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AI- Based Driver Drowsiness Detection with Automatic Alert and Vehicle Control

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Abstract: This project proposes an innovative Anti-Sleep Driving System (ASDS) that detects early signs of driver tiredness and alerts the driver to take corrective action. Driver tiredness, especially during night-time driving, long highway journeys, or extended periods on the road, can significantly damage attention and increase the risk of accidents. The system uses an infrared sensor to monitor the driver's eye movements, particularly frequent blinking, which is often a sign of tiredness. When such patterns are detected, the glasses activate a signal to a buzzer, which produces a loud alarm, waking up the driver. If the driver continues to ignore the warning, the system can automatically engage the vehicle's emergency stop function to prevent further risk. To enhance safety, this system can be extended with IoT technology, such as Bluetooth or Wi-Fi, to send the driver's location to nearby contacts or emergency services. This affordable and effective solution can greatly improve driver safety, particularly during nighttime or long-distance driving, by preventing accidents caused by drowsiness. The project provides an innovative approach to ensure safer journeys on the road.

IndexTerms **– Driver Drowsiness Detection, Infrared Sensor, Eye Blink Monitoring, Buzzer Alert, Fatigue Detection, Accident Prevention, Vehicle Safety System.**

I. INTRODUCTION

Nowadays, many accidents occur due to over speeding, drunk driving, and drivers falling asleep while driving cars or buses. One of the major reasons for these accidents is drowsiness, which happens when a person gets very little sleep or becomes extremely tired. When a driver is drowsy, their reaction time slows down, their attention decreases, and they may even close their eyes without realizing it. This greatly increases the chances of serious road accidents, putting the lives of passengers and other road users at high risk. When people get more tired, their ability to drive safely goes down. Every year, more people are hurt or die in car accidents because of mistakes made by drivers.

II. LITERATURE SURVEY

Being sleepy while driving is a big risk and can be hard to notice.[1] According to the National Sleep Foundation's data, 51% of young people feel sleepy while driving, and 17% actually fall asleep.[2]Also, 40% of highway accidents happen because drivers fall asleep at the wheel. Reports from detailed accident investigations show that fatigue is involved in 10 to 20% of serious traffic accidents.[3]

To overcome this problem, we are designing an Anti-Alarm Glass for drivers. This device continuously monitors the driver's eye movements. If the driver's eyes are closing for too long, it detects the movement of eye blinking then immediately gives an alert through a buzzer and led. This warning helps the driver stay awake and focused while driving. By detecting drowsiness early and providing timely alerts, the Anti-Alarm Glass helps prevent accidents, improves road safety, and ensures a safer driving experience for everyone.

The Arduino Nano is the main part of this project and acts like the brain of the system. An infrared (IR) sensor is attached to the glasses and positioned close to the user's eye. This sensor continuously checks infrared reflections from the eye and can spot early signs of tiredness, like when the eyelids close for more than specified time. When the sensor detects these signs, the Arduino quickly processes the information and turns on alert system. The device then uses a bright LED light and a loud buzzer to warn the user. These alerts help keep the driver awake and alert, lowering the risk of falling asleep while driving or during other important activities. If the driver is neglected the alert, then relay gets activated and vehicle stops moving.

The Anti-Sleep Glasses combine smart engineering with IoT technology. The hardware and software work together smoothly to give the user an easy and comfortable experience. These glasses offer a useful solution to the common issue of drowsiness by providing fast and accurate warnings. The real-time alerts help improve safety and performance in daily life by preventing accidents that happen because of tiredness.

III. BLOCK DIAGRAM

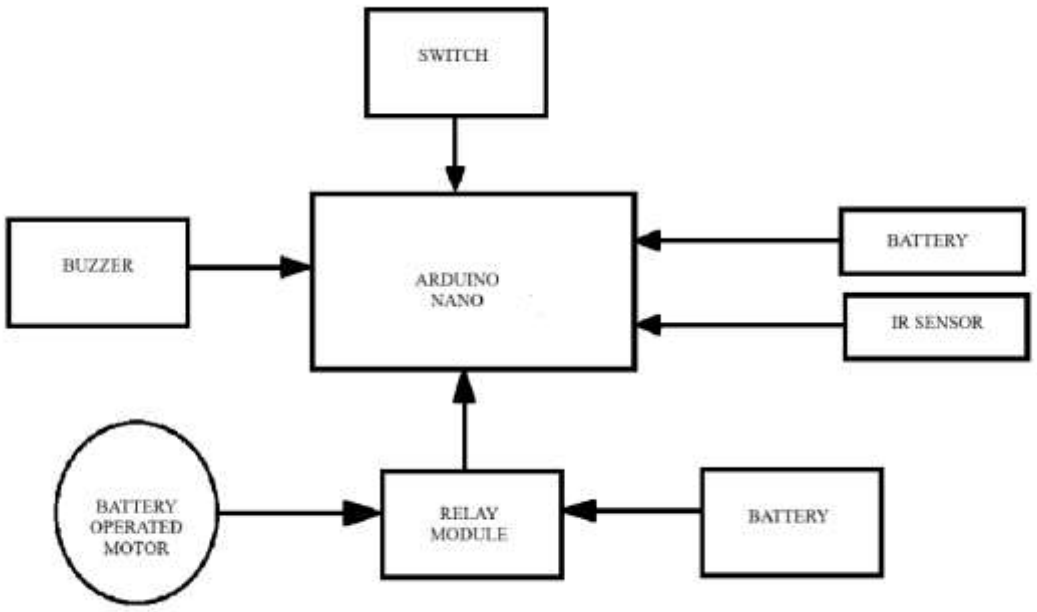

Fig. 1 Block Diagram

The block diagram shows the Anti-Sleep Driving System (ASDS), which is made to find when a driver is getting sleepy and stop accidents that happen because of tiredness while driving. The system uses an infrared sensor to watch the driver's eyes and notice signs of being tired, like blinking a lot or closing the eyes. When the system finds the driver is tired, it makes a buzzer sound to warn them and help keep them safe. If the driver doesn't react, the system can turn off the car to make sure everyone stays safe.

Description of Components

3.1 Arduino Nano

The Arduino Nano is an open-source breadboard-friendly microcontroller board based on the Microchip ATmega328P microcontroller (MCU) and developed by Arduino.cc and initially released in 2008. It offers the same connectivity and specs of the Arduino Uno board in a smaller form factor.[4]The Arduino Nano is equipped with 30 male I/O headers, in a DIP-30-like configuration, which can be programmed using the Arduino Software integrated development environment (IDE), which is common to all Arduino boards and running both online and offline. The board can be powered through its USB Mini-B receptacle or from a 9 V battery.[5] In 2008, the Arduino Nano was introduced. In 2019, Arduino came out with the Arduino Nano Every, which has the same number of pins as the Nano. It uses an ATmega4809 microcontroller(MCU).[6]In 2025, Arduino released the Arduino Nano R4, which also has the same number of pins as the Nano. It uses an ARM Cortex-M4F based R7FA4M1AB microcontroller and includes a USB-C port.[7]

3.2 IR Sensor

An IR sensor is an electronic tool that picks up infrared radiation. It is used in many devices like touchscreen phones, robots that avoid edges, line-following robots, and systems that count items or detect intruders. An IR sensor has two parts: the emitter and the receiver. Together, these parts are called a photo-coupler or optocoupler. The emitter is an IR LED, and the receiver is an IR photodiode. The photodiode reacts to the infrared light from the LED. When it gets bright light, its resistance and voltage change. This is how the IR sensor works. The light can come directly or indirectly. In direct setup, the IR LED is placed right in front of the photodiode with nothing in between.

3.3 Relay Module

A relay module is basically a circuit board that has one or more relays. These modules come in many different shapes and sizes, with the most common ones being rectangular boards that have 2, 4, or 8 relays. Each module also includes other parts like indicator lights, protection diodes, transistors, and resistors. Important details about the module, such as its input voltage, switch voltage, and current limit, are usually written on the board for easy viewing. When a control signal is given, the electromagnet inside the relay turns on, which causes the switch contacts to close. This lets current flow through the circuit. Control signals are necessary for the relay to work. These are low-power signals that tell the electromagnet when to turn on. Usually, these signals come from a microcontroller or a sensor, acting like a switch. When the signal is present, the relay works, and when it's gone, the relay stops. This lets you control the relay exactly when you need to, making it useful in many tasks like turning on a light or starting a motor. Electrical relays first came into use mainly with telegraph systems. The American scientist Joseph Henry is usually credited with inventing a relay in 1835. He did this to improve his own version of the electrical telegraph, which he had developed earlier in 1831.[8]

3.4 DC Motor

A DC motor is a device that changes direct current into mechanical movement. It works because of Lorentz's Law, which says that when an electric current flows through a conductor in a magnetic field, a force is created. This force is called the Lorentz force, and it makes the motor move. A DC motor is an electrical machine that turns electrical energy into mechanical energy. It works by using the interaction between a magnetic field and electric current to produce torque. DC motors are used in many things like cars, power tools, appliances, and electronic devices. The direction of the force created by the motor is found using Fleming's Left-Hand Rule.

A series motor can provide a lot of starting power, which makes it suitable for heavy loads like trains, elevators, or hoists. [9] However, when powered by an AC supply, it runs slower and produces less torque compared to when it's powered by DC. This is because AC causes a voltage drop due to reactance, which doesn't happen with DC. [10]

3.5 Buzzer

A buzzer or beeper is an audio signaling device,[11] which may be mechanical, electromechanical, or piezoelectric (piezo for short). They were mainly used in early doorbells until they were phased out in the early 1930s in favor of musical chimes, which had a softer tone.[12] Piezoelectric buzzers, or piezo buzzers, as they are sometimes called, were invented by Japanese manufacturers and fitted into a wide array of products during the 1970s to 1980s. In 1951, they established the Barium Titanate Application Research Committee, which allowed the companies to be "competitively cooperative" and bring about several piezoelectric innovations and inventions.[13]

3.6 Battery

The nine-volt battery, or 9-volt battery, is an electric battery that supplies a nominal voltage of 9 volts. Actual voltage measures 7.2 to 9.6 volts, depending on battery chemistry. Batteries of various sizes and capacities are manufactured; a very common size is known as PP3, introduced for early transistor radios. This type is commonly used for many applications including household uses such as smoke detectors, gas detectors, clocks, and toys.[14] In 2007, 9-volt batteries made up 4% of all alkaline primary battery sales in the United States. In Switzerland, they accounted for 2% of primary battery sales and also 2% of secondary, or rechargeable, battery sales in 2008. [15]

3.7 Switch

Switches come in many different types and setups. Some have more than one set of contacts, and all of them can be controlled by the same knob or button. The contacts in a switch can work at the same time, one after another, or take turns. A switch can be used by hand, like a light switch or a keyboard button, or it can sense something, like the position of a part, the level of liquid, pressure, or temperature, such as in a thermostat. There are many special kinds of switches, like toggle switches, rotary switches, mercury switches, push-button switches, reversing switches, relays, and circuit breakers. They are often used to control lights, and multiple switches can be connected to one circuit to make it easier to turn lights on and off. In circuits that carry a lot of power, switches need special designs to stop dangerous sparks from forming when they turn off.

3.8 Cables

In electrical and electronic systems, a cable is a conductor or group of conductors used to carry electric power or telecommunication signals from one place to another. Electric communication cables send voice messages, computer data, and visual images through electrical signals to devices like telephones, radios, computers, teleprinters, fax machines, and televisions. There is not a clear difference between an electric wire and an electric cable. Usually, a wire refers to a single, solid metal conductor, which may or may not have insulation, while a cable refers to a group of wires or a bundle of insulated conductors. Fiber-optic cables use flexible glass or plastic fibers to carry signals. In these cables, electrical signals are turned into light pulses to send audio, video, and computer data.

IV. CONTROLLER DESIGN AND IMPLEMENTATION

The Anti-Sleep Driving System (ASDS) uses a controller to detect when a driver is getting sleepy in real time. It uses an infrared sensor to watch the driver’s eyes and check for signs of drowsiness like blinking too much or closing their eyes for too long. When the sensor notices these signs, it sends signals to a microcontroller, like an Arduino Nano, which acts as the main part of the system. The microcontroller gets the signals from the sensor and checks them against a set standard. If the signals show the driver is too tired, the microcontroller turns on a buzzer to make a loud noise and alert the driver. The system also has a switch to let the user control it manually and a power source to keep everything running.

V. RESULT

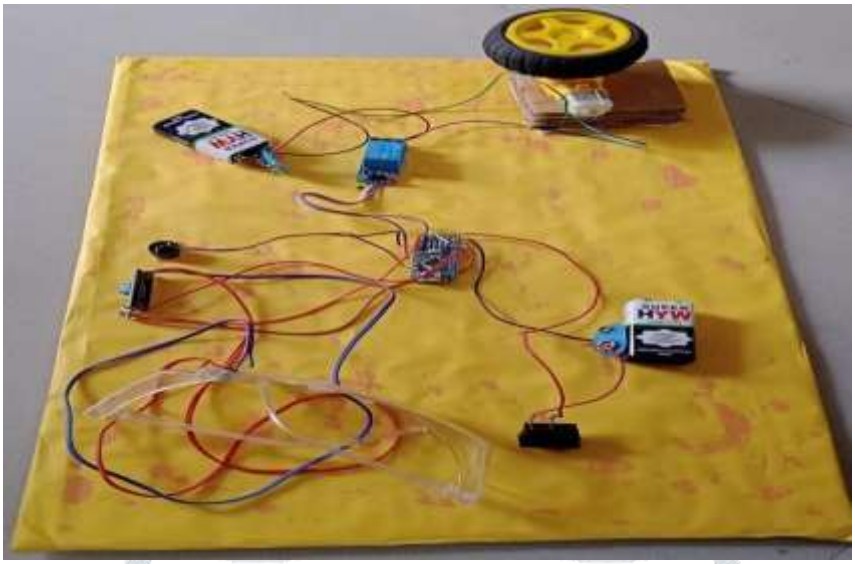

Fig.2. Complete Kit Setup

VI. CONCLUSION

In conclusion, drowsiness alert glasses are a promising technology that can help improve road safety by reducing accidents caused by driver fatigue. These glasses work by detecting when a driver is getting sleepy and sending an alert, which can keep them awake and lower the chances of a crash happening because of tiredness. But it's important to think about some ethical issues too, like making sure driver privacy is protected, not setting unrealistic expectations about how alert drivers should always be, and avoiding improper use of the data collected. Research on facial recognition-based tiredness detection shows that being clear about how data is handled, getting permission from users, and making sure the system is fair are key to keeping people trust. If these glasses are made and used carefully, they could make a big difference in society by making roads safer and helping save lives. To get this benefit, it's important to balance ethical rules with making sure the technology is environmentally friendly and affordable so that it can be used widely and responsibly.

VII. REFERENCES

[1] G. O. Young, ‘‘Synthetic structure of industrial plastics,’’ in Plastics, vol. 3, 2nd ed., J. Peters, Ed., New York, NY, USA: McGraw-Hill, 1964, pp. 15–64.

[2] B. M. K. Kumari and P. R. Kumar, ‘‘A survey on drowsy driver detection system,’’ in Proc. Int. Conf. Big Data Anal. Comput. Intell. (ICBDAC), Mar. 2017, pp. 272–279.

[3] D. Drobnich, ‘‘A national sleep foundation’s conference summary: The national summit to prevent drowsy driving and a new call to action,’’ Ind. HEALTH, vol. 43, no. 1, pp. 197–200, 2005.

[4] "Getting Started with the Arduino Nano". Arduino.

[5] "Arduino Nano". Arduino Official Store. Archived from the original on 2020-12-08. Retrieved 2020-11-25.

[6] "Deep dive with Dario: Get to know the Arduino Nano Every". *Arduino Blog. 31 May 2019*. Retrieved 2020-11-25.

[7] "Arduino R4 with RA4M1 MCU now in Nano form-factor". *Electronics Weekly. August 6, 2025.* Archived *from the original on August 23, 2025.*

[8] Ohio Electric Motors. DC Series Motors: High Starting Torque but No Load Operation Ill-Advised. Ohio Electric Motors, 2011. Archived October 31, 2011, at the Wayback Machine

[9] "Universal motor", Construction and working characteristics, Retrieved on 27 April 2015.

[10] "buzzer - definition of buzzer by The Free Dictionary". Retrieved 22 May 2015.

[11] "INOBAT 2008 Statistics" (PDF). INOBAT.ch. Archived from the original (PDF) on 2012-03-25.

[12] Scientific American Inventions and Discoveries: All the Milestones in Ingenuity--From the Discovery of Fire to the Invention of the Microwave Oven. John Wiley & Sons. 2005-01-28. p. 311. ISBN 9780471660248.

[13] "The History of the Doorbell by 1800doorbell.com". www.1800doorbell.com. Retrieved 2015-07-12.

[14] "Piezo Systems: History of Piezoelectricity". www.piezo.com. Archived from the original on 2013-10-11. Retrieved 2015-07-12.

[15] ‘‘9-Volt Battery Safety’’. National Fire Protection Association.2016. Archived (PDF) from the original on 2016-07-27. Retrieved 2022-05-01.