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Anti Sleep Alert System for Drowsiness Detection

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ABSTRACT-The "Anti-Sleep Alert System using Arduino Nano and IR Spectacle Sensor" project is aimed at developing a system that can detect drowsiness in individuals and alert them using a buzzer and motor. The system is designed using an Arduino Nano microcontroller, an IR spectacle sensor, and other electronic components such as a buzzer and motor. The IR sensor detects changes in the user's eye movements and sends signals to the microcontroller, which triggers the buzzer and motor to alert the user when drowsiness is detected.The project has practical applications in various fields such as transportation, healthcare, and safety. Drowsy driving is a significant cause of road accidents, and detecting drowsiness can help prevent accidents and save lives. Additionally, the system can be used to monitor patients' sleep patterns and detect sleep disorders.In this project, we will discuss the circuit design, programming, testing, and demonstration of the system. The project aims to showcase the potential of embedded systems and electronics in developing innovative solutions to real-world problems. The effectiveness of the system in detecting drowsiness and alerting the user will also be evaluated.

KEYWORDS -Tilt Sensor, Buzzer, Eyesensor, microcontroller, Arduino.

I.INTRODUCTION

The "Anti-Sleep Alert System using Arduino Nano and IR Spectacle Sensor" project aims to develop a system that can detect drowsiness in individuals and alert them using a buzzer and motor, thereby reducing the risk of accidents while driving or performing other activities that require alertness. The system is designed using an Arduino Nano microcontroller, an IR spectacle sensor, and other electronic components such as a buzzer and motor. The IR sensor detects changes in the user's eye movements and sends signals to the microcontroller, which triggers the buzzer and motor to alert the user when drowsiness is detected. The project is relevant because drowsy driving is a significant cause of road accidents, and detecting drowsiness can help prevent accidents and save lives. Additionally, the system can have practical applications in other fields such as healthcare, where it can be used to monitor patients' sleep patterns and detect sleep disorders.In this project, we will discuss the circuit design, programming, testing, and demonstration of the system. We will also evaluate the effectiveness of the system in detecting drowsiness and alerting the user. The project will showcase the potential of embedded systems and electronics in developing innovative solutions to real-world problems. According to Royal Society for Prevention of Accident (RoSPA), nearly 1.3 million people die in road accident each year worldwide. On an average 3,287 deaths per day, with an additional 20-50 million are injured or disabled due to road accident. Fatigue or dizziness among drivers is a major cause of these road accidents. To reduce the accidents due to fatigue or dizziness, anti sleep alarm helps a lot. There are two types of anti-sleep alarms. There are various types of alarms available in the market. One of the type of alarm is built into the car and uses its sensors, cameras and other high-tech tricks to identify the driver’s fatigue and handles the situation accordingly. Another type of alarm fits over the driver’s ear and it acts promptly when the driver fall asleep. In this research work we proposed an anti sleep alarm system device which can be easily handled and very affordable in price in comparison to all the available devices in the market. We designed our anti sleep alarm system by using eye sensor and Arduino (esp8366). The eye sensor consists of transmitter and receiver. The transmitter transmits very high amount of IR rays when the eyes are open and in case of closed eyes it will transmit very less in turn. This variation can be converted to voltage using proper interface. The controller can sense the voltage difference and define the condition that if the eyes are open then the buzzer will be inactive and if the eyes are closed then the buzzer will be active. In the rest of the papers we have explained hardware requirements, circuit and pin diagram, working principles, results followed by conclusion and future scope.

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II.SLEEP-DETECTION SYSTEM

The list of features in your new car can be quite overwhelming. If you want to tick this box on the options list when you're buying a new car, you'll need to know what some of the popular brands call this tech. While most features have self-explanatory names like fatigue monitoring, driver attention alert, and more, some automakers bundle sleep-detection systems in cars with other features and give them unique names. On most Audi models, for example, the tech is buried in an available Driver Assist package. Here are some of the more common drowsy driving detection technologies to be aware of and some of the latest models you can expect to find them in:

1.GM/Cadillac's Super Cruise: While the Super Cruise name refers to the suite of driver assistance systems, it makes use of FOVIO driver monitoring technology to keep track of whether the driver is getting fatigued. It is available on the Cadillac Escalade.

2.Volvo's Driver Alert Contro (DAC)l: The Swedish automaker was at the forefront of this tech, and introduced DAC back in 2007 to make the driver aware when they drive less consistently and become distracted due to drowsiness. The updated version of this tech is available across the lineup, including the flagship SUV, the Volvo XC90.

3.Mercedes' Attention Assist: Detecting driver fatigue is equally important in leisure cars as it is in commercial vehicles, so Attention Assist is available in all of the newest Mercedes models, including passenger and cargo vans.

4.BMW's Active Protection System: The Driving Assistant suite here uses an attention assistant and a driver attention camera to detect if there are erratic movements that could indicate sleepiness. The Fatigue and Focus Alert feature is standard on cars like the BMW 7 Series.

5.Subaru's EyeSight Driver Assist: This comprehensive suite of safety assists monitors the way your vehicle behaves and will alert you if you drift outside of your lane. The tech is standard on all new Subarus, including the Outback, Forester, and Crosstrek.

IV.HARDWARE REQUIREMENTS

There are two main hardware involved in this work.

Infrared LED Sensor: An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surrounding by either emitting and/or detecting infrared radiation given including experimental design and the technique (s) used along with appropriate statistical methods used clearly along with the year of experimentation.

Microcontroller: It is an open-source platform used for building electronics gadgets. Arduino consists of both physical and programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on the computer, used to write and upload computer code to the physical board.

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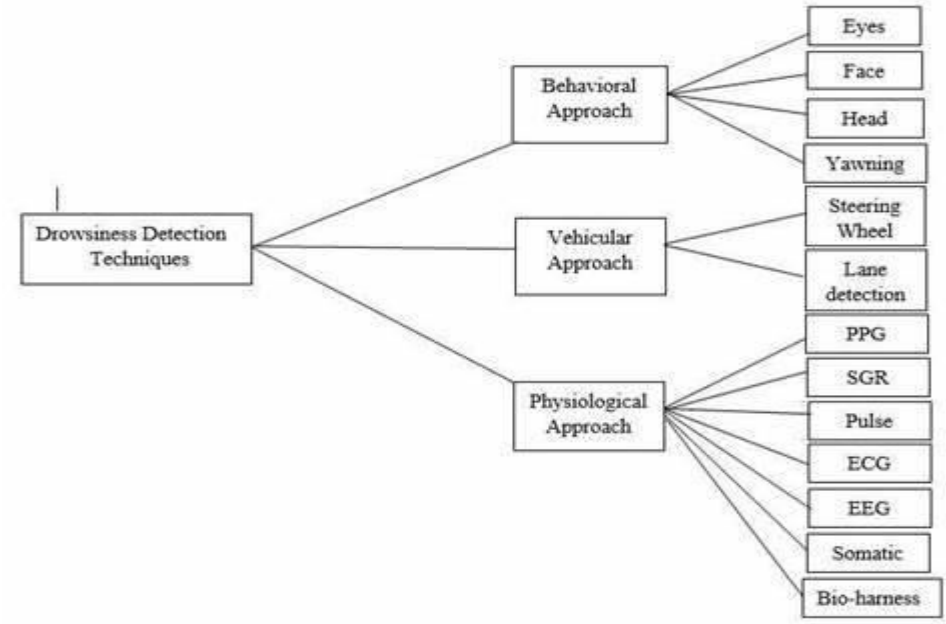
III.VARIOUS DROWSINESS DETECTION TECHNIQUES



1. Eye blinking based technique In this eye blinking rate and eye closure duration is measured to detect driver's drowsiness. Because when driver felt sleepy at that time his/her eye blinking and gaze between eyelids are different from normal situations so they easily detect drowsiness. In this system the position of irises and eye states are monitored through time to estimate eye blinking frequency and eye close duration.. And in this type of system uses a remotely placed camera to acquire video and computer vision methods are then applied to sequentially localize face, eyes and eyelids positions to measure ratio of closure . Using these eyes closure and blinking ratio one can detect drowsiness of driver.

2.Image processing based techniques In image processing based techniques, drivers face images are used for processing so that one can find its states. From the face image one can see that driver is awake or sleeping. Using same images, they can define drowsiness of driver because in face image if driver is sleeping or dozing then his/her eyes are closed in image. And other symptoms of drowsiness can also detected from the face image. We can classify these techniques in three sub-categories.

3. Artificial Neural Network Based Technique In this approach they use neurons to detect driver's drowsiness. Only one neuron is always not much accurate and the result of that is not good as compare to more than one neurons. Some researchers are carrying out investigations in the field of optimization of driver drowsiness detection using Artificial Neural Network. People in fatigue exhibit certain visual behaviors that are easily observable from changes in facial features such as the eyes, head, and face. Visual behaviors that typically reflect a person's level of fatigue include eyelid movement, gaze, head movement, and facial expression. To make use of these visual cues, they made artificial neural network to detect drowsiness. They tested samples and got 96% result that flow how an artificial neural network system can detect drowsiness.

4. **EEG Based Technique** In this technique it is compulsory to wear electrode helmet by drivers while driving. This helmet have various electrode sensors which placed at correct place and get data from brain. Researchers have used the characteristic of EEG signal in drowsy driving. A method based on power spectrum analysis and FastICA algorithm was proposed to determining the fatigue degree. In a driving simulation system, the EEG signals of subjects were captured by instrument NT-9200 in two states, one state was sober, and the other was drowsy. The multi-channel signals were analyzed with Fast ICA algorithm, to remove ocular electric, my electric and power frequency interferences EEG based systems get data for acquisition. Experimental results show that the method presented in this paper can be used to determine the drowsiness degree of EEG signal effectually.

V.OBJECTIVES

1. Design and build a circuit using an Arduino Nano microcontroller, an IR spectacle sensor, a buzzer, a motor, a breadboard, jumper wires, and a power source.
2. Program the system to detect drowsiness in the user by analyzing changes in the IR sensor signals.

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3. Develop an algorithm that triggers the buzzer and motor to alert the user when drowsiness is detected.
4. Test the system using simulated drowsy signals and evaluate its effectiveness in detecting drowsiness and alerting the user.
5. Demonstrate the system's effectiveness in detecting drowsiness and alerting the user in a real-world scenario, such as during driving or other activities that require alertness.
6. Analyze the limitations of the system and propose potential improvements for future iterations.

VI. LITERATURE REVIEW

In 2009, Mercedes-Benz unveiled a system called “Attention Assist” (Wikipedia, 2015). The system monitors the driver's fatigue level and issues a visual and audible alarm. The significant feature in this system is the linking with the car's navigation system. This allows the system to tell the driver where coffee is available. The practical use and efficiency of these devices in preventing accidents are still under inspection. UK Royal society for the prevention of accidents published a literature review on driver fatigue and road accidents (RoSPA, 2001).
The system is designed to detect if the driver is not looking forward and will signal an alert if it detects an object ahead. SMI’s InSight system (InSight, 2015) has been conceived to detect driver fatigue and inattention using cameras monitoring the driver’s face. DADSTM (Driver Alertness Detection SystemTM) (DADS, 2015) is a cloud based service that monitors a driver’s state of alertness in real-time to reduce the risk of road accidents caused by drowsiness and fatigue. To use the system, a driver needs a smartphone and a certified Bluetooth camera. The camera captures information from a driver's face, and then software analyses this information to monitor the state of alertness while driving.

List of Components :
1. Arduino Nano
2. Spectacle ir based sensor
3. DC Motor 6-9v
4. buzzer 5v
5. 5v Relay
6. Bc547
7. Resistor
8. 9v battery
9. LM7805 IC
10.Connecting wires
11. Zero pcb

VII. METHODOLOGY

Implementing an automated system to vehicles that provides high security to driver and the passengers, by designing an eye blink sensor which continuously monitor number of times the eye blinks, once when the eye blinks count decreases (that means the driver is sleepy), buzzer indication will be given and that wakes driver from sleep. This paper involves measuring the eye blinks using IR sensor. There are two sections in IR sensor .The IR transmitter is used to transmit the infrared rays to our eye. The IR receiver is used to receive the reflected infrared rays of eye. If the eye is closed then the output of IR receiver is high otherwise the IR receiver output is low. This is to know whether the eye is at close or open position at that condition. In the transmitter section, eye blink sensor is placed near the eye to sense the blink count and this information is transmitted in the form of pulses and is given to the ARM7 Microcontroller. The ARM7 processor use this information to compare with the normal eye blink programmed in and if any abnormal situation arises, the buzzer indication is given to the driver to alert him, this operation is enabled by means of the circuit connected to the buzzer and the signal is transmitted via RF-transmitter at the frequency of 433.92 MHz’s. The transmitted signal is received and the signal is decoded and given to the Microcontroller, which use this information for displaying the alert message in the LCD as programmed along with buzzer alert. When there is any leakage of gas in the vehicle the sensor sense such condition and give the signal by glowing the Emergency light. And in case of any fire inside the vehicle the temperature sensor sense the condition and stops the engine. And in case of any gas leakage the smoke sensor deducts the condition and gives the emergency light.

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VIII. CONCLUSION

This system is an attempt to help in decreasing and/or prevent traffic accidents that happen due to drivers' drowsiness and fatigues. Using our anti sleep alarm system the drivers will be benefited and be alert while driving with a low price. We believe that our model has lots of societal impact which will reduce the accidents. In future we will use small micro camera which will replace the eye sensor and will incorporate GPS module in the device to track the location of the driver. Since the price is very affordable, we have a plan to marketing it in future.

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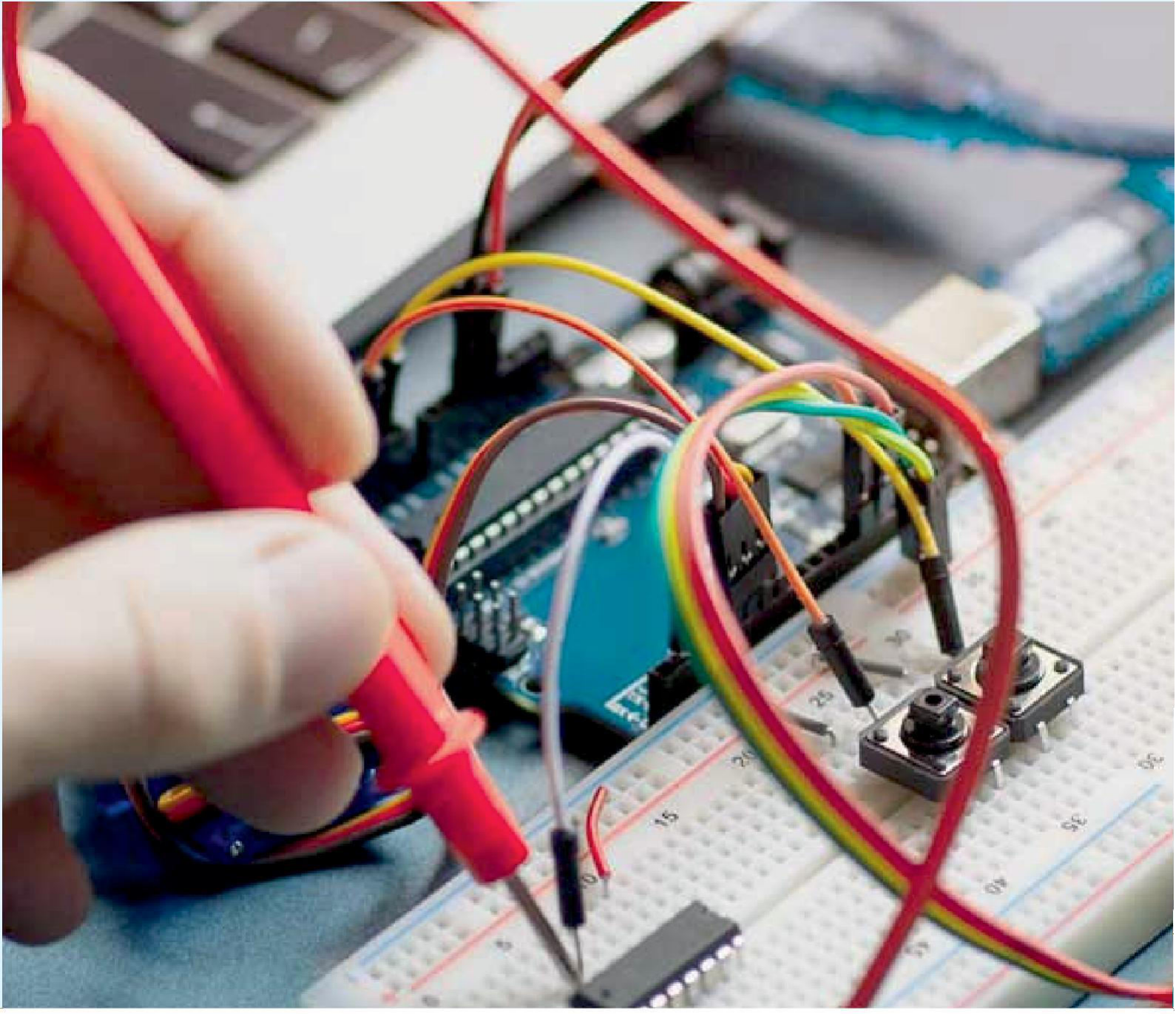

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