Animal Intrusion Device Using Arduino Nano

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Abstract- *Despite advances in technology, the field of animal incursion detection has frequently been neglected and understudied. This is an important issue, particularly in rural and agricultural regions where animal invasion may cause considerable crop damage, financial loss, and pose risks to both humans and wildlife. To close this gap, we offer a sensor-based method that tracks animal ingress onto human-occupied or agricultural land, giving a real-time solution for identifying possible invasions. This project uses an ARDUINO UNO microcontroller as the central processing unit, as well as a variety of necessary components such as a GSM (Global System for Mobile Communications) module, a buzzer, and a PIR (Passive Infrared) sensor to detect movement. The PIR sensor detects animal movements within its range of vision, and the Arduino analyzes the sensor data. When the system detects the presence of an animal, it activates the GSM module, which is set to send SMS messages with particular information about the movements location. This real-time notice is transmitted to both law enforcement officers and the farm owner, giving them with quick information about the incursion and allowing them to take appropriate measures to limit harm. In this arrangement, the buzzer acts as a local alarm system, perhaps driving away smaller animals while also notifying surrounding humans. This setup's simplicity makes it a low-cost, scalable alternative for farmers who may not have access to more advanced monitoring systems. Overall, this project aims to create a system that actively monitors agricultural fields for any animal invasions. The Arduino Nano detects motion using the PIR sensor and analyzes the data, ensuring that notifications are transmitted to the appropriate parties as soon as possible using the GSM module. This strategy not only improves the safety and security of agricultural areas, but also promotes greater human-animal cooperation by avoiding future confrontations.*

Keywords- Animal Intrusion, Arduino Nano, PIR Sensor, GSM Module, Real-Time Monitoring, Crop Protection.

I. INTRODUCTION

In the modern era, technological advancements have transformed various sectors, yet critical issues like animal intrusions in rural and agricultural areas remain unaddressed. These invasions threaten crop yields, cause financial losses, and risk human-wildlife conflicts, undermining coexistence efforts. Rural farmlands, often near natural habitats, are particularly vulnerable, with small-scale farmers bearing the brunt of these losses. Balancing crop protection and wildlife conservation requires affordable, non-invasive solutions. To address this, we propose a low-cost, sensor-based animal intrusion detection system using an Arduino Nano microcontroller, paired with a PIR sensor, GSM module, and buzzer. The PIR sensor detects animal movement, triggering the Arduino to activate the GSM module, which sends real-time SMS alerts to farmers and authorities. Additionally, a buzzer acts as a local deterrent, scaring smaller animals and alerting nearby humans. This system is simple, scalable, and cost-effective, making it accessible to farmers with limited resources. By providing early warnings, it helps prevent crop damage, reduces financial losses, and promotes non-lethal human-wildlife coexistence. Combining real-time monitoring with local alerts, this solution enhances agricultural security while supporting sustainable practices and wildlife conservation.

II. LITERATURE SURVERY

1. Manabu Ishihara, Makoto Shiina and Shin-nosuke Suzuki. Evaluation of Method of Measuring Distance Between Object and Walls using Ultrasonic Sensors: This paper presents an ultrasonic wave sensor system for robots moving parallel to walls. Operating at 40 kHz, the system uses a PIC computer to process sensor data, displayed on an LCD. Designed for moving environments, the architecture is simple and suitable for positioning control studies. Built with affordable components, testing confirmed its effectiveness in robotic applications.
2. Santhiya, Dhamodharan, Kavi Priya, Santhosh, Surekha. A Smart Farmland Using Raspberry PI Crop Prevention and Animal Intrusion Detection System: This project uses a Raspberry Pi to protect farmland from animals like wild boars, elephants, and monkeys. It employs RFID modules and GSM modems to detect animals via RFID tags under their skin. Upon detection, the system sends SMS alerts to farmers and forest officers, emits irritating sounds, and generates smoke using a fog machine to repel animals back to the forest. This practical solution improves on current methods by combining detection, repellent actions, and real-time notifications.

3. Baharuddin Mustapha, Aladin Zayegh, Rezaul K. Begg. Ultrasonic and Infrared Sensors Performance in a Wireless Obstacle Detection System: This project develops an obstacle detection system using ultrasonic (US) and infrared (IR) sensors for elderly individuals and those with vision impairments. The prototype detects obstacles with 95% to 99% accuracy when sensors are properly calibrated and output is linearized. It effectively identifies obstacles of various materials (wood, plastic, mirror, plywood, concrete) and colors, with a minimum detectable size of 5 cm x 5 cm.
4. Sakthivel, Kannan, Pradeep. Savings of Crops from Wild Animals Solar Operated Mechatronics Embedded System: Agriculture is vital for food and raw materials, but wild animal intrusions cause significant crop damage. Traditional human surveillance is impractical for continuous monitoring. This project proposes an animal detection system powered by a Torque motor using solar energy due to limited electricity. When a PIR sensor detects animals, a high-frequency buzzer is activated to scare them away, offering a fencing-free solution to protect crops.
5. Jeevitha, Venkatesh Kumar. A Review of Animal Intrusion Detection System: This paragraph discusses using image processing and IoT sensors to tackle human-animal conflicts in agricultural and forest areas. A proposed animal incursion alarm system detects animal movements via wireless sensors, captures images, and classifies them using image processing algorithms. The GSM module sends SMS alerts with photos to landowners and officials, enabling timely responses. The survey explores methods and configurations to protect human life from animal intrusions.

III. AIM AND OBJECT

Aim: Our aim is to identify animals entering the field and send an alarm message to the farm's owner. Unlike many existing systems, our suggested method is scalable, cost-effective, and widely available.

Object:

1. **To Prevent Harm:** Protect Structures, Crops and Cattle Against animal destruction.
2. **To Prevent Undesired Behavior:** Discourage animals from digging, scratching or nibbling on property.
3. **To Promote Coexistence:** Encourage peaceful relationships between people and nature.
4. **To Preserve Ecosystems:** Protect Wildlife, reduce the number of invasion and disruption.

IV. PROPOSED METHOD

TECHNIQUE: Arduino Nano.

METHOD: Buzz and Alarm along with that a message will be sent to the consent mobile.

SYSTEM APPROACH: The study presents a sensor-based method for detecting animal incursions on agricultural land, a crucial issue in rural and agricultural areas. The system uses an ARDUINO NANO microcontroller, a GSM module, a buzzer, and a PIR sensor to detect movement. The GSM module sends SMS messages to law enforcement officers and farm owners, providing real-time information about the animal's presence. The buzzer acts as a local alarm system, potentially driving away smaller animals and notifying surrounding humans. This low-cost, scalable solution is ideal for farmers without access to advanced monitoring systems. The project aims to actively monitor agricultural fields for animal invasions, improving safety and security while promoting human-animal cooperation. The system's simplicity makes it a low-cost, scalable alternative for farmers without access to advanced monitoring systems.

ADVANTAGES: Easy to use, Reduce the Human efforts, Ensure protection of farmland, It acts as a plant defender.

V. BLOCK DIAGRAM FOR HARDWARE EXECUTION

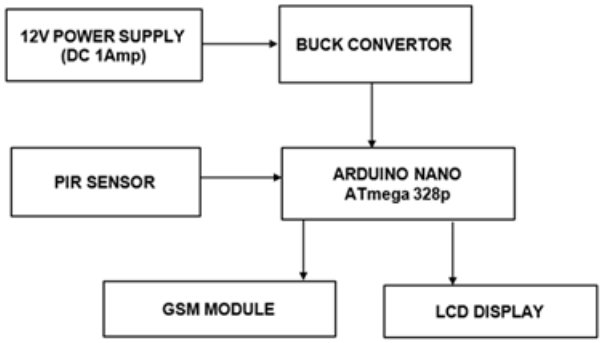

Fig: 1.1 Schematic Representation of Hardware execution

The hardware setup (fig: 1.1) uses a 12V DC power source, which is stepped down to 5V or 7-12V using a buck converter to safely power the Arduino Nano and other components. The Arduino Nano, controlled by the ATmega328p microprocessor, processes signal from the PIR sensor, which detects motion via infrared radiation changes. Upon detecting motion, the Arduino triggers the GSM module to send SMS alerts and updates the LCD display with messages like "Motion Detected" or system

status. The GSM module enables SMS and call functionality, while the LCD provides real-time visual feedback.

VI. CIRCUIT DIAGRAM

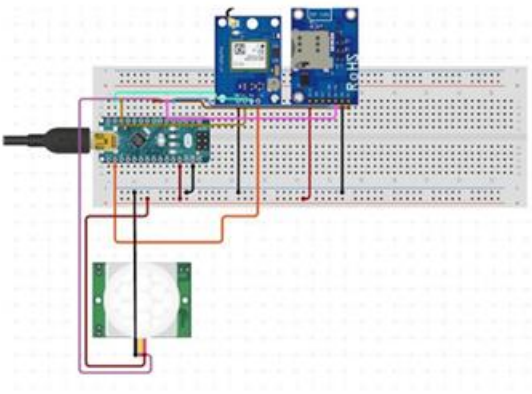

Fig: 1.2 Circuit Diagram of Hardware

VII. RESULT

Fig: 1.3 Representation of Animal Intrusion Device execution

VIII. CONCULSION

A sensor-based animal intrusion detection system is proposed to tackle wildlife invasions in agricultural fields. Using an Arduino NANO, PIR sensors, GSM module, and buzzer, it detects animal movement in real-time, sends SMS alerts to farm owners, and activates a buzzer to deter animals. This cost-effective, scalable solution reduces human-wildlife conflict, promotes coexistence, and supports sustainable farming by providing early warnings. Key goals include protecting crops, livestock, and property, minimizing accidents, preserving ecosystems, and fostering harmony between humans and wildlife.

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