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A Survey of Drowsiness Detection System for Drivers

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ABSTRACT: Driver in-alertness is an important cause for most accident related to the vehicles crashes. Driver fatigue resulting from sleep deprivation or sleep disorders is an important factor in the increasing number of the accidents on todays roads. Drowsy driver warning system can form the basis of the system to possibly reduce the accidents related to drivers drowsiness. The purpose of such a system is to perform detection of driver fatigue. By placing the camera inside the car, we can monitor the face of the driver and look for the eye-movements which indicate that the driver is no longer in condition to driver is no longer in condition to drive. In such a case, a warning signal should be issued. This paper describes how to find and track the eyes. We also describe a method that can determine if the eyes are open or closed. The main criterion of this system is that it must be highly non-intrusive and it should start when the ignition is turned on without having at the driver initiate the system. Nor should the driver be responsible for providing any feedback to the system. The system must also operate regardless of the texture and the color of the face. It must also be able to handle diverse condition such as changes in light, shadows, reflections etc. In given paper a drowsy driver warning system using image processing as well as accelerometer is proposed.

KEYWORDS: Acquisition, Classification, Drowsiness, Feature Extraction, Pre-processing.

I. INTRODUCTION

The innovations in the automobile industry over the last hundred years have made our vehicles more powerful, easier to drive and control safer more energy efficient, and more environmentally friendly. Majority of the accidents caused today by cars are mainly due to the driver fatigue. Driving for a long period of time causes excessive fatigue and tiredness which in turn makes the driver sleepy or loose awareness. With the rapid increase in the number of accidents seems to be increasing day to day. Therefore a need arises to design a system that keeps the driver focused on the road. Data on road accidents in India are collected by Transport Research Wing of Ministry of Road Transport and Highways. The aim of this paper is to develop a prototype of drowsy driver warning system. Our whole focus and concentration will be placed on designing the system that will accurately monitor the open and closed state of the drivers eye in real time. By constantly monitoring the eyes, it can be seen that the symptoms of driver fatigue can be detected early enough to avoid an accident. This detection can be done using a sequence of images of eyes as well as face and head movement. The observation of eye movements and its edges for the detection will be used. Devices to detect when drivers are falling asleep and to provide warnings to alert them of the risk, or even control the vehicles movement, have been the subject to much research and development. Driver fatigue is a serious problem resulting in many thousands of road accidents each year. It is not currently possible to calculate the exact number of sleep related accidents because of the difficulties in detecting whether fatigue was a factor and in assessing the level of fatigue. However research suggests that up to 25

Young male drivers, truck drivers, company car drivers and shift workers are the most at risk of falling asleep while driving. However any driver travelling long distances or when they are tired, it is at the risk of a sleep related accidents. The early hours of the morning and the middle of the afternoon are the peak times for fatigue accidents and long journeys on monotonous roads, particularly motor-ways, are the most likely to result in a driver falling asleep. In this

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paper the algorithms for face detection and eye tracking have been developed on frontal faces with no restrictions on the background .The proposed method for eye tracking is built into five stages. Using frontal images obtained from a database, the probability maps for the eyes region are built etc.

II. LITERATURE SURVEY

To analyze driver's drowsiness several systems have been built. They usually require simplifying the problem to work partially or under special environments, for example D. Taneral et al. [6] presents an automatic drowsy driver monitoring and accident prevention system that is based on monitoring the changes in the eye blink duration. He proposed the method that detects visual changes in eye locations using the proposed horizontal symmetry feature of the eyes. This new method detects eye blinks via a standard webcam in real-time at 110fps for a 320×240 resolution. Flores Javier macro et al. [11] has presented a new Advanced Driver Assistance System (ADAS) for automatic driver's drowsiness detection based on visual information and Artificial Intelligent. This system works on several stages to be fully automatic. In addition, the aim of the algorithm is to locate and to track the face and the eyes to compute a drowsiness index. Garcia .i et al [3] has presented a non-intrusive approach for drowsiness detection, based on computer vision. It is installed in a car and it is able to work under real operation conditions. An IR camera is placed in front of the driver, in the dashboard, in order to detect his face and obtain drowsiness clues from their eyes closure. It works in a robust and automatic way, without prior calibration. The presented system is composed of 3 stages. The first one is pre-processing, which includes face and eye detection and normalization. The second stage performs pupil position detection and characterization, combining it with an adaptive lighting filtering to make the system capable of dealing with outdoor illumination conditions. The final stage computes PERCLOS from eyes closure information. In order to evaluate this system, an outdoor database was generated, consisting of several experiments carried out during more than 25 driving hours. Sharma nidhi et al. [5] presented a novel approach to alert a driver who tends to doze off while driving to avoid road crashes. In her system using a small camera that points directly towards the driver's face, an image is obtained. From that image, skin region i.e. face is segmented out using YCbCr colour space. Finally localization of eyes is done with fuzzy logic application to determine the level of fatigueness and then warn the driver accordingly.

III. SYSTEM DEVELOPMENT

Various author has proposed different methods, in general drowsiness detection system consists of following major steps.

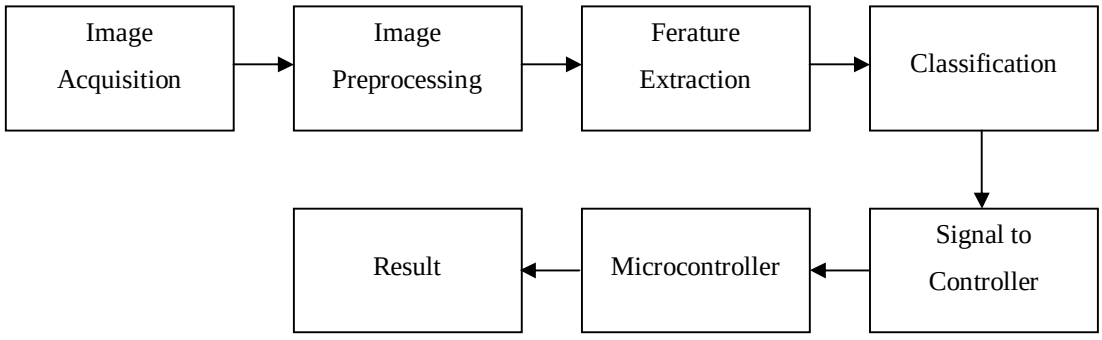

Figure: Block Diagram of Drowsiness Detection System for Drivers

A. Image Acquisition

The first stage of any vision system is the image acquisition stage. After the image has been obtained, various methods of processing can be applied to the image to perform the many different vision tasks required today. However,

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if the image has not been acquired satisfactorily then the intended tasks may not be achievable, even with the aid of some form of image enhancement. In image processing it can be broadly defined as the action of retrieving an image from some source, usually a hardware-based source, so it can be passed through whatever processes need to occur afterward. Performing image acquisition in image processing is always the first step in the workflow sequence because, without an image, no processing is possible. The image that is acquired is completely unprocessed and is the result of whatever hardware was used to generate it, which can be very important in some fields to have a consistent baseline from which to work. One of the ultimate goals of this process is to have a source of input that operates within such controlled and measured guidelines that the same image can, if necessary, be nearly perfectly reproduced under the same conditions so anomalous factors are easier to locate and eliminate. It can be done with the help of usb camera

.

B. Image Pre-processing

Image pre-processing can significantly increase the reliability of an optical inspection. Several filter operations which intensify or reduce certain image details enable an easier or faster evaluation. Users are able to optimize a camera image with just a few clicks. Examples are

- Normalization
- Edge filters
- Soft focus, selective focus
- User-specific filter
- Static/dynamic binarisation
- Image plane separation
- Binning

C. Feature Extraction

There is no universal or exact definition of what constitutes a feature for drowsiness detection. A feature is defined as an “interesting” part of an image, and is used as a starting point in main primitives for subsequent algorithms. The feature is defined as a function of one or more measurements, each of which specifies some quantifiable property of an object, and is computed such that it quantifies some significant characteristics of the object. The various features classified and currently employed are

- General features
- Pixel level features
- Local features
- Global features
- Domain specific features

All features can be coarsely classified into low level features and high level features. Low level features can be extracted directly from the original images, whereas high level feature extraction depends on low level features.

D. Classification

Classification includes a broad range of decision-theoretic approaches to the identification of images. All classification algorithms are based on the assumption that the image in question depicts one or more features and that each of these features belongs to one of several distinct and exclusive classes. The classes may be specified *a priori* by an analyst (as in *supervised classification*) or automatically clustered (*i.e.* as in *unsupervised classification*) into sets of prototype classes, where the analyst merely specifies the number of desired categories.

A vehicle driver drowsiness warning system using image processing technique with neural network is proposed explained by Itenderpal [01]. Their proposed system is based on facial images analysis for warning the driver of drowsiness or inattention to prevent traffic accidents. The facial images of driver are taken by a video camera which is installed on the dashboard in front of the driver. A Neural network based algorithm is proposed to determine the level of fatigue by measuring the eye opening and closing, and warns the driver accordingly. The results indicated that the proposed expert system is effective for increasing safety in driving.

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E. Microcontroller

After classification results are sent to hardware. The interfacing is done with matlab through serial port. Matlab sends command to hardware whether drowsiness condition detected or not. Selection microcontroller depends on compatibility with MATLAB. Some authors prefer Arduino board for interfacing. It reads the signal sent by matlab and take decion accordingly. Hardware contains microcontroller and buzzer to warn the driver about drowsiness condition.

F. Result

In the result part the output is sent to buzzer. If drowsiness condition detected driver is warned through alarm by buzzer. The level of drowsiness decides beeping of buzzer if there is severe or high level drowsiness condition then buzzer continuously beeps. The result can be sent to mobile in the form of SMS if GSM module is installed.

IV. CONCLUSION

Young male drivers, truck drivers, company car drivers and shift workers are the most at risk of falling asleep while driving. However any driver travelling long distances or when they are tired, it is at the risk of a sleep related accidents. The early hours of the morning and the middle of the afternoon are the peak times for fatigue accidents and long journeys on monotonous roads, particularly motor-ways, are the most likely to result in a driver falling asleep.

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