

# Intrusion Detection System for Agriculture

*Jadisisindri<sup>1</sup>, P. Rajkumar<sup>2</sup>, Dr. T. John Peter<sup>3</sup>*

*Department of Computer Science and Engineering,  
Vaagdevi College of Engineering*

## ABSTRACT

Agriculture remains a cornerstone of India's economy, vital for sustenance and economic prosperity. Despite technological advancements, traditional methods like scarecrows are still employed to deter animals from damaging crops. However, such methods have limitations, prompting the need for enhanced agricultural security. This paper introduces an Intrusion Detection System for Agriculture (IDSA) designed to detect intruders, monitor suspicious activity, and notify farm owners promptly. Utilizing Raspberry Pi technology, IDSA employs motion sensors in agricultural fields to detect intruders, triggering alarms and capturing images sent directly to the owner via the Telegram app.

## I. INTRODUCTION

Agriculture remains a vital sector of India's economy, critical for both sustenance and economic prosperity. Despite technological advancements, traditional methods like scarecrows are still employed to deter animals from damaging crops. However, such methods have limitations, prompting the need for enhanced agricultural security. This paper proposes a system that detects intruders, monitors suspicious activity, and promptly notifies the system owner.

In today's era, the Internet of Things (IoT) plays a significant role in connecting physical devices and facilitating data transfer across networks. This project aims to protect crops and livestock by leveraging IoT technology. The system comprises various components, including a Raspberry Pi Model B3, Ultrasonic Sensor, Buzzer, Camera Module, and Telegram App for real-time notifications on Android devices.

## II. EXISTING SYSTEM

Currently, some farmers employ fences to protect crops from predators. However, this approach necessitates substantial investments in technology, electrical infrastructure, and regulatory permissions. Improper installation of electric fences can pose risks to animals and farmers, while constant electrification requires significant power consumption and ongoing maintenance, leading to crop losses and animal fatalities.

### Disadvantages of Current Method:

- Crop losses are incurred.
- Animals may suffer fatalities due to electrical currents.
- High power consumption is required for electric fencing.

### III. PROPOSED SYSTEM

The proposed system, IDSA (Intrusion Detection System for Agriculture), is designed to benefit farmers and protect animals. When an intruder enters the field, the device captures their image, providing evidence for the farmer to take appropriate action, such as filing a police report. Similarly, if animals intrude into the field, the farmer receives immediate alerts along with captured images, allowing them to take measures to prevent crop damage. By promptly addressing intrusions, the system minimizes crop losses and ensures the safety of both crops and animals.

#### Advantages of this System:

- Prevention of crop losses.
- Protection of animals from harm.
- Increased crop yield and profitability.
- Mitigation of risks to both animals and humans.
- Real-time notifications for the owner upon intrusion.
- Applicable for domestic use as well.
- 

### IV. REQUIREMENTS

#### HARDWARE TOOLS

- Ultrasonic Sensor
- Raspberry Pi 3 with Raspbian OS
- 5MP Camera Module
- Buzzer
- RAM: 2GB

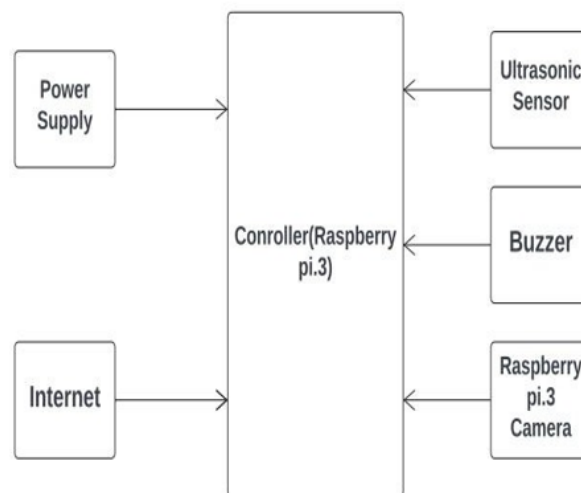


Figure.2.2.2:Block Diagram

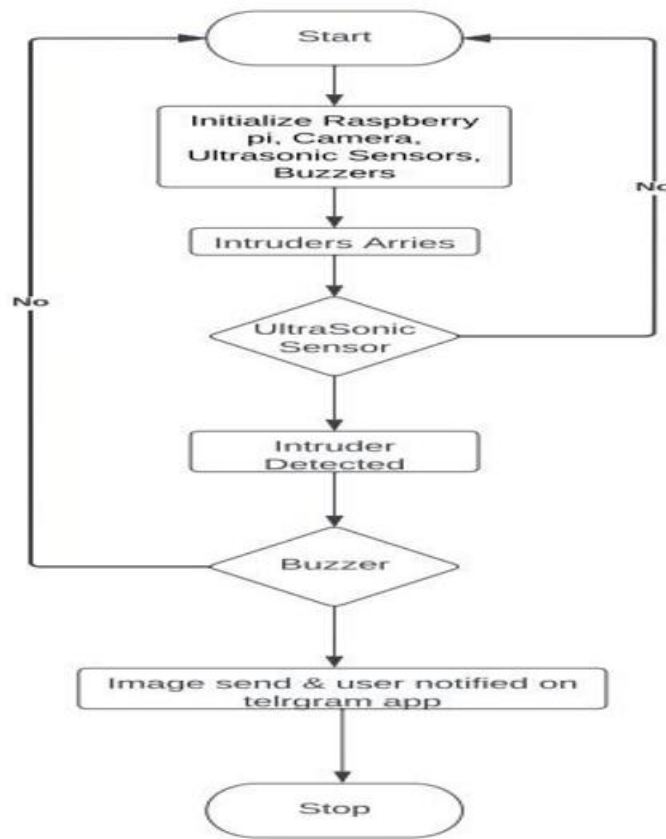


Figure.2.3.1: Flowchart

## V. IMPLEMENTATION

**RASPBERRY PI:** Raspberry Pi is a series of single-board computers developed by the Raspberry Pi Foundation with the aim of promoting computer science education and enabling easy access to computing. It has evolved since its inception in 2012, with the latest models featuring powerful quad-core CPUs and ample RAM. Raspberry Pi boards are known for their affordability, with prices typically under \$100, making them accessible for various projects and applications.

**ULTRASONIC SENSOR:** An ultrasonic motion detector is a device capable of sensing movement within a defined area by analyzing sound waves in its environment. These sensors can either listen for sounds or emit ultrasonic signals and analyze their reflections. They are commonly used in home security systems to trigger alarms or activate devices when motion is detected.

**BUZZERS:** Buzzers are commonly used in projects to produce simple audio alerts or alarms. They are audio signaling devices that emit distinctive sounds and are often used for user

feedback or alert notifications. In this project, a buzzer is employed to raise an alarm when an intrusion is detected in the agricultural field.

**TELEGRAM APP:** Telegram Messenger is a cloud-based instant messaging and voice over IP service that offers end-to-end encryption for secure communication. It can be installed on various platforms, including smartphones and computers. Telegram allows users to create bots that can interact with them through messages and commands. In this project, Raspberry Pi interacts with a Telegram bot to send notifications to the user's Telegram account whenever motion is detected in the agricultural field.

**Implementation Steps:**

1. Connect the Raspberry Pi to power and the internet.
2. Attach the ultrasonic sensor, camera, and buzzer to the Raspberry Pi.
3. Mount the Raspberry Pi on a pole in the agricultural field.
4. When an intrusion is detected, the motion sensor triggers the Raspberry Pi.
5. The camera captures an image of the intruder, and a notification is sent via the Telegram app.
6. The buzzer raises an alarm to alert nearby individuals of the intrusion.



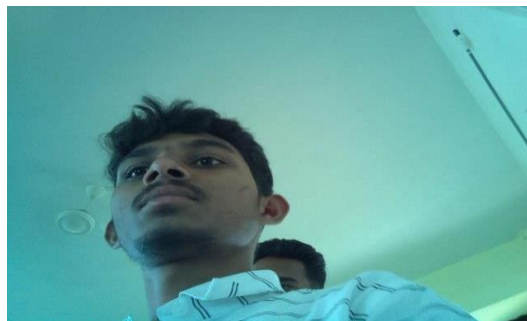
**Figure 5.1:** Instrument placed in the field

Some sample images of intruders detected and send to telegram.



- When an intruder enters the field, the device captures an image and activates a buzzer alarm.
- The buzzer alarm serves as a deterrent, signaling to intruders that they have been detected and encouraging them to leave the field.
- Simultaneously, the captured images are sent to the Telegram app for further review and monitoring.

In addition to its application in agricultural security, this system can also be utilized for Smart Door Security Systems. Below are some images showcasing the Smart Door Security System:



## VI. Conclusion

The issue of crop damage caused by wild animals and theft by intruders is a significant challenge for farmers, requiring urgent attention and effective solutions. This project addresses this pressing problem by offering a practical and efficient solution. The proposed system, based

on Raspberry Pi technology, is compact, user-friendly, and less complex, making it readily deployable for various agricultural settings. By automating tedious and repetitive tasks, this system enhances agricultural security without causing harm to animals.

Farmers face difficulties in guarding their fields round the clock, making them vulnerable to crop damage and theft. The Intrusion Detection System for Agriculture (IDSA) device provides a crucial solution by automatically detecting any movement in the field and triggering alarms, alerting farmers to potential threats. The captured images further aid in identifying intruders and taking necessary actions. Thus, IDSA proves to be an invaluable tool for farmers in safeguarding their livelihoods.

## **VII. Future Scope**

Looking ahead, there are several avenues for future development and enhancement of this system. Leveraging advancements in artificial intelligence (AI), there is potential to identify the type of animal detected, allowing for more targeted and efficient response strategies. Additionally, ongoing efforts involve optimizing the system for solar power operation, reducing dependency on conventional energy sources. Further research is also underway to integrate fire detection capabilities into the system to protect farms from wildfires. Moreover, exploring GPS-based animal tracking functionalities holds promise for enhancing the system's ability to monitor and manage wildlife interactions effectively. These future advancements aim to strengthen agricultural security and resilience, empowering farmers to mitigate risks and optimize productivity.

## **REFERENCES**

1. Raspberry Pi Foundation. (n.d.). Getting Started with Picamera. Retrieved from <https://projects.raspberrypi.org/en/projects/getting-started-with-picamera>
2. Raspberry Pi Foundation. (n.d.). Physical Computing with Python. Retrieved from <https://projects.raspberrypi.org/en/projects/physical-computing/8>
3. Raspberry Pi Foundation. (n.d.). Projects. Retrieved from <https://projects.raspberrypi.org/en/projects>
4. Yadahalli, S., Parmar, A., & Deshpande, A. (2020). Smart Intrusion Detection System for Crop Protection by using Arduino. In 2020 Second International Conference on Inventive Research in Computing Applications (ICIRCA) (pp. 405-408). doi:10.1109/ICIRCA48905.2020.9182868.
5. Dhake, P. S., & Borde, S. S. (2014). Embedded surveillance system using PIR sensor. International Journal of Advanced Technology in Engineering and Science, 2.
6. Vigneshwar, R., & Maheswari, R. (2016). Development of embedded based system to monitor elephant intrusion in forest border areas using internet of things. International Journal of Engineering Research, 5(7), 594–598.