

## A System and Method for Human Eye Detection Using Digital Image Processing In Matlab

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**ABSTRACT** -Face detection is one of the most common techniques in various future visual applications. Face detection plays an important role in biometric technology, Face recognition technology. It is based on the skin colour as well as face facial features using Haar feature. The aim of this project is to detect the human face using viola-jones algorithm in MATLAB. Viola-jones algorithm is mainly used to detect the human face and facial expressions recognition. Here we mainly focussed on eye detection for drowsiness. Based on the eye ball movement of a particular person, it detects whether the person is conscious while driving. First, it captures the image of the person through the camera and detects the face if it contains. Later, it specifies the movement of the eye ball. Thereafter, if the eye ball is left it indicates as left and If the eye ball is towards right it indicates as right. By this we can keep an eye on the person if he is in critical situations of road accidents during driving.

**Index Terms:** Face detection, Viola jones algorithm, MATLAB, Digital Image processing

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### I. INTRODUCTION

Due to negligence, people when driving vehicles may feel asleep or when drunk may lead to accidental cases.

### II. PROPOSED WORK

In this process firstly, image is captured by camera. Next in the field of digital image processing it converts colour image (RGB) to a gray level image using viola-jones algorithm face is detected. Eyes are detected by using regions of Haar features and indicates the eye ball whether it is left or right

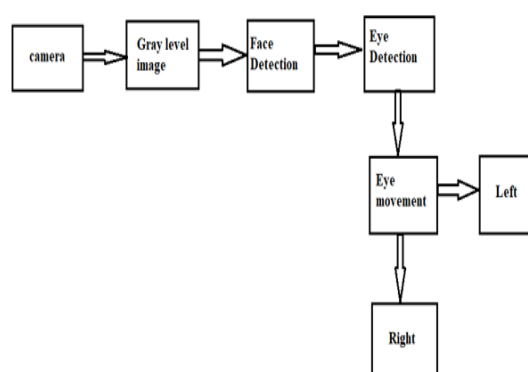


Fig 1: Procedure Flow for Human Detection

#### 2.1 DIGITAL IMAGE PROCESSING

Digital image processing is processing any digital image. In this pre-processing step, a colour image is divided into frames and converted into a gray level image within the range of pixel intensities [0-255], which is called dynamic range of an image.

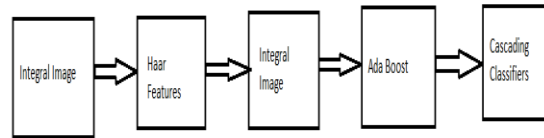
#### 2.2 FACE DETECTION

An image is captured by a camera(webcam) and next it converts into gray level image by using processing steps. Now, the face is detected by using Viola Jones algorithm. When the features of human face are compared

with the regions of Haar features, if they match it indicates the corresponding face and eyeball direction otherwise gives an indication as no face.

### 2.2.1 VIOLA-JONES ALGORITHM

Viola-Jones algorithm is mainly meant for detecting the human face applications in the image processing area. It is based on the histograms of oriented gradients which was introduced by Paul Viola and Michael Jones in 2001.



**Fig 2: Block Diagram of Viola Jones Algorithm**

Finally, it gives the warning before the occurrence of any danger situations. Viola jones algorithm has four types, they are:

#### A. Haar Features

The Haar feature is mainly used for the detection of facial images. It shows the difference between the facial and non-facial images. It contains several numbers of features which are difficult to make use of all the available features, and therefore, we consider only primary features that can make changes recognizable with the facial features in a better way.

#### B. Integral Image

In the integral image, we need to calculate a value for each feature and then perform computations on all the pixels in the image that are particularly selected. When dealing with the larger images, we have an option of making with larger pixel values, which allow to perform intensive calculations with less computational time.

#### C. Ada Boost Training

Here, we select only specific regions of interest which are mainly used to detect the face, this is based on the integral image. This helps to reduce the complexity of Haar feature selection. This helps to speed up the process.

#### D. Cascading Classifiers

Here when an image sub region enters the cascade, it goes through the first stage. It considers results from each successive step and then adds additional information to the results thereby producing final outcome.

### 2.3 EYE DETECTION

Here we mainly consider Eye feature of the facial image for detection of eye ball movement. The Eye feature is detected by using one of the Haar feature. If the eye ball is towards left, it indicates us the particular person is observing towards left. If it is right, it indicates the person is observing towards right.

## III. IMPLEMENTATION

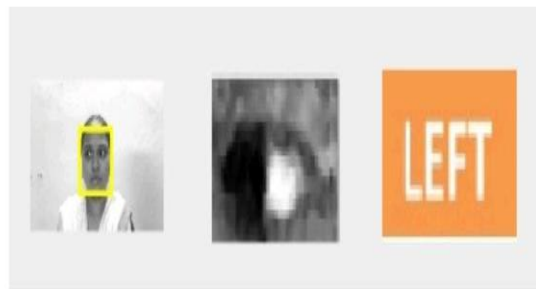
The following is the procedural steps that are followed:

1. Firstly, we have to capture the image from the camera (webcam)
2. Next the image is converted into gray level image using pre-processing steps
3. Only the face is detected, viola-jones algorithm uses the gray level image.
4. Thereafter, using the Haar transforming features, face is detected.
5. In the later stage, the eyes are focussed and the movement of eye-ball has been detected
6. when the eye-ball moves towards left side, then it shows as the left direction and when the eye-ball is in right side then it shows as the right direction.

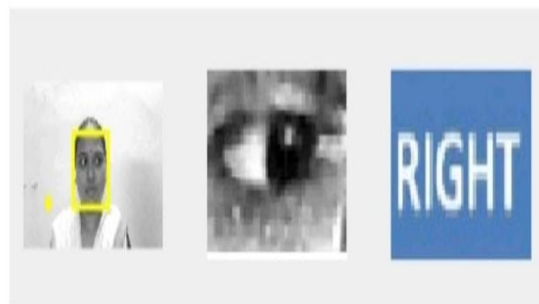
By performing this, we can find whether a person is aware of things in the surroundings.

## IV. RESULTS

When the image captured through the camera, firstly if finds where the human face is and next that is based on the viola-jones algorithm. Later on, it detects the eyes in the face and find the eye ball direction. When it is at left, it represents left direction and when it is in right, it represents right direction. In this way, we are able to make a person know the surrounding circumstances under any traffic conditions. The results we have tested are shown in the preceding section.



**Fig 3: Eye-ball movement detection towards left direction**



**Fig 4: Eye-ball movement detection towards right direction**

#### **4.1. SOFTWARE USED**

- Here, we have used the MATLAB of version R2021a for carrying out the simulation analysis

### **V. CONCLUSION**

We implemented the human face detection algorithm using Viola-jones algorithm in digital image processing in MATLAB and the same is implemented to make a check out of the face detection and thereafter eyeball movement detection results. The proposed system is implemented and tested successfully although it has some limitations.

#### **5.1. LIMITATIONS**

When eyes are not detected or viable, then it gives a warning. When any colour glasses are worn by the person, it does not detect the face. Also, when the light strikes on camera it may not detect the face in few situations.

### **VI. FUTURE WORK**

Further work can be carried out by recognizing the face after detection and the respective face will be helpful in the biometric technology applications wherever it is needed. Also, the system can assist blind people to detect the human face using the same methodology and can be implemented using advanced technology.

In order to overcome this, the proposed work may be helpful to the maximum extent. It is a challenge today to detect the face of human using the Viola jones algorithm which can detect whether it is facial or non-facial. The algorithm is mostly preferred for human face detection applications. It also used in snap chat Face detection focuses on the detection of frontal human faces. Viola jones algorithm makes use of Haar features to detect the face. Basically, it considers the facial features such as eyes, nose, lips, eyebrows. Human face contains several features, but it is difficult to detect considering all these features and hence we consider the primary facial features as mentioned. Since Viola Jones used Haar features, it has many regions to detect the face. These regions of Haar features compare with primary facial features of human face. If it matches, then it is identified as human face otherwise not. The work carried out mainly focusses on human important visionary feature Eye. According to the eye ball movement of the individual person, it specifies the direction of eye ball movement. According to obtained simulation analysis, it illustrates that the person can be saved from danger by intimating/warning to any of the registered family members. During detection process, if eyes are not identified by the camera or the face is not clear, it intimates by a warning to the person.

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