

# DRIVER AND ROAD SAFETY SYSTEM

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# Importance of driver safety

Driver safety systems are crucial for several reasons:

1. **Preventing Accidents:** Advanced driver safety systems can detect potential hazards and alert the driver, significantly reducing the risk of collisions. Features like automatic emergency braking, lane departure warnings, and blind spot detection help prevent accidents.
2. **Saving Lives:** These systems can save lives by preventing accidents and reducing the severity of collisions. For example, airbags, seatbelts, and automatic braking systems are designed to protect occupants during a crash.

3. **Enhancing Driver Awareness:** Many safety systems enhance driver awareness by providing real-time information about road conditions, vehicle status, and potential dangers. This can help drivers make informed decisions and respond more effectively to changing conditions.

4. **Reducing Insurance Costs:** Vehicles equipped with advanced safety features often qualify for lower insurance premiums. Insurance companies recognize that these systems reduce the likelihood of accidents and the severity of claims.

5. **Increasing Vehicle Value:** Vehicles with modern safety features tend to have higher resale values. Buyers are increasingly prioritizing safety when making purchasing decisions, making these features a valuable asset.

6. **Supporting Autonomous Driving:** Advanced safety systems are the building blocks for autonomous driving technology. Features like adaptive cruise control, lane-keeping assistance, and automated parking are steps towards fully autonomous vehicles, which promise to further reduce accidents and improve road safety.

7. **Improving Traffic Flow:** Some driver safety systems, such as adaptive cruise control and traffic sign recognition, can help improve traffic flow and reduce congestion. By maintaining safe following distances and obeying traffic signals, these systems contribute to smoother traffic patterns.

8. **Compliance with Regulations:** Many regions have implemented regulations requiring certain safety features in new vehicles. Staying compliant with these regulations is essential for manufacturers and helps ensure a baseline level of safety for all cars on the road.

9. **Driver Behavior Monitoring:** Some systems monitor driver behavior, such as drowsiness detection and distraction alerts. By encouraging safer driving habits and alerting drivers to potential risks, these systems can prevent accidents caused by human error.

10. **Economic Benefits:** Reducing the number and severity of accidents has significant economic benefits. Fewer accidents mean lower costs for medical treatment, vehicle repairs, and lost productivity, ultimately benefiting individuals and society as a whole.

## Materials used:

1. **Arduino Nano:** The Arduino Nano is a microcontroller-based device with 16 digital pins that can be used for various purposes. It can be used for almost every task, from minor to massive industrial-scale projects. Here it is used as the brain of the project.
2. **IR (Infrared) sensor:** An infrared sensor (IR sensor) is a radiation-sensitive optoelectronic component with spectral sensitivity in the infrared wavelength range 780 nm ... 50  $\mu\text{m}$ . Here it is used to detect the alcohol in the driver's breath.

3. MQ-3 sensor: The Gas Sensor(MQ3) module is useful for gas leakage detection (home and industry). It is suitable for detecting Alcohol, Benzene, CH<sub>4</sub>, Hexane, LPG, and CO. Due to its high sensitivity and fast response time, measurements can be taken as soon as possible. Here it is used to detect the alcohol in the driver's breath.
4. 5v-Relay: A relay allows circuits to be switched by electrical equipment: for example, a timer circuit with a relay could switch power at a preset time. For many years relays were the standard method of controlling industrial electronic systems. Here it is used as a break to stop the vehicle.
5. 5v Gear motor: A gear motor is a motor designed with an integrated gearbox. Gear motors function as torque multipliers and speed reducers thus requiring less power to move a given load. The design of the gearbox structure, type of gears, lubrication, and type of coupling affect its performance. Here it is used to act as a car.
6. Breadboard: A breadboard (sometimes called a plug block) is used for building temporary circuits. It is useful to designers because it allows components to be removed and replaced easily. It is useful to the person who wants to build a circuit to demonstrate its action, and then to reuse the components in another circuit. Here it is used to connect the wires.
7. LED: LED stands for light emitting diode. LED lighting products produce light up to 90% more efficiently than incandescent light bulbs. How do they work? An electrical current passes through a microchip, which illuminates the tiny light sources we call

LEDs and the result is visible light. Here it is used to alert the nearby drivers.

8. **5v buzzer:** This voltage buzzer is generally used in alarm circuits, communication equipment, piezo, and Automobile electronics. This is small, durable, and easy to use. This product normally operates on 5v DC and its current rating is less than equal to 30mA. Here it is used to alert the other drivers and to wake up the sleeping driver.
9. **Vibrating Motor:** The vibration motor is designed to operate within a voltage range of 1.5 to 5 volts DC (direct current) and is commonly used for applications that require vibration, such as in mobile devices, wearables, controllers, and more. Here it is used to vibrate the seats to wake the driver.
10. **Jumper Wire:** Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points without soldering. Jumper wires are typically used with breadboards and other prototyping tools to make it easy to change a circuit as needed.
11. **Switch:** SPST is an abbreviation for Single-Pole Single-Throw, and Pole refers to the number of circuits that one switch can control "simultaneously". Here it is used to on and off the system.
12. **9v Battery:** A nine-volt battery, either disposable or rechargeable, is usually used in smoke alarms, smoke detectors, walkie-talkies, transistor radios, test and instrumentation devices, medical batteries, LCDs, and other small portable appliances. Here it is used to power the system.

## WORKING OF PROJECT:

The project is divided into two parts:

1. Driver Alert System
2. Alcohol detection system

### Driver alert system

This is the first part of the project, in this, the driver wears glasses while driving which have the IR sensor. While driving if the driver gets sleepy and closes his eyes for more than two seconds the sensor will detect that the driver has closed his eyes and start the alarm, LEDs, and the vibrating seats, even after a few seconds if he does not open his eyes the sensor will detect it and make the vehicle come to a stop, the alarm, LEDs, and the vibrating seats will keep on going until the driver opens his eyes when he opens his eyes the alarm stops, the LEDs shut down, the vibrating seats stop, and the vehicle slowly restarts.

### Alcohol detection system

This is the second part of the project, In this part of the project there is a sensor for the detection of alcohol in the driver's breath, if the sensor detects alcohol in the driver's breath then it immediately stops and locks the vehicle, flashes the LEDs, and starts the buzzer. When the sensor stops detecting the alcohol in the driver's breath it unlocks the vehicle and makes it drivable again.

## Problems of not following road safety:

The exact number of deaths due to drunk driving worldwide can vary by year and source. However, the World Health Organization (WHO)

estimates that around 1.35 million people die each year as a result of road traffic crashes, and a significant portion of these fatalities are related to alcohol impairment. According to the WHO, alcohol consumption is a major risk factor in traffic crashes and contributes to approximately 25-30% of all road traffic fatalities globally. This means that roughly 337,500 to 405,000 deaths annually could be attributed to drunk driving.

The U.S. National Highway Traffic Safety Administration (NHTSA) estimates that drowsy driving is responsible for approximately 100,000 crashes each year in the United States, resulting in about 1,500 deaths and 71,000 injuries.

On a global scale, the World Health Organization (WHO) acknowledges that fatigue is a major risk factor in road traffic crashes. While global estimates are harder to find, it is believed that drowsy driving contributes to a significant number of fatalities worldwide. Some studies suggest that fatigue-related crashes account for 10-20% of all road traffic accidents. Given that around 1.35 million people die in road traffic crashes each year globally, this would imply that drowsy driving could be responsible for approximately 135,000 to 270,000 deaths annually.

## Conclusion

Road safety is of paramount importance due to its profound impact on public health, economic stability, and overall quality of life. Ensuring safe roads involves implementing and adhering to safety measures that can significantly reduce accidents, injuries, and fatalities. Effective road safety strategies, such as driver education, strict enforcement of traffic laws, and the integration of advanced safety technologies, play crucial roles in protecting lives and preventing devastating consequences for families and communities. Furthermore, improved road safety leads to economic benefits by reducing healthcare costs, minimizing lost productivity, and

decreasing the financial burden on individuals and society.  
Ultimately, prioritizing road safety fosters a safer, more efficient transportation system, contributing to the well-being and prosperity of society as a whole.