Problem Statement

- Develop a simple Microcontroller based system that can detect the drowsiness of drivers and can alert the driver
- Drowsiness in drivers is one of the most prominent reason for accidents in todays day and age.
- The current available solutions for the problems in todays market are not reliable, slow in detecting drowsiness which defeats the purpose of the device thus needing much improvement in both design and hardware aspects of the design.

Scope of Solution

Scope of Solution: Microcontroller-Based Driver Drowsiness Detection and Alerting System

1. Outline of Boundaries and Objectives:

- Objective: The primary objective of this project is to design and implement a simple microcontroller-based system capable of detecting driver drowsiness and providing timely alerts to enhance road safety.

Scope Limitations:

This system will primarily focus on detecting drowsiness based on driver eye behavior, specifically eyelid movements, blinks, and eye closure durations.

The system's alerting mechanism will be limited to auditory and visual alerts, ensuring minimal distraction to the driver.

It will not involve advanced features such as adaptive cruise control, automatic lanekeeping, or autonomous driving.

The system will be designed to work in standard passenger vehicles and should be nonintrusive.

2. Define Solution Aims:

Drowsiness Detection: The system aims to accurately detect signs of driver drowsiness by monitoring eye behavior in realtime. It will utilize image processing techniques to analyze eye movements and alertness levels.

Alert Mechanisms: The system will provide timely alerts to the driver through both visual and auditory cues. Visual alerts may include LED indicators, while auditory alerts may involve a buzzer or prerecorded voice messages.

Realtime Monitoring: The system will continuously monitor driver behavior, ensuring that alerts are triggered promptly upon detecting drowsiness signs.

Cost-Effective: The solution aims to be cost-effective, using readily available components and an easily programmable microcontroller platform, such as Arduino.

User-Friendly Interface: The system will feature a simple user interface, including buttons or switches for activating/deactivating the system and adjusting alert settings.

3. Mention Constraints or Limits:

Hardware Constraints: The solution will be designed to operate within the constraints of a basic microcontroller platform (e.g., Arduino nano), limiting the complexity and processing power available.

Sensor Limitations: The system will rely on lowcost sensors, which may have limitations in terms of accuracy and range.

Driver Responsiveness: The system cannot guarantee that the driver will respond appropriately to alerts; it can only provide warnings.

Environmental Conditions: The system may be affected by environmental factors (e.g., low light conditions, dirt on sensors) that could influence its performance.

Legal and Ethical Considerations The solution should comply with all relevant legal and ethical guidelines regarding data privacy and driver monitoring.

Driver Distraction: The design of alerting mechanisms must ensure they do not create distractions or stress for the driver.

Scalability: The solution will not address the scalability of the system for integration into commercial or fleet vehicles. It will be limited to individual vehicle use.

Maintenance and Updates:-While the system will be designed to be user-friendly, it will not include advanced maintenance or over the air update capabilities. Updates may require manual intervention.

By adhering to these boundaries, objectives, aims, and constraints, the proposed microcontroller-based driver drowsiness detection and alerting system can provide a practical and cost-effective solution to enhance road safety.

Required components :-

Hardware components :-

- Arduino Nano

- Eyeblink Sensor

- RF Transceiver Module

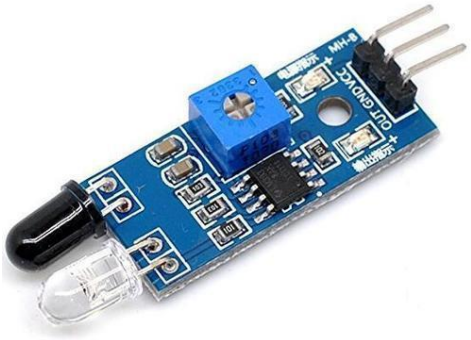
- HT12E & HT12D IC

- Buzzer

- 9V Battery

- 12V DC power supply

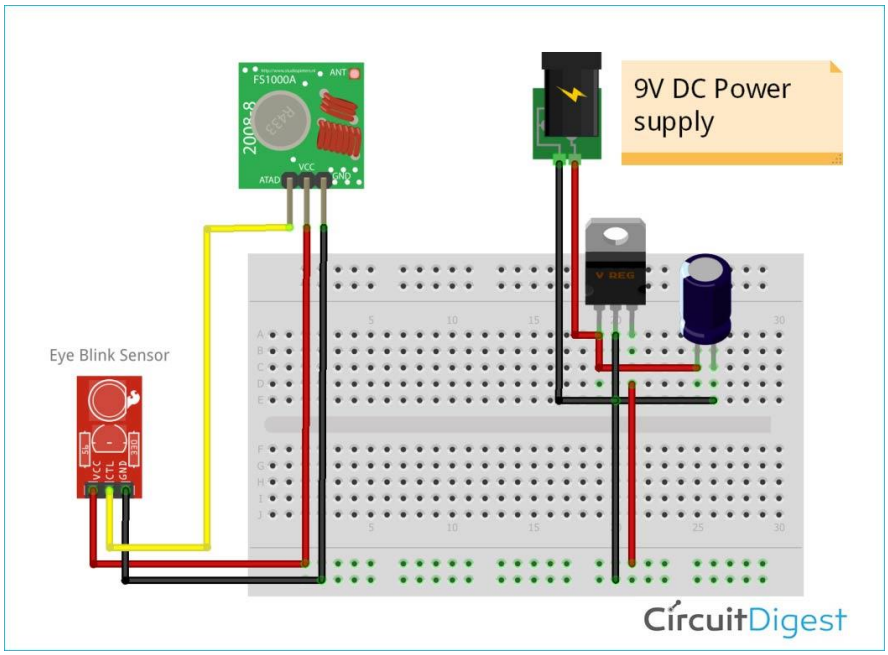
- IR sensor



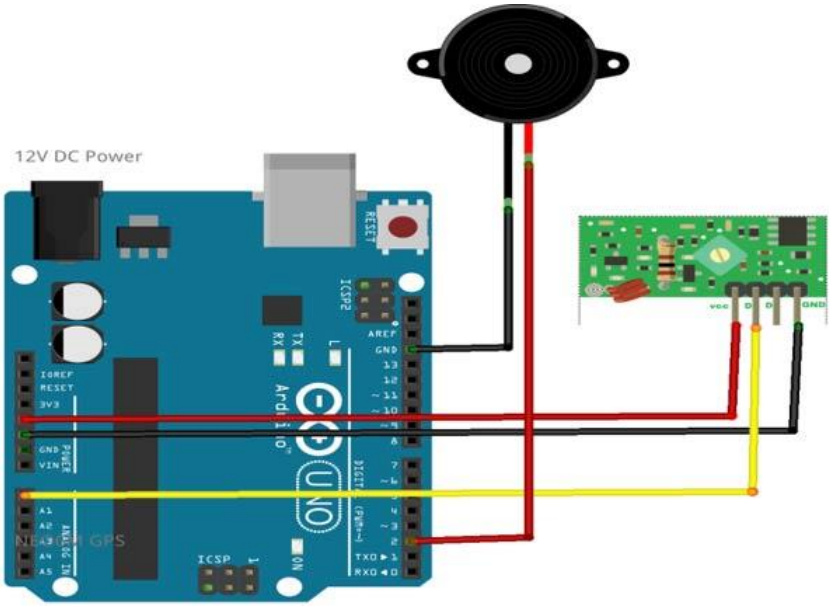
Software components :-

- **Arduino IDE**
- **TinkerCad**
- **Fritzer**

Transmitter Side



Receiver Side



TinkerCad