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Computer Based System for Sleep Detection of Driver

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Abstract— Driver drowsiness represents an important risk on the roads. It is one of the main factors leading to accidents or near-missed accidents. So there is a need to develop a system to detect drowsiness of a driver so that the risk of accidents due to drowsiness can be reduced. The Computer Based System to Detect Sleep of a Driver includes the process for detecting the drowsiness of a driver. It detects driver drowsiness and progressively warns the driver, so that he/she can either correct the behavior or stop driving .Video of the driver is taken as input to the system from this video frames are extracted. Then each extracted frame is processed by the system. First of all, blurring of image is done. Then RGB to HSV conversion of image is done. After conversion of image to HSV color format thresholding is applied. Head movement of driver is tracked through camera and offset is set. If head movement offset is greater than set offset value drowsiness of driver is detected and alarm is generated.

Keywords- *drowsiness, RGB, HSV, thresholding, blurring.*

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I. INTRODUCTION

It is a hard test of endurance for drivers to take long distance driving. It is very difficult for them to pay attention to driving on the entire trip unless they have very strong willpower, patience, and persistence. Thus, the driver drowsiness problem has become an important factor of causing traffic accidents. A driver drowsiness detection system can detect whether the driver is tired, such as dozing or inattention, so as to generate some warning alarms to alert the driver. Therefore, the system can reduce not only traffic accidents hut also the social cost caused by these accidents.

II DRIVER DROWSINESS DETECTION SYSTEM

The system uses a color camera mounted on the dashboard of a car to capture the images of the driver for driver drowsiness detection. The flow chart of the proposed drowsiness detection system is depicted in Fig. aside.

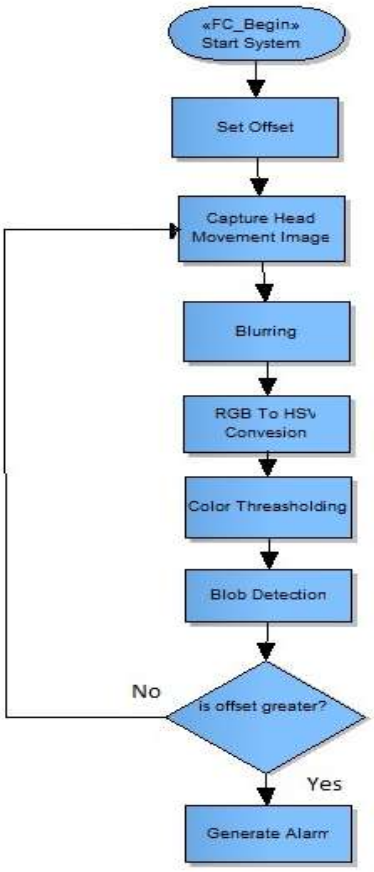

Fig.Flowchart

First offset is set &video is taken from camera to track head movement for further processing. Once the image is captured then basic image processing algorithms like blurring of image, RGB to HSV conversion, color thresholding and blob detection are used. After all the processing is done offset is checked. If offset is greater than set offset then alarm is generated otherwise check for next image. This process continue until there are no more images.

The detailed steps are described in the following .

A. Blur Image

In image terms blurring means that each pixel in the source image gets spread over and mixed into surrounding pixels. Another way to look at this is that each pixel in the destination image is made up out of mixture ofsurrounding pixels from the source image. Blurring an image reduces the sharpening effect, this makes the detection more accurate.

Algorithm

1) Traverse through entire input image array.
2) Read individual pixel color value (24-bit).
3) Split the color value into individual R, G and B 8- bit values.
4) Calculate the RGB average of surrounding pixels and assign this average value to it.
5) Repeat the above step for each pixel.
6) Store the new value at same location in output image.

Fig. Color image

Fig. Blur Image

B. RGB to HSV Conversion

Digital images usually adopt the RGB color space to represent colors. However, any color in the RGB space not only displays its hue but also contains its brightness. For two colors with the same hue but different intensities, they would be viewed as two different colors by the human visual system. Color vision can be processed using RGB color space or HSV color space. RGB color space describes colors in terms of the amount of red, green, and blue present. HSV color space describes colors in terms of the Hue, Saturation, and Value. In situations where color description plays an integral role, the HSV color model is often preferred over the RGB model. The HSV model describes colors similarly to how the human eye tends to perceive color. RGB defines color in terms of a combination of primary colors, where as, HSV describes color using more familiar comparisons such as color, vibrancy and brightness. The basketball robot uses HSV color space to process color vision.

Algorithm

1) Traverse through entire input image array.
2) Read individual pixel color value (24-bit).
3) Split the color value into individual R, G and B 8-bit values.
4) Calculate the grayscale component (8-bit) forgiven R, G and B pixels using a conversion formula.
5) Compose a 24-bit pixel value from 8-bit grayscale value.
6) Store the new value at same location in output image.

Formulae

```
v = rgbMax;
 s = 255 * (rgbMax-rgbMin)/v;
 if  rgbMax == r
      h = 0 + 43*(g-b)/(rgbMax-rgbMin);
  if rgbMax == g
       h = 85 + 43*(b-r)/(rgbMax-rgbMin);
   if rgbMax == b
        h = 171 + 43*(r-g)/(rgbMax-rgbMin);
   if  h<0
        h = 255+h;
```

Fig. RGB to HSV conversion

C. Thresholding

Thresholding is the simplest method of Image segmentation. From a grayscale image, thresholding can be used to create binary images i.e. image with only black or white colors. It is usually used for feature extraction where required features of image are converted to white and everything else to black. (or vice-versa)

Algorithm

1) Traverse through entire input image array.
2) Read individual pixel color value (24-bit) and convert it into grayscale.
3) Calculate the binary output pixel value (black or white) based on current threshold.
4) Store the new value at same location in output image.

Fig. Colour image

Fig Threshold Image

D. Blob Detection

In the area of computer vision, blob detection refers to visual modules that are aimed at detecting points and/or regions in the image that differ in properties like brightness or color compared to the surrounding. There are several motivations for studying and developing blob detectors. One main reason is to provide complementary information about regions, which is not obtained from edge detectors or corner detectors. It is used to obtain regions of interest for further processing. These regions could signal the presence of objects or parts of objects in the image domain with application to object recognition and/or object tracking.

E. Drowsiness Detection

The system uses a color camera mounted on the dashboard of a car to capture the images of the driver for driver drowsiness detection.

Once the offset is set then driver will start the camera. As soon as camera starts video capturing is starts and head movement is tracked by the system. While capturing the videos systems continuously monitoring the offset. If the offset is greater than the value system generates the alarm and flashes message as “Drowsiness Detected”.

F. Experiment Result

The proposed driver drowsiness detection system uses a color camera to capture driver's images. The system is tested under the environment of Pentium P6100CPU and 2GBRAM.The format of input video is **320x240** true color. After starting the system offset threshold value is set for tracking of head movement. As per set offset horizontal red line is set on output image as shown in Fig below.

Fig Offset Setting

Once the offset is set then driver will start the camera. As soon as camera starts video capturing is starts and head movement is tracked by the system. While capturing the videos systems continuously monitoring the offset. If the offset is greater than the value system generates the alarm and flashes message as “Drowsiness Detected”. See fig below.

Fig Drowsiness Detected

G. Conclusion

This paper presents a computer based system for driver drowsiness detection system for driving safety. The system uses the HSV color model to detect faces of input images. Finally, the obtained images are converted to the HSV model track head movement whether the offset id greater or less for judging driver drowsiness.

H. Acknowledge

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