AutoAssist: Smart IoT-Based Fence Alert System

Name:-G.Mahendra
Email:-2303a51la9@sru.edu.in

Name:-M.Akhil
Email:-2303a51l38@sru.edu.in

Name:-G.Maruthi
Email:- 2303a51l98@sru.edu.in

Name:-D.Abhiram
Email:-2303a51l65@sru.edu.in

Name:-M.Anil
Email:-2303a51la1@sru.edu.in

Department of Computer Science and Engineering,
SR University

Introduction

The Smart Fence Alert System is a microcontroller-based security mechanism designed to monitor and protect perimeters or restricted areas. This system uses a combination of sensors and actuators to detect unauthorized access and instantly trigger alerts through visual, audio, and vibration signals. It is ideal for securing borders, agricultural lands, and sensitive zones. The core objective is to detect any movement or intrusion and alert the concerned authority in real time, ensuring proactive safety measures.

Literature Review

Various sensor-based fence alert systems have been proposed over the years. Traditional systems relied heavily on manual surveillance or simple tripwires, which were inefficient and unreliable. Recent advancements have introduced automation using microcontrollers and sensors. Projects utilizing PIR and ultrasonic sensors have demonstrated effective motion and distance-based detection. However, integration with additional components like buzzers, relays, and vibrating motors enhances the system's alert mechanism. The use of Arduino microcontrollers simplifies development and deployment due to its open-source nature and vast community support.

Materials and Methods

Materials:

The hardware setup of the project includes a **microcontroller (Arduino UNO)**, which acts as the processing hub for all connected components. An **ultrasonic sensor** measures the distance of objects from the fence to detect proximity or climbing attempts. A **PIR (Passive Infrared) sensor** detects motion caused by humans or animals near the fence.
To notify about intrusions:
• A **buzzer** is used for audible alerts.
• An **LED** provides visual signals.
• A **vibrating motor** generates tactile feedback (ideal for wearable or portable alert systems).
• An **LCD display** is used to show real-time status and messages.
• A **relay module** can be used to control external high-power devices like floodlights or sirens.
The entire system is powered using a battery or adapter, mounted on a **breadboard**, and interconnected using jumper wires and resistors.

Components of a Smart Fence Alert System
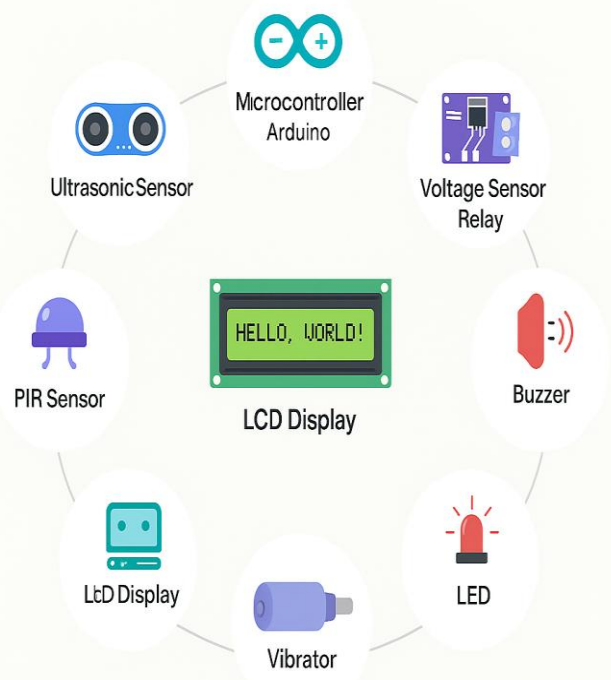
Methods :

Methodology / Working Process
Initialization and Setup:
The Arduino is programmed to constantly monitor inputs from the PIR and ultrasonic sensors.The LCD is initialized to display system status.
Intrusion Detection:
If the ultrasonic sensor detects an object approaching within a critical range (e.g., less than 100 cm), the system recognizes it as a potential threat.Simultaneously, if the PIR sensor detects motion, the system confirms an intrusion.
**Alert Activation:**
The buzzer sounds an alarm.The LED flashes continuously.The vibration motor activates for portable/wearable alerts.The LCD displays a message such as "Intrusion Detected!"
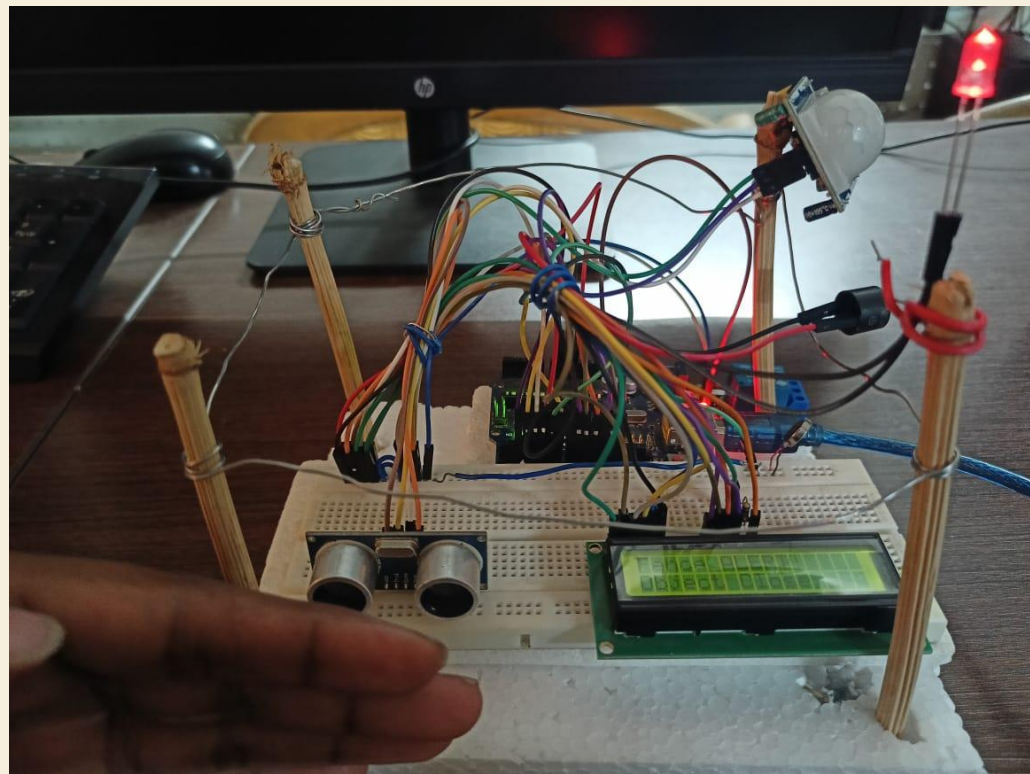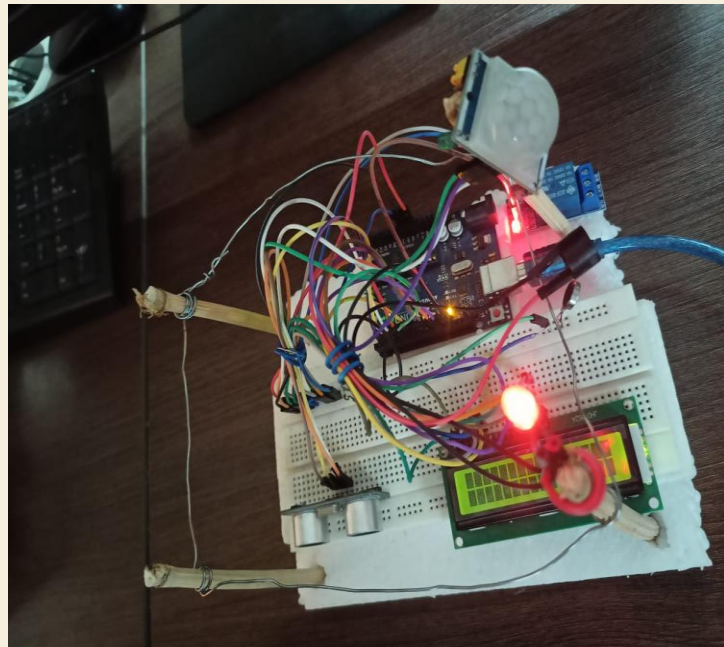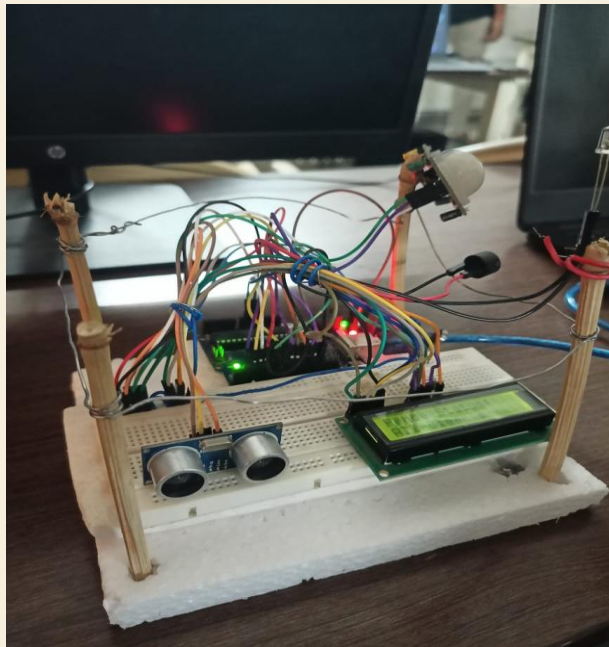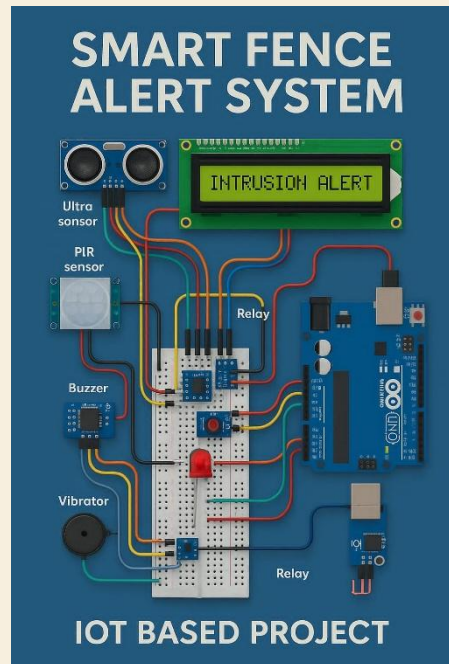**Control Action:**
If connected, a relay module triggers an external security device such as a spotlight or GSM module for message alerts.
Reset and Monitoring:
After alerting, the system continues to monitor for further activity or automatically resets after a time delay.
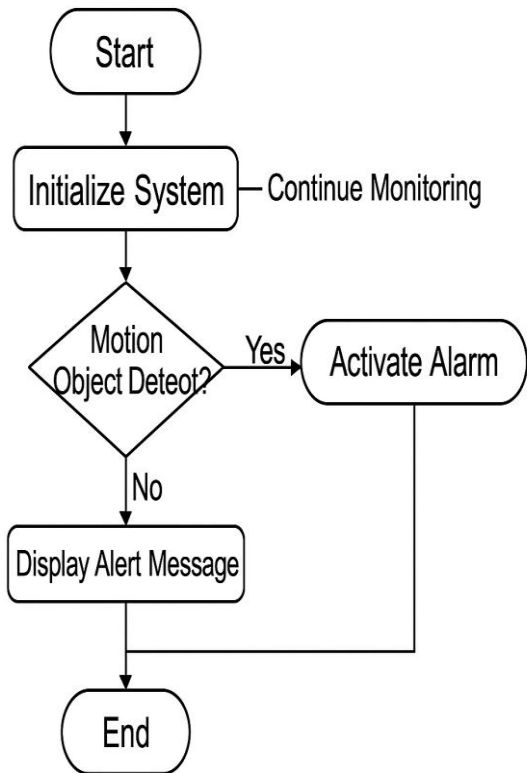
Results

Conclusion

The Smart Fence Alert System offers an effective and low-cost solution for perimeter security using accessible and widely available electronic components. The integration of multiple alert mechanisms ensures that intrusions do not go unnoticed, enhancing overall safety. The project demonstrates the practical use of sensors and microcontrollers in developing real-world security solutions.

References

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