1. **INTRODUCTION**

**1.1 Introduction**

Driver fatigue is a significant factor in a large number of vehicle accidents. Recent statistics estimate that annually 1,200 deaths and 76,000 injuries can be attributed to fatigue related crashes [9]. Driver drowsiness, compounded by the high workloads and stress of the ever-increasing complexity of car and traffic environments, is a major cause of severe accidents.

The development of technologies for detecting or preventing drowsiness at the wheel is a major challenge in the field of accident avoidance systems. Because of the hazard that drowsiness presents on the road, methods need to be developed for counteracting its affects. The aim of this project is to develop a prototype drowsiness detection system. The focus will be placed on designing a system that will accurately monitor the open or closed state of the driver’s eyes in real-time.

By monitoring the eyes, it is believed that the symptoms of driver fatigue can be detected early enough to avoid a car accident. Detection of fatigue involves a sequence of images of a face, and the observation of eye movements and blink patterns.

In modern era accidents take place very often. As per the recent statistical analysis shows that, India is one of the leading countries in road accidents. We have a rough idea for the accident factors such as drowsiness, inexperienced drivers, intoxication as of alcohol drinks, recklessness *etc*…There aren’t lot of technologies available to prevent and control or even monitor these symptoms. The aim of this paper is to curtail the accident by using sensor detection. The main issues covered in this paper such as heartbeat monitoring, eye blink monitoring, alcohol monitoring and enhance the usage of hand brake system.

Driver drowsiness is recognized as an important factor in the vehicle accidents. “Driving to save lives, time, and money in spite of the conditions around you and the actions of others.”- This is the slogan for Defensive Driving. Vehicle accidents are most common if the driving focus is inadequate [3]. These happen on most factors if the driver is drowsy or if he is alcoholic. It was demonstrated that driving performance deteriorates with increased drowsiness with resulting crashes constituting more than 20% of all vehicle accidents. But the life lost once cannot be re-gained. Advanced technology offers some hope avoid these up to some extent [1]. There are several contribution factors for accidents such as fatigue, distraction, alcohol and drug usage, speeding, heedlessness etc. These causes loss of attention, at last the result is road fatalities. There are several technologies accessible to control and prevent the accidents. But in certain circumstances these systems prove failure due to inaccuracy.

Drowsy driving is among the main causes of accidents throughout the world. There is an immense increase in the use of automobiles in recent years, and along with it, problems created due to drowsy driving as well as driving under the influence of alcohol has become multifarious as well.

Drowsy driving is hard to quantify for a number of reasons. Currently, there is no standard test to determine sleepiness of the driving person and although there are breath analysers to detect intoxication but it cannot prevent a person from driving in improper state.[10] There is almost no police training in identifying drowsiness or fatigue as a crash factor. Every accidental prone state currently addresses fatigue or sleepiness to be the reason directly or indirectly in their crash report forms.

**1.2 Necessity**

This system is a novel based approach for real time detection of car driver drowsiness and alcoholic intoxication. There are large numbers of road accidents which takes place due to fatigue or alcohol drinking of driver. Computer vision and alcohol gas sensor application is combined to an embedded system to achieve this goal.

This system also aims to create one more step towards solving of this serious problem. The paper represents a new design to detect the drowsiness and alcohol intake of car driver and perform necessary actions on real time. The design is based on computer vision and embedded system application principles. For the detection of drowsiness, it detects the eye closing rate of the person. Haar feature based cascade classifier [3] method is used for closed eye detection.

On the other hand to detect the alcoholic intoxication of the driver, and also shows different approaches for alcohol quantity measurements. The work done over here is different from [1], and provides a more practical and efficient design with algorithm implementation which can be easily implemented as a prototype to calculates the results.

Table1.1: Statistical Analysis of Reasons of Accidents

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| --- | --- |
| **% of People** | **Reasons of Accidents** |
| 93% | Of all accidents are caused due to human factors. |
| 80% | Crashes involve driver inattention within 3 seconds before the event. |
| 30% | Talking on phone |
| 30% | Dialling phone |
| 40% | Drowsiness |
| 28% | Accidents are rear-end collision |
| 67% | Accidental cases to rise by 2020 as per WHO |

**1.3 Objective**

This system includes a Computer vision and alcohol gas sensor application is combined to an embedded system to achieve this goal. The proposed system is realized with an open source digital camera supported embedded system board Raspberry-pi loaded with Raspbian-OS, and Python-IDLE with Open-CV installed.

The Raspberry-pi system board is serially interfaced with another open source embedded system board Arduino Uno with I2C protocol, which will perform some task like issuing the alarm notification and switching off the car power source to stop the car upon receiving the positive detection message from Raspberry-pi. a distinct system is designed which combines the application of computer vision with embedded systems and are targeted for reducing road accidents due to driver drowsiness and alcoholic intoxication.

This section shows the steps for the detection drowsiness and alcoholic intoxication. Detection of drowsiness can be done in several ways like remotely measuring the heart rate or facial expression of the person to be tested. This work is the combination of face detection, eye region detection and eye closing rate detection in real time environment. OpenCV is open source software for creating computer vision related task and it is available as an extension for C, C++, Java and Python programming languages. Making a computer vision application in real time is a challenging task and it needs efficient processing power.

Development of software algorithm is completed which is partially tested and found successfully working. The requirements for an effective drowsy driver detection system are as follows:

* A non-intrusive monitoring system that will not distract the driver.
* A real-time monitoring system, to insure accuracy in detecting drowsiness.
* A system that will work in both daytime and night-time conditions. And with the Performance Parameters of the system i.e. Normal behaviour, Drunk behaviours, Fatigue behaviour, Reckless behaviour

**1.4 Theme**

Development software’s used in this project are all open source and available for free download. The design also includes two open source embedded application development board Raspberry pi [6] and Arduino Uno [7] to speed up real time processing. Hence the proposed design over here is cost effective and also does not compromise with the quality.

Raspberry pi system board is interfaced with OV5647 [2] colour CMOS QSXGA 5 megapixel camera, which is capable of capturing real time images and video. The captured frame is processed by Raspberry pi. Raspberry pi algorithm is implemented using Python [2] programming language with open source computer vision extension Open CV [8].

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Figure: Block diagram of the proposed system

Figure shows the basic block diagram of the proposed system. HAAR Feature based Cascade Classifier technique [23] is used for the detecting face region and eye region. It is a learning based approach where a function is trained from lots of similar and dissimilar images. It is then used to detect objects in other images. Open CV is packed with a trainer as well as detector. The trainer is used to create our own classifier for an object. For proper detection 1000 eye closing images has been put as similar images and 1000 dissimilar images are also included. The resulting classifier is stored in a file with .xml extension which is used in the programming environment. The Raspberry Pi is connected with arduino through I2c protocol for real time interaction between the Raspberry Pi board and Arduino.

On the other hand to measure the alcohol intake by the person, an alcohol gas sensor or breathalyzer MQ-3 is interfaced with the Arduino system board which will scan whether the person in driving seat is drunk. Based on the detection of drowsiness or alcoholic intoxication, an alarm will be turned on or the car’s power source can be cut down through a relay to stop the vehicle or preventing the driver to start the vehicle.

**1.5 Organization of Dissertation**

Due to increase in the amount of automobiles in recent years, problems created by accidents have become complex as well. There is large number of accidents which takes place due to fatigue or alcohol intake of the driver. According to the report of year 2013 by World Health Organization (WHO) approximately 105000 road deaths occurred in India.

Road accidents also create enormous monetary loses which accounts to $20 billion annually. Driver’s fault was accounted for 77.5% of total road accidents while pedestrian & cyclist fault was accounted for 3.7% [1]. Hence safe driving is a major concern of societies all over the world.

The dissertation report is arranged in five main topics namely Introduction, Literature Survey, System Development, Performance Analysis and Conclusions with Future scope.

**Chapter 1 Introduction** This gives the introduction of “A Real Time Embedded System for Driver Drowsiness and Alcoholic Intoxication Detection” Project. It also specifies the necessity and objectives of designing such a system.

**Chapter 2 Literature Survey** Literature Survey includes historical background of A Real Time Embedded System for Driver Drowsiness and Alcoholic Intoxication Detection how their Organisation is comprised and how they work. It also includes the brief review of technology including past themes and present day survey.

**Chapter 3 System Development** It explains about development of the system which mainly deals with various stages in the system development i.e. hardware and software development stages. The detail explanation of block diagram of proposed system, operation of system, working principles of various components used in the system and system specifications has been highlighted. Also it contains detail information about hard ware and software.

**Chapter 4 Performance Analysis** Comprises the various types of performance testing. And the results achieved by the system, functional testing of various stages in the development of system and results. Performance analysis is mainly divided into two parts: theoretical/statistical analysis and experimental/practical analysis.

**Chapter 5 Conclusions** It is the part of dissertation which contains the results and conclusions of the work that have been done for designing A Real Time Embedded System for Driver Drowsiness and Alcoholic Intoxication Detection future scope, further related studies in the designed system are discussed.