regroup and drive safely

***Key Words*: Drowsiness, Viola-Jones, Sobel Edge Detector, Haarcascade, Integral image**

1.INTRODUCTION

Driver drowsiness detection is very important to avoid the vehicle accident in the high way. Many studies have shown , the 50% of accidents happens only due to the driver fatigues In the stats annually 1200 death and around estimated 76000 injuries will occur. Hence there is a urgent need f reliable technology to make the on road travelling of vehicles over the highway specially safe to people and the drivers.

Human eye based Driver drowsiness detection prediction which will be under constant change over the time has been challenging task in drowsiness recognizing accurately. The face frames has to be processed based on the last recognized features like eyes, mouth using sobel edge detection and viola jones algorithm.

The real time video monitoring is essential in detecting the drive drowsiness. The main parts like eyes and the mouth will help the system to interact to give the final result. The sequence of the frames will be used to detect the exact condition of the driver. Eyes open, close, mouth open close all activities are tracked. When the user has unusual activity for 2 or more frames the warning is issues to driver.

2. OBJECTIVE

The main objective of the proposed work is to design and develop the driver assistance model or driver drowsiness alert system by using the edge detection, vioaljones algorithm to alert the driver in case of any unusual activity on the face is notices. The warning message should help the driver to regroup and have a safe journey to him and also to the other peoples.

3.EXISTING SYSTEM

There are a number of existing approaches for recognizing the human activity like yawning close eyes in the human face by the image input. Methods like viola jones, Ycbr color segmentation, fuzzylogic, computer vision models, IOT , skin mapping, template matching has given the efficient results in detection of the driver drowsiness.

DISADVANTAGES

- Requires dedicated camera set device
- Humans are data has to be monitored and updated
- Increases the cost of the system

4. PROPOSED SYSTEM

In this proposed work we have proposed the concept by using the digital image processing techniques(DIP) in MATLab for detection of driver drowsiness by using the viola jones algorithm . The human skin mapping, face part extraction, classification approaches has been used to reach the objective of the work.

ADVANTAGES

- No need of human interference
- The data base can be updated easily
- Images with any background gives accurate results
- Improves the road safety of the user

5. METHODOLOGY

The following section has the description regarding the use of the methods used in the system.

1. **VIOLA JONES ALGORITHM**
   - **1.1. FEATURE TYPES AND EVALUATION**
   - **1.2. HAAR FEATURE SELECTION**
   - **1.3. CREATING AN INTEGRAL IMAGE**
   - **1.4. INTEGRAL IMAGE**
   - **1.5. ADABOOST**
   - **1.6. CASCADE**
2. **SOBEL EDGE DETECTION ALGORITHM**

1 VIOLA JONES ALGORITHM

In 2001 by Paul Viola and Michael Jones has proposed the object detection method by using this method it is very easy and efficient to detect the object .It is implemented in the OpenCV.

1.1 FEATURE TYPES AND EVALUATION

Viola-Jones algorithm has following characteristics to detect the face detection algorithm:

1. Robust : works in multiple scenario
2. Real time : can be implemented in dynamically
3. Face detection : detect face by skin mapping

- Proposed algorithm has 4 stages:

1. Selection of the Haar Feature for image.
2. Creating the specified Integral Images.
3. Adaboost Training for the image dataset.
4. Cascading method for the Classifier.

1.2 HAAR FEATURE SELECTION

Haar function used the pixel summing to locate the pixel in the rectangle area of the image. The figure 1 shows the selection of the image cluster by using the feature of pixel summing mode as follows.

The Haar features sets the threshold to extracts the pixels.

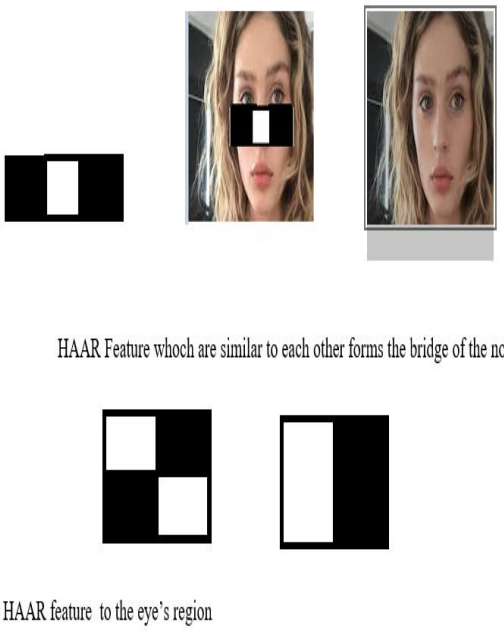

Fig-1:HAAR feature Selection

Haar Features like uses the measurement like

1. eye region : darker than upper cheeks.
2. nose bridge : lighter than the color of the eyes.

Value=∑ (pixels in black area) - ∑ (pixels in white area)

- location and the values of the pixels obtained are in the Composition of the properties to locate area if interested

1.3 CREATING AN INTEGRAL IMAGE

The VisionCascadeObjectDetector used in the MATLAB script for taking the snapshot() for the frame which are passed to the system after the Haar featuers as shown in the above image. It is being stored in the system computer memory for the future use.

1.4 INTEGRAL IMAGE

As the imge size increase the size of the pixels will be used to sum the pixel . the integral values are the windows to integral image at location (x, y) sum of the pixel left to the (x, y) as shown in figure 2.

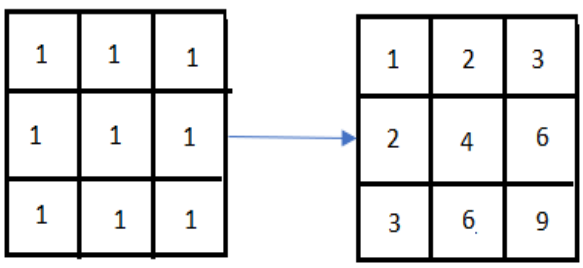

Fig-2: Integral image

1.5 ADABOOST

Adaboost determines the both relevant and the irrelevant features. It uses the weight to all of the features to them. The strong classifier in the linear combination compared to the weak classifiers.

$F(x) = \alpha_1 f_1(x) + \alpha_2 f_2(x) + \ldots\ldots\ldots$

The strong classifier is formed by using the multiple linear combination of the weak rectangle generated to the classifiers.

1.6 CASCADE

After 600 strong classifier to detect the classifiers range.

- If window fails in first stage, tha discard it
- If it passes, use the later stages to continue process.

2 SOBEL EDGE DETECTION ALGORITHM

Sobel-Feldman operator or the Sobel Filter is used in the detection of the edges of the image by using the image processing and the computer vision. By emphasizing the edge, basically the discrete differentiation of the operator. At every point, results corresponding to the image gradient vector or it sum the norm of the vector.

6.SYSTEM ARCHITECTURE

The Figure 3 represents the block diagram of Drowsiness detection system of driver. The camera is focused on the face of the automobile driver to detect the face, we can even avoid the corners of the image which reduces the significant amount of processing as required. Once the region of the interest is found that is face has been detected, the next step is to detect the eyes.

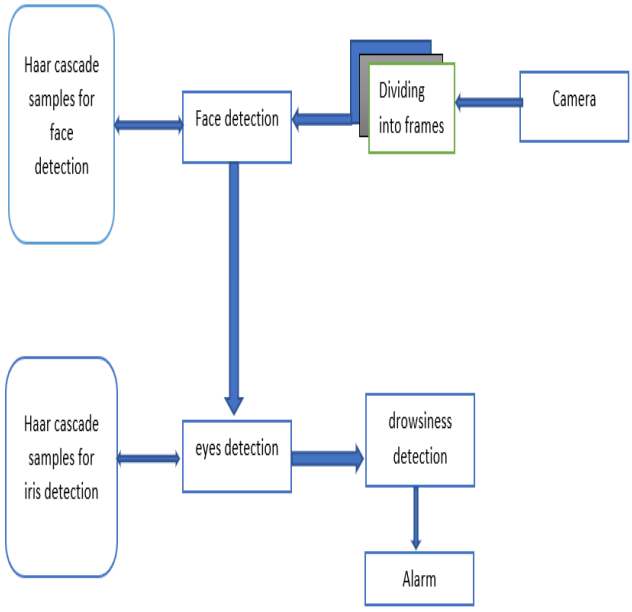

Fig-3: Block diagram of the Drowsiness detection

The following figure 4 illustrates the working of Drowsiness Detection System.

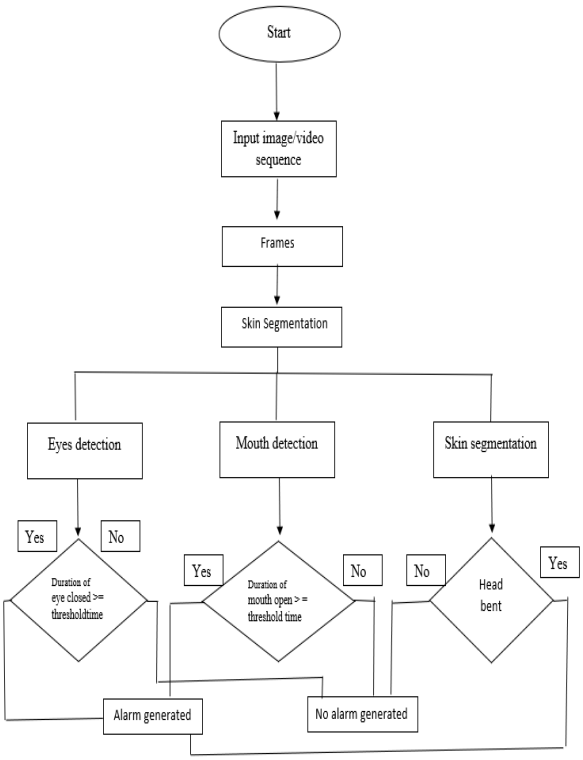

Fig-4: Flowchart of Drowsiness Detection System

7. IMPLEMENTATION

The Drowsiness Detection System has the following 3 modules:

1. Segmentation of the human face
2. Detection of eyes in face image
3. Detection of mouth in the face image

1. SEGMENTATION OF FACE

In this phase of the human face processing, initially processed face is going to be transformed based on the requirement in the phases like Lighting compensation, Edge based Unit analysis, Edge hole filling. By these extracted set of the features of human face, the skin mapping is performed by using the following module.

Skin mapping for the face extraction of the image , the skin pixel labelling place an important role as it's the base for the later stages where the image is proceeds based on the extracted pixel values and the features form the image are extracted by these labelled pixels. Hence the probability of the image pixel in the form of $c = [Cb\ Cr]^T$

Image Histogram

A=imread('sample.jpg');

hist(A);

The imread() reads the grayscale or the colour image to detcet the image histogram based on the pixels of the image.

YCbCr Colour Space

The came records the video in the RGB format only . Later the system will transmit the image to YCbCr or YC_BC_R is used to forms the color space. It is used for the pipelining in the real time video for the digital photography systems.

Y` luma component

C_B Blue- difference chroma components.

C_R red- difference chroma components.

The final values are displayed in the original RGB primaries.

2. DETECTION OF EYES CONDITION

Position of the eyes are locatedin the Haar features as explained in the above segments. The use of the eye pupil plays important role as it will enable the system locate the extract eye position. The eye detection will help to detect the use eyes is open o not. Based on the system processing the eyes opening is considered as normal if it is closed 2 frames or more than it is considered as the fatigue.

Eye Template generation process

The Sobel edge detection is used to detect the eye based precise boundaries. It uses the concept to left and to right side to the detect the eyes. Eye generate by using the sobel edge detector for the eyes template.

3. Yawning Detection

K-means clustering for detecting the distances from one pixel to another is used. K menas uses the position of the, mouth to detect the yawning of the human face. The clustering at the position will decide whether the driver is yawning or not. It will help the system to process the position and give the result to the user or driver.

8. RESULTS

We can observe that the eyes are open and mouth is closed so there is no sign of fatigue detected, thus alarm is not generated in the Figure 5.

Fig-5: Person not feeling drowsy

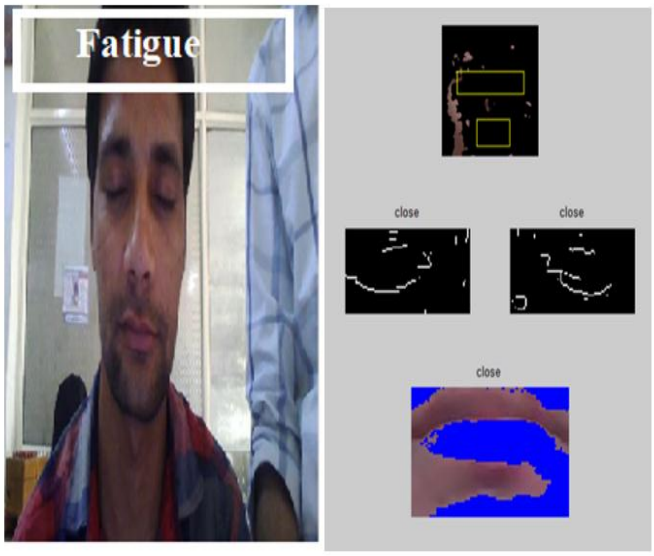

Fig.-6: Person feeling drowsy

9.CONCLUSION AND FUTURE ENHANCEMENT

Viola Jones algorithm has been implemented by using Matlab and DI technologies . we have successfully established the system for detecting the driver Drowsiness. The drivers who are not carefull will cause the accidents on the highway. It will cost many lives. Hence the use of the proposed system will alert the driver and will help in saving the lives of them and others.

The 15 fps video frames are processed in the k-means and Sobel edge detector to hech the eye, mouth activity to decide the driver condition.

FUTURE ENHANCEMENT

In future the user is wearing any obstacles like sun glasses or mask has to be processed to detect the eye mouth . It is a challenging task as the obstacles created problem in detecting the human face parts.

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