Drowsiness Detection Using Viola Jones Algorithm

Dr Smitha P. Sa*, Pugazhendhi Db, Nivas Mc, Shiril Vijai Rd

*aAssistant Professor Department of Computer Science and Engineering Velammal Engineering College, Surapet.
b,c,dDepartment of Computer Science and Engineering Velammal Engineering College, Surapet.

VDGOOD use only: Received 14-Mar-2020; revised 30-Mar-2020; accepted 20-Apr-2020

Abstract

In India major accidents are caused due to drowsiness. Around 20% of vehicle crashes have been caused by drowsy drivers. Image processing has applied to process images in medical stream, in cooperating drowsiness detection using various algorithms. In Traditional System there were Monitors which could predict the drowsiness based on the eyes but they required more time & also they got poor result. So, to overcome that problem, we designed a new system called Drowsiness Detection System (DDS) which will give better result in less time. The system uses DIP and analyzing techniques to identify such status of eyes. DDS increases accuracy of such observations of eyes. With the help of DDS system, we can detect the drowsiness in its early stage hence the cost can be reduced for the further treatment. As the drowsiness is detected in the early stage so the diagnosis becomes easy for the prevention of accidents. DDS applies digital image processing techniques on input as face image to find the certain features in the eyes and mouth using MATLAB Software. © 2020 VDGOD Professional Association. All rights reserved

Keywords: DDS; DIP; Human Eye; Yawning; MATLAB;

1. Introduction

Image processing is a method of converting a grayscale image into digital form and perform some operation on it, in order to get an extract some useful information from that image.

In India many people lose their lives due to traffic accidents. The role of human plays a key role in the accidents. In general, the driver rashes in driving alone accounts for around 25 percent of the road accidents and up to 60 percent of road accidents result in death or serious injury. A main cause of driver is sleeplessness. So, a drivers’ drowsiness is a major result in road accidents that claims thousands of lives every year.

The proposed system will extract color feature of human face image for drowsiness detection. The system is focusing on image recognition on the basis of human eye and mouth. In this system human face
image is captured using camera. Captured face is uploaded to our system and region of interest from eye and mouth area is selected from uploaded image manually. The selected area is then processed further for extracting features of eye and mouth such as status of eye. This color feature of eye is matched using simple matcher algorithm for drowsiness detection. In this way the system is useful in detection of drowsiness in their initial stages. In literature study we mentioned some of the drowsiness with its related algorithms.

2. Background

In healthcare domain, there are different ways available to diagnose the diseases in human body. Human eye analysis is one of the ways to predict the existence of disease. Usually eyes and mouth indicate healthy human and a particular color changes in eyes indicate certain diseases. Many diseases can be predicted by observing face and eyes which are shown in below table:

<table>
<thead>
<tr>
<th>Eye Type</th>
<th>Possible Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue</td>
<td>Lack of sleep, heavy exertion, jet lag</td>
</tr>
<tr>
<td>Non-fatigue</td>
<td>Healthy, Having extra energy</td>
</tr>
</tbody>
</table>

3. Related Work

There are some existing systems which use monitors and sensors of human head for identifying drowsiness. The system presented by Li G Lee, analyzes certain features of a human headbands and sensors for identifying drowsiness. This system presents work to get drowsiness using monitors and sensors. The authors mainly used PERCLOS features for eye status detection. All the eye features used in their research were calculated from eyelid movements. The features are information provided by eyelid movements. Researchers have used speaking and smile detection as emotion detection parameters. The algorithm is more complex to identify drowsiness. Kim et al have used deep learning and facial expression recognition. But this approach uses huge amount of data to train a neural network to work with a high level of accuracy. Trivedi et al have considered only the iris status for drowsiness detection. They did not consider yawning detection or head lowering which could lead to a system with a better accuracy. Singh, R. K., et al. have integrated an electrode with a steering to monitor the heart rate and alarm in case of fatigue. This paper presents a new method for drowsiness detection which monitors the status of eyes and mouth and does not require any sensors or devices.

4. Existing System

4.1. Introduction

The existing system uses HOG SVM approach for identifying the drowsiness. HOG SVM deals with object detection and not with the eye detection. Further, comparisons with a human rate in highly unreliable as human decisions are prone to more errors than an automated one.

4.2. Disadvantages of Existing System

- PERCLOS Monitors are huge in size
- Unable to wear headbands
- Cannot detect exact drowsiness.

5. Proposed System

5.1. Introduction

The main objective of this system design is to provide an application for use in healthcare domain and this is advantageous in terms of cost and time. The proposed system that is being developed is focused on image recognition based on drowsiness. In the field of healthcare, study of human face has its own significance. Drowsiness can be detected by scrutinizing the status of eye. This algorithm which will automatically extract eye area and scrutinize this eye part for drowsiness detection based on status of eye.

The proposed framework is done on the basis of real time face. Initially a camera acquires the image of the driver. The video is broken down into frames. The face detection and skin segmentation. The Eye tracking
is done to know the status of eye. The yawning
detection can be done to know the body reflexes when
a person is tired.

5.2. System Description

- Image acquisition: Face image of the driver
  will be captured using web camera in real time.
- Median filter: The median filter is a digital
  filtering technique, often used to remove noise from an
  image. The median filter is an algorithm that is useful
  for the removal of binary noise, which is manifested in
  a digital image by corruption of the captured image
  with bright and dark pixels that appear randomly
  throughout the distribution.
- Face detection & skin segmentation: The face
detection is to minimize the false detections in
identifying facial expressions.
- Eye Tracking: The most important factor
  which helps detect driver fatigue is the state of eyes,
  i.e. open or closed.
- Yawning Detection: Depending upon the
  feature values of eye and mouth, affected status name
  will be displayed as output.

5.3. Advantages of proposed system

- We can able to predict the starting stage of
  drowsiness.
- We can save time.
- We can analyse the drowsiness easily.

6. Algorithm

Support Vector Machine (SVM)

- After extracting values for the input face
  image, those values are compared with the values of
  the training set data using Support Vector Machine
  Algorithm.
  - In machine learning, SVM are supervised
    learning models with associated learning algorithms
    that analyze data used for classification and regression
    analysis.
  - An SVM model is a representation of the
    examples as points in space, mapped so that the
    examples of the separate categories are divided by a
    clear gap that is as wide as possible. New examples are
    then mapped into that same space and predicted to
    belong to a category based on which side of the gap
    they fall.

Properties of SVM:

- Flexibility in choosing a similarity function
- Sparseness of solution when dealing with
  large data sets

7. Result

Sample of input datasets and the respective di are
shown below:

For example: To find average values of Eye
plane, the
code is as follows:
After extracting values for input as face image and comparing with status of eye the following sample result is obtained as shown below:

```matlab
Leye = 
    Eeye(:,1:round(nce/2),:); Reye = 
    Eeye(:,round(nce/2+1):end, :); subplot(3,4,7)
```

8. Conclusion

The proposed system is useful for diagnosing various diseases of human body with least cost and also it saves time since the system needs only human finger nail processing for detecting diseases. This model gives more accurate results than human vision, because it overcomes the limitations of human eye like subjectivity and resolution power. The accuracy in detection of disease is around 70%.

9. Acknowledgement

The authors would like to thank Velammal Engineering College for providing facilities in research lab.

References

[2] Pauly, Leo, and Deepa Sankar. "Detection of drowsiness based on HOG features and SVM classifiers." 2015 IEEE International Conference on Research in Computational...