

Driver sleep sensing detection and alerting system

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Abstract— Now a days, there has been a significant increase in traffic accidents caused by driver fatigue, which results in several fatalities. The driver loses control when he falls asleep, resulting in an accident. This occurs when the driver is unable to manage his vehicle at high speeds on the road. Driver inattention is a major cause of most car accidents. Driver weariness caused by sleep deprivation or sleep disorders is a major factor in the increasing frequency of accidents on today's roadways. Drowsy driver warning systems can serve as the foundation for a system that could reduce accidents caused by driving drowsiness. This project can generate a model which can prevent such accidents. To avoid this, we devised a very simple and cost-effective solution. When a driver falls asleep on this project.

Keywords: Traffic Accidents, Control, Warning, Vehicle, Sleep.

1. INTRODUCTION:

According to published data, 20 to 50 million people experience non-fatal injuries as a result of traffic accidents every year, and roughly 1.3 million people pass away on the roads. According to the US National Highway Traffic Safety Administration (NHTSA), a motorist Each year, tiredness results in 100,000 auto accidents. Around 1,550 people were hurt in these collisions. \$12.5 billion in financial losses, 71,000 injuries, and deaths. The German claims that Road Safety Council (DVR), one in every four fatalities resulting from highway traffic a result of driver fatigue. from highway traffic a result of driver fatigue. When a driver nods off behind the wheel, they lose control of the vehicle, which frequently results in a collision with another automobile or stationary objects. Checking the driver's level of tiredness can help

prevent these tragic accidents. It has been generally reported that monitored utilising the subsequent techniques: measures based on vehicles several indicators, such as lane changes, steering wheel movement, and pressure The accelerator pedal, among other things, is constantly monitored, and any modification that crosses NREM is broken into three stages for the second stage.

Stage I: the change from being awake to being groggy

Stage II is a light nap.

Stage III: a sound slumber One of the most common causes of car accidents is sleepy driving.

Drowsy driving poses a danger, risk, and other potentially fatal situations, including disturbing. A certain threshold denotes a significantly elevated risk that the driver is sleepy. Driving while fatigued, sleep-deprived, or both is known as "drowsy driving." This frequently happens when a driver doesn't get enough sleep, but it can also happen due to a lack of concentration, certain drugs, sleep disorders, drinking alcohol, or shift work. Although falling asleep at the wheel is dangerous, being sleepy impairs one's ability to operate a vehicle safely even when not dozing off. According to popular belief, one in every Twenty drivers have slept off behind the wheel. Driving for more than 20 hours without any rest or sleep is comparable to driving while intoxicated by 0.08%. You are three times more likely to be in a car accident if you are fatigued. Drowsiness can be difficult to notice, so some motorists may oblivious to their weariness. Some motorists doze off behind the wheel. which are succinct, uncontrollable lapses in attention. However, due to the brief 4-5 seconds, this is dangerous. can be dangerous and inflict substantial harm. More than 1.5 million people have passed away as a result. a result of traffic collisions. According to India's Ministry of Road Accidents, there are an average of 1280 collisions resulted in 417 fatalities, or about 53 collisions and 17 fatalities every hour.

1) PROBLEM STATEMENT:

This system includes a driver aid system to reduce the number of accidents caused by driver fatigue and thereby boost road safety. Because of drowsiness, the driver has completely lost all attention and should notify the driver that they are no longer capable of operating the drowsy vehicle safely.

2. OBJECTIVES:

- The purpose of the driver sleep sensing and alerting system is to help reduce accidents involving passenger and commercial vehicles.
- The technology detects early indicators of fatigue before the driver loses their ability to drive safely.

3. LITERATURE SURVEY:

- 1) A study of the literature on the haar cascade's use in real-time drowsy driver detection. Dr. Suryaprasad J. Sandesh samples Saraswathi, D. V.J.[5] suggested a technique for employing real-time image processing to recognise a face or an eye. In the project being proposed, It explains how to carry out the Haar cascade tests, identify tiredness, and distinguish between eye blinks. This research essentially presents a real vision-based method for identifying sleepiness. The fundamental challenges are the location of the iris under various lighting situations, facial recognition, and making a instantaneous system.
- 2) Using the vehicle state (steering wheel) algorithm to detect fatigue Using a neurofuzzy system that supports vector machines, Arefnezhad et al. [6] suggested a non-interfering sleepiness detection method based on the vehicle steering data. and the optimisation strategy for particle swarms. Mutya et al.'s [7] system was suggested. to use the steering wheel algorithm to overcome the fatigue problem. Its foundation is CNN algorithm and picture-based steering movement for accurate categorization weariness, which can essentially lower the rates of false drowsiness detection.
- 3) Accident prevention using eye blink sensors,"M. Hemamalini and P. Muhilan, volume 1, issue L11, 2017.
- 4) PG Scholar, Mechanical Engineering Department, Bannari Amman Institute of Technology, Sathyamangalam, Erode, India, M.E. Industrial Safety Engineering Professor, Bannari Amman Institute of Technology, Department of Mechatronics Technology.

4. METHODOLOGY:

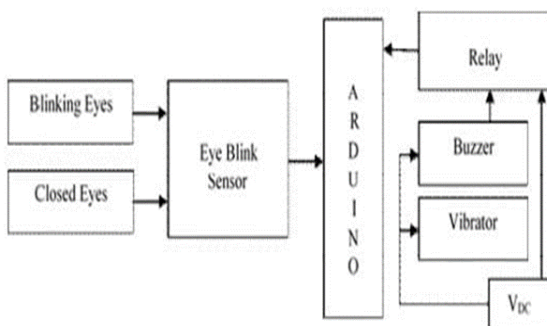


Fig 5.1 : Block Diagram

COMPONENTS REQUIRED:

- 1) Buzzer
- 2) Power Supply
- 3) Arduino nano
- 4) Relay
- 5) DC Motor
- 6) IR Sensor

1) Buzzer:



Fig. 5.2: Buzzer

The buzzer's pin configuration is displayed below. It has two pins: a positive pin and a negative pin. The '+' symbol or a longer terminal is used to indicate this's positive terminal. 6 volts are used to power this terminal, while the negative terminal is represented by It is attached to the GND terminal and bears the '-'symbol or short terminal. A buzzer's operation is based on the idea that once a voltage is applied across a piezoelectric material, a pressure difference is created. Two conductors and piezo crystals make up a piezo type. Once these crystals have a potential differential, they thrust one conductor and drag it. the extra conductor via their internal assets. Therefore, this ongoing action will result in a direct audio gnal.

Specifications:

- The buzzer's specifications include the following.
- The colour black
- 3,300 Hz is the frequency range.
- The operating temperature varies from 20 to 60 degrees Celsius.
- 3V to 24V DC operating voltage range
- The decibel level of the sound is 85dBA, or 10cm.
- The supply current is less than 15 mA.
- Working Theory:
- The buzzer's operation is based on the idea that, once the voltage is applied across
- the piezoelectric

2) Power Supply:



Fig 5.3: Power Supply

Specifications:

- Output DC Voltage: 5 volts
- AC Input Voltage: 100V–240V, 50Hz–60Hz
- Current Output: 2A
- input current: 100 mA
- 5 percent load regulation

3) Arduino nano:

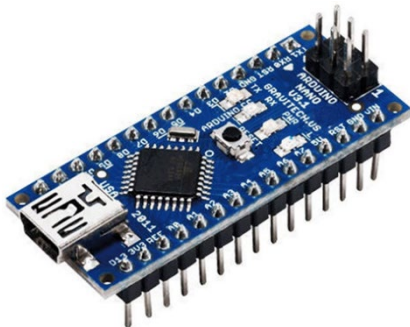


Fig 5.4: Arduino nano

The smallest and most traditional breadboard friendly board offered by Arduino is the Nano. Pin headers that are included with the Arduino Nano make attaching them simple. has a Mini-B USB connector and is mounted onto a breadboard. The oldest board in the Arduino Nano family is the original Nano. It is comparable to a breadboard-compatible version of the Arduino Duemilanove that lacks a dedicated power source. jack. Examples of the traditional Nano's successors include the Nano 33 IoT with Wi-Fi. Bluetooth Low Energy and numerous environmental features are featured in the Nano 33 BLE Sense module sensors.

Name	Processor	Operating/Input Voltage	CPU speed	Analog In/Out	Digital IO/PWM	EEPROM / SRAM[kB]	Flash	USB	USART
Mega	ATmega2560	5V / 7-12V	16 MHz	16 / 0	54 / 15	4 / 8	256	Regular	4
Nano	ATmega328P	5V / 7-12V	16 MHz	8 / 0	14 / 6	1 / 2	32	Mini	1

4) Relay:

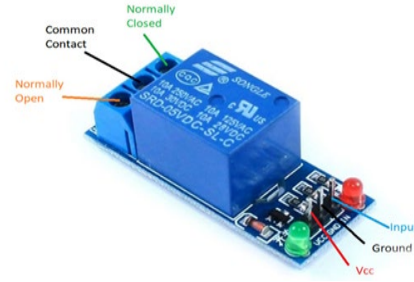


Fig 5.4: Relay

An electromechanical device called a relay uses an electric current to open or close a switch's contacts. The single-channel relay module includes elements that facilitate switching and connecting as well as serve as indicators, making it much more than simply a simple relay to display whether or not the relay is active and whether the module is powered.

Description of the Single-Channel Relay Module Pin:

- 3.75 to 6 volts is the supply voltage.
- 2mA is the quiescent current.
- 70mA of current flow when the relay is on.
- 250VAC or 30VDC is the maximum contact voltage for relays.
- 10A is the maximum relay current.

Replacing Relay Modules:

- Dual-channel, four-channel, and eight-channel relay modules are available.

supplementary switching modules:

- TRIAC, SCR, and solid state relay module.
- A 5V single channel relay module contains the following components:

Working:

The contacts of a switch are opened or closed by the relay using an electric current. This is typically accomplished with the aid of a coil that, when engaged, attracts the switch contacts and draws them together, while a spring, when deactivated, pushes them apart. There are two benefits to using this system: First, the amount of current needed to turn on the relay is Second, the coil's current capacity is substantially lower than the maximum current that relay contacts can switch. and there is no electrical connection between the contacts because they are galvanically isolated. them. This means that a mains current switch can be made using the relay by switching an isolated low voltage. digital voltage system, such as a microcontroller.

5) DC Motor:

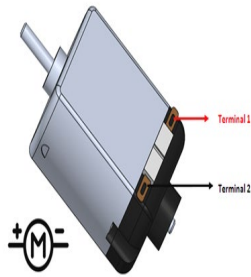


Fig 3.6: Toy DC Motor

Fig 3.7: Toy DC Motor Wiring

Motor Information:

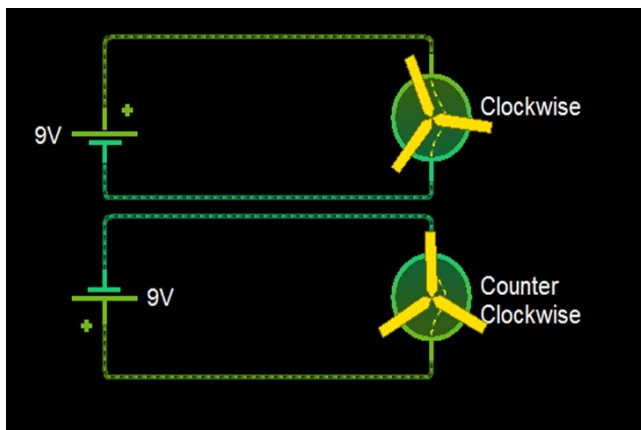
- Standard 130-type DC motor • 4.5V to 9V operating voltage
- Rated/recommended Voltage: 6V
- The maximum current at no load is 70 mA.
- Speed with no load: 9000 rpm
- Approximate loaded current: 250 mA
- Maximum Load: 10 g/cm
- Motor Dimensions: 27.5 x 20 x 15 mm
- 17 gramme weight

Note: At the bottom of the page is the DC motor datasheet.

Various DC motors

- 12V DC motor with gears
- Various motors
- Stepper motors, BLDC motors, and servo motors.

Where to Use a Hobby DC Motor:



Since many of us are familiar with hobby DC motors from children's toys like remote-control cars, trains, and other items, this

motor is also known as a toy motor. But even so, this motor is primarily used by novice-level users and can be used for many other common uses. Since many of us are familiar with hobby DC motors from children's toys like remote-control cars, trains, and other items, this motor is also known as a toy motor. But even so, this motor is primarily used by novice-level users and can be used for many other common uses. electrical enthusiast. They are incredibly robust, simple to use, and operate with standard A variety of voltage levels are readily available. These motors are able to rotate both ways, and Although speed control is also feasible, don't anticipate very high torque and fast speeds from these tiny men. The good news is that, in comparison to other motors, this one is reasonably priced. Motors are the best option for you.

Applications:

- Toy cars.
- Windmill projects.
- Basic Electronics projects.
- As Robot wheels.

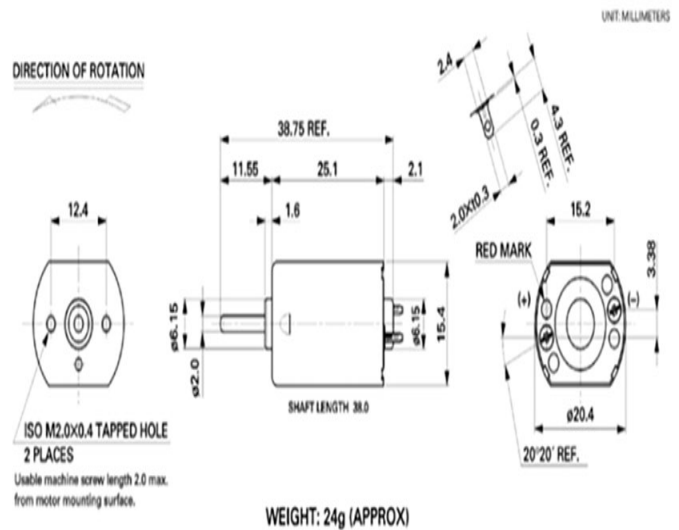


Fig 3.8: Dimensions of DC Motor

6) IR Sensor:



Fig 3.8: IR Sensor

The eye blink sensor is used to track eye blinks, which allows us to monitor other behaviours like driver drowsiness while driving. Based on infrared LED technology, it operates. It has a receiver LED and an infrared transmitter that are used to detect an eye blink.

WORKING PRINCIPLE OF BLOCK DIAGRAM:

The IR sensor in this case is regarded as a microcontroller input. The microcontroller's outputs, or actuators, include the buzzer, vibrator, and motor. The IR sensor is first provided with electricity. While driving, the IR sensor at the input identifies the person's eye blink pattern. When the system is turned on, the motor begins to rotate to simulate vehicle motion. The microcontroller receives information when the IR notices that the driver is nodding off. When a person's eyes are closed for three seconds, the microcontroller is instructed to start responding by turning on the output buzzer and vibrator, which then alerts the driver by making a sound and vibrating. In order to avoid any accidents on the road, this warns the motorist to get up. The motor slows down, signifying that the ignition will be switched OFF and that the vehicle's movement will be stopped gradually.

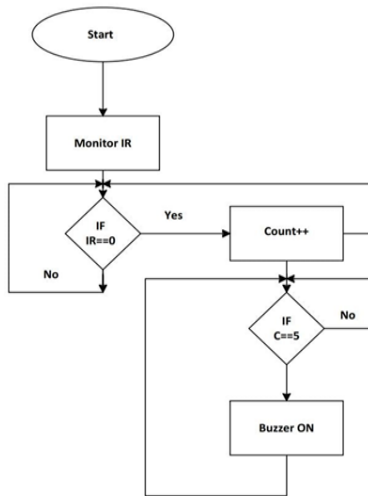


Fig: Flow Chart

ADVANTAGES AND DISADVANTAGES:

A. Advantages:

- Security of vehicle.
- Helpful for strangers.
- Detect if the driver is feeling sleepy.
- Better service to passengers.
- Low cost and flexible in design.
- This module can reduce the passenger tension in journey to unknown place.
- Decreasing road accidents.
- It provides high efficiency.
- This system can be implemented in any vehicle.
- Low power consumption i.e., it requires very less power to be operated.
- Economic losses due to crashing of vehicles can be avoided through this system.
- Major road accidents and severe injuries can be prevented through this system.

B. DISADVANTAGES-

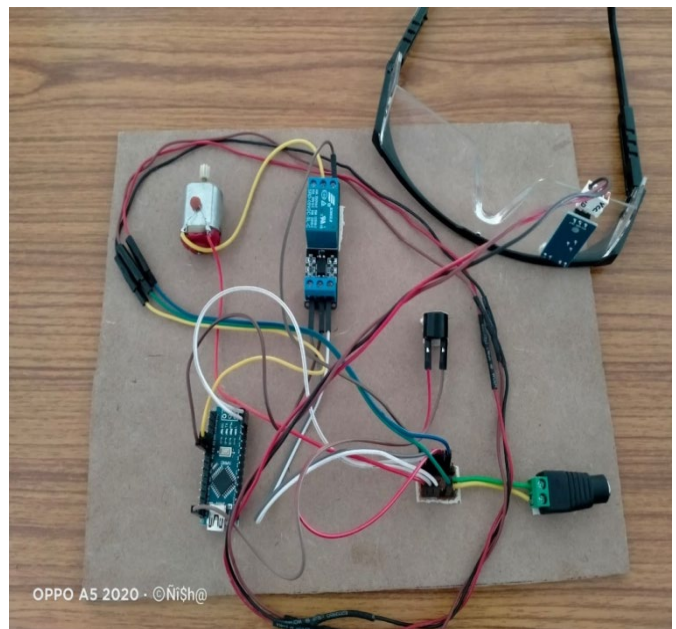
- Damage of sensor cannot be detected.
- Aging of sensor and all these sensors are attached to the drivers body which may affect the drivers.

5. APPLICATIONS:

- For a personal car.
- This device warns the user if they start nodding off while driving, preventing accidents and preserving lives.
- This approach is quite useful, especially for those who travel great distances and persons who are out driving late at night.
- It can be utilised by truck and bus drivers who spend a lot of time on the road.
- It can be utilised by public transportation drivers to assure the security of the passengers.
- The operator of large load lifting equipment, such as cranes, can use this technique to prevent accidents at the workplace

RESULTS AND DISCUSSIONS:

In this scenario, the IR sensor is viewed as a microcontroller input. The buzzer, vibrator, and motor are examples of microcontroller outputs, or actuators. First, power is given to the IR sensor. The IR sensor at the input recognize the person's eye blink pattern while they are driving. The motor starts to revolve as soon as the system is turned on, mimicking vehicle motion. When the IR determines that the driver is dozing off, it sends information to the microcontroller. The output buzzer and vibrator are turned on by the microcontroller when a person's eyes are closed for three seconds, which alerts the driver by generating a noise and vibrating. This alerts the driver in order to prevent any mishaps on the road.



CONCLUSION:

Based on the results of the testing, it is evident that employing an IR sensor to detect an individual's eye blinks is a practical and reliable way to identify whether or not they are sleepy, provided that the sensor is securely fastened to a fixed area of the glass. utilising alarm modules composed of the system aids the driver's ability to stay awake through the use of the buzzer and vibrator driving.

FUTURE SCOPE:

The following wireless modules can be added to this prototype to make it more practical to use: Wi-Fi, Bluetooth, Zig-bee, etc. This system can be placed directly into the eyewear using nanotechnology, which results in the usability of the product. It is advised to investigate additional sensors in order to determine the blinking rate because the IR sensor is delicate and not long-lasting when used frequently. However, with reference to the connection .It is advised to use any device that will connect the eye blink sensor to the Arduino. If the eye blink sensor's output can be transferred to a wireless connection, do so. influence the delay procedure. The use of image processing by academics is widespread in various domains.

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