



# INTRUSION DETECTION AND REPELLENT SYSTEM FOR WILD ANIMALS USING ARTIFICIAL INTELLIGENCE OF THINGS

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**Abstract:** In agricultural regions, Animals intrusion into crop fields poses a significant threat to food security and farmers livelihoods. Traditional methods of deterring animals are often labor intensive, ineffective over long periods, or harmful to the animals and environment. This project proposes a smart, humane, and efficient solution to mitigate the problem using cutting-edge technology. we aim to develop an automated system that utilizes the YOLO v5 algorithm for real time animal detection, enabling immediate action through non-lethal repellent measures. upon detection, the system will notify farmers via mobile notifications and activate a series of deterrents: LED lights, auditory warnings, and physical movements, all designed to safely scare away the intruders without causing them harm.

**IndexTerms** - Arduino Uno, PC/Laptop with AI code, Mp3 player, speaker, servomotor, RGB LED's.

## I. INTRODUCTION

In agricultural sectors worldwide, the incursion of animals into crop fields is a pervasive issue that results in significant yield losses, affecting farmers productivity and livelihoods. Traditional deterrent methods, such as physical barriers, chemical repellents, and human scare tactics, are either partially effective, labour-intensive, environmentally unfriendly, or inhumane to the wildlife [1,2]. Moreover, these methods don't provide a sustainable solution to the problem, often resulting in harm to the animals or adverse ecological impacts. The challenge lies in devising an efficient, humane, and technologically advanced system that can detect animal intrusions in real time and initiate immediate, non-lethal counter measures to deter these animals effectively. In recent times Human-wildlife conflicts have escalated due to expanding human settlements encroaching on natural habitats.[3] These conflicts pose risk to both humans and wildlife, leading to fields damage, livestock loss, and human injuries. Traditional methods of wildlife management and deterrents have proven ineffective and sometimes harmful to animals [4]. However, with advancements in technology, particularly in Artificial Intelligence of things (AIOT), there is an opportunity to revolutionize wild life intrusion detection and repellent systems.[5] The integration of artificial intelligence of things in wildlife management offers a solution by providing real-time monitoring, analysis, and response capabilities.

This system leverages a network of Interconnected devices equipped with cameras and mp3 players and speakers deployed strategically in wildlife prone areas. These devices collect vast amounts of data, which are processed and analysed by AI YOLO v5 algorithm to accurately detect wildlife intrusions. So, by using YOLO v5 algorithm is mainly used for real-time monitoring the animals. YOLO v5 (you only look once version 5) algorithm. So, these are used for the detection of the animals.

## II. OBJECTIVES

In this project, we detect the animals by using YOLO v5 algorithm and will notify farmers via mobile notifications and activate a series of deterrents. The equipment's provide LED lights, camera, auditory warnings, and physical movements. This equipment's are mainly used to designed to safely scare away the intruders without causing them harm. The main objective of this project is to detect the animals and farmers doesn't loss their crops and don't harm the animals.

## III. PROPOSED SYSTEM

The proposed system for the Intrusion detection and repellent system for wild animals using Artificial intelligence of things and its several key features are:

**a) Real-time Animal Detection:**

Utilizes the YOLO v5 (You only look once version 5) algorithm for real-time detection of animals entering the crop-field. This deep learning model is known for its speed and accuracy in object detection tasks. The system can differentiate between various types of animals, allowing for species-specific deterrent strategies.

**b) Automated Repellent activation:**

Upon detection of an animal, the system automatically activates non-lethal deterrent mechanisms such as: LED lights to startle and deter nocturnal animals.

- Playing predator or distress sounds to scare away intruders.
- Movement generated by servomotors to mimic human activity or create unsettling motion for the animals.

**c) Customizable Deterrent strategies:**

Farmers can customize the repellent strategies based on the type of animals frequently encroaching the fields and the crop being protected. The system allows for adjustments in the deterrent mechanisms to prevent animals from becoming habituated.

**d) Minimal Environmental impact:**

The deterrents are designed to be non-lethal and environmentally friendly, reducing the need for chemical repellents or physical barriers that could harm the ecosystem.

The system aims to maintain ecological balance by deterring animals without causing harm.

**e) Remote monitoring and control:**

Integration with IOT (Internet of Things) for remote monitoring and control. Farmers can receive notifications on their mobile devices about intrusion events and the status.

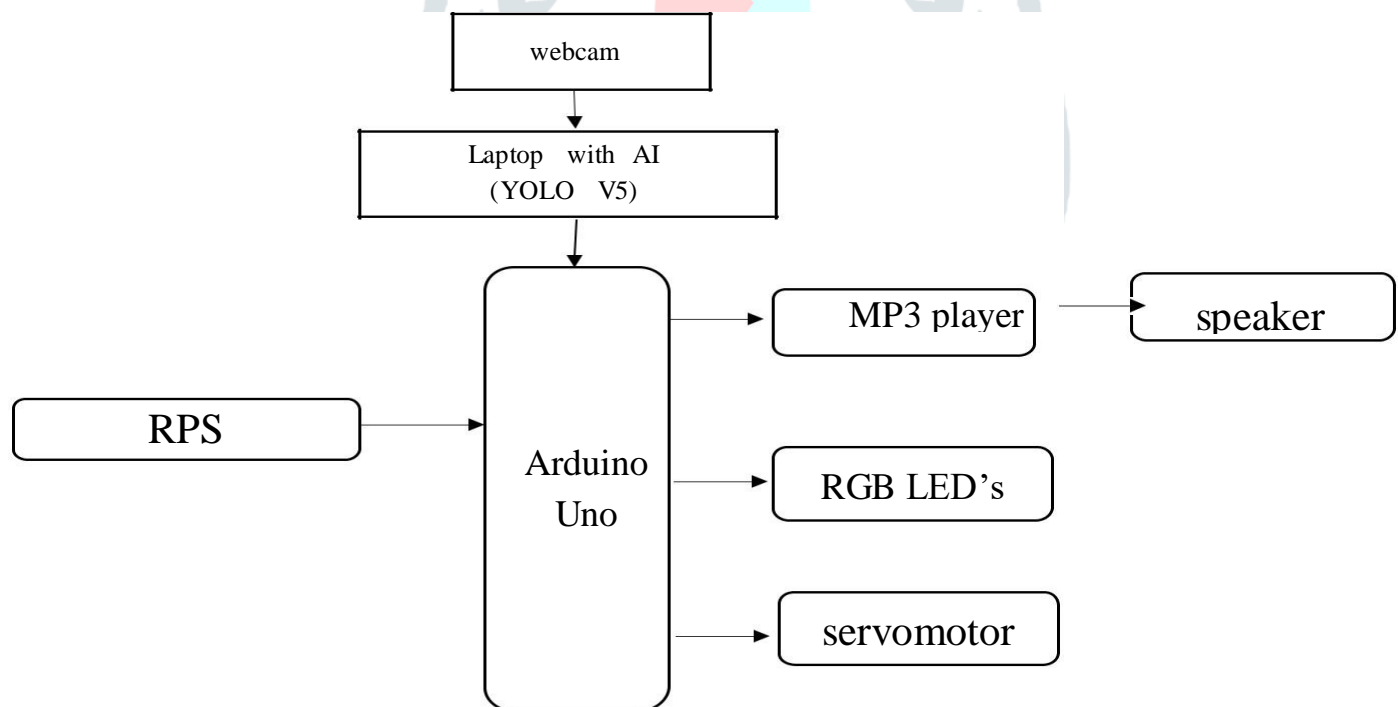
**IV. BLOCK DIAGRAM**

Fig 4.1: Block Diagram

**V. COMPONENTS DECSRIPTION****a) Arduino Uno:**

The Arduino Uno can be utilized in an intrusion detection and repellent system for wild animals by integrating it with sensors such as motion detectors or infrared sensors to detect the presence of animals. These sensors can trigger actions such as activating repellent devices or sending alerts. This integration of artificial intelligence algorithm allows for smarter decision making based on the sensor data, enabling the system to differentiate between harmless movements and potential threats. This enhances the systems efficiency in

repelling animals while minimizing the alarms. In such a system, the Arduino Uno serves as the central control unit, receiving input from Algorithms.



Figure 2. Arduino Uno

can be trained to analyse sensor data patterns, distinguishing between typical animal behavior and potential threats. When a threat is detected, the Arduino triggers appropriate repellent mechanisms, such as sound emitters, lights, physical movements etc. Additionally, the system can be configured to send notifications or alerts to users via SMS or through a mobile app, providing real-time updates on intrusions and system status. Overall, the Arduino Uno, combined with AI algorithms, enhances the effectiveness and responsiveness of wildlife intrusion detection and repellent systems, offering a non-invasive and eco-friendly approach to wildlife management.

**b) Regulated power supply (RPS):**

Intrusion detection and repellent systems for wild animals often rely on regulated power supplies to ensure consistent and reliable operation. These power supplies help maintain stable voltage levels, crucial for powering various components such as sensors, cameras, actuators, and microcontrollers, which are essential for the functioning of the AI-driven system. By regulating power, fluctuations and voltage spikes are minimized, ensuring optimal performance and longevity of the system, thereby enhancing its effectiveness in detecting and repelling wild animals through AI-driven algorithms and IOT connectivity.

**c) YOLO v5 Algorithm:**

The usage of the YOLO v5 algorithm in intrusion detection and repellent system for wild animals using Artificial Intelligence of Things (AIOT) primarily revolves around its ability to provide real time object detection and classification. YOLO (You look only once) v5 is known for its fast and accurate object detection capabilities, making it suitable for identifying animals or intruders in outdoor environments. By developing YOLO v5 on AIOT devices such as cameras or sensors, the system can quickly detect the presence of animals or intruders and trigger appropriate responses, such as activating repellent mechanisms or sending alerts to human operators. This integration enables efficient and proactive management of wildlife-human conflicts while minimizing the alarms and response times.

**d) Servo motor:**

A servo motor can be utilized in an intrusion detection and repellent system for wild animals by controlling the movements of deterrent devices such as sound emitters, lights, or physical barriers. Artificial intelligence (AI) algorithms can analyse sensor data to detect the presence of animals and trigger the servo motor to actuate the deterrent mechanism accordingly.

For example, if an AI algorithm detects movement indicating the presence of a wild animal, it can send a signal to the servomotor to activate a deterrent, such as flashing lights or emitting a loud noise, to scare away the animal. This integration of servo motors with AI technology enables a responsive and effective deterrent system for wild life intrusion.

**e) WEB-CAM:**

webcams in intrusion detection and repellent systems for wild animals leverage Artificial intelligence of Things (AIOT) to enhance monitoring and protection efforts in key ways. Firstly, webcams equipped with AI algorithms can accurately detect and classify animal intrusions in real-time, distinguishing between harmless wildlife and potential threats. This capability enables timely responses, such as activating repellent mechanisms or alerting personal to intervene.

Additionally, by integrating AIOT, these systems can adapt and learn from patterns of animal behaviour, improving their efficiency and reducing false alarms.

This integration of Webcams and AIOT empower wildlife conservation efforts by providing effective and non-invasive methods for mitigating human-animal conflicts while minimizing disruptions to natural ecosystems.

**f) MP3 Player:**

using MP3 player, in an intrusion detection and repellent system for wild animals, powered by Artificial intelligence of Things (AIOT), involves leveraging sound to deter animals from entering restricted areas. The MP3 player can be programmed to emit specific sounds or patterns recognized to repel certain animals, such as predator calls or loud noises that mimic natural threats.

AI algorithms can analyse real-time data from sensors like motion detectors or cameras to identify animal presence, triggering the MP3 player to emit deterrent sounds accordingly. This integration of AIOT enables a proactive approach to wildlife management by automatically responding to intrusions, minimizing human intervention and potential conflicts between wildlife and human activities.

It provides different types of sounds to scare away the animals. By providing this sounds the animals will scare and will go back. In this way the animals will not get any harm by the intruders. So, in this way MP3 player is mostly used.

**g) RGB LED's:**

RGB LED's can be utilized in intrusion detection and repellent systems for wild animals by leveraging Artificial intelligence of Things (AIOT) in several crucial ways. Firstly, RGB LED's can serve as visual deterrents, emitting bright, flashing lights in response to detected intrusions, effectively startling and deterring animals from approaching further.

Additionally, RGB LED's can be integrated with AIOT algorithms to dynamically adjust their colours and intensity based on the type of animal detected, tailoring the repellent effect to specific species sensitivities. Moreover, RGB LED's can enhance the effectiveness of motion detection sensors by providing visual cues to security personnel or automated systems, facilitating rapid response to potential threats.

#### h) Speaker:

In AIOT technology can greatly enhance efficiency and accuracy. By utilizing sensors and cameras equipped with AI algorithms, such systems can detect the presence of animals in real-time and differentiate between harmless wildlife and potential threats.

The integration of speakers allows for immediate response mechanisms, such as emitting deterrent sounds or activating repellent measures, effectively deterring animals from approaching or entering restricted areas. This proactive approach not only mitigates potential damage caused by wildlife intrusion but also minimizes the risk of human-wildlife conflicts, prompting coexistence while ensuring the safety of both wildlife and human inhabitants.

## VI. FLOW CHART FOR PROPOSED SYSTEM

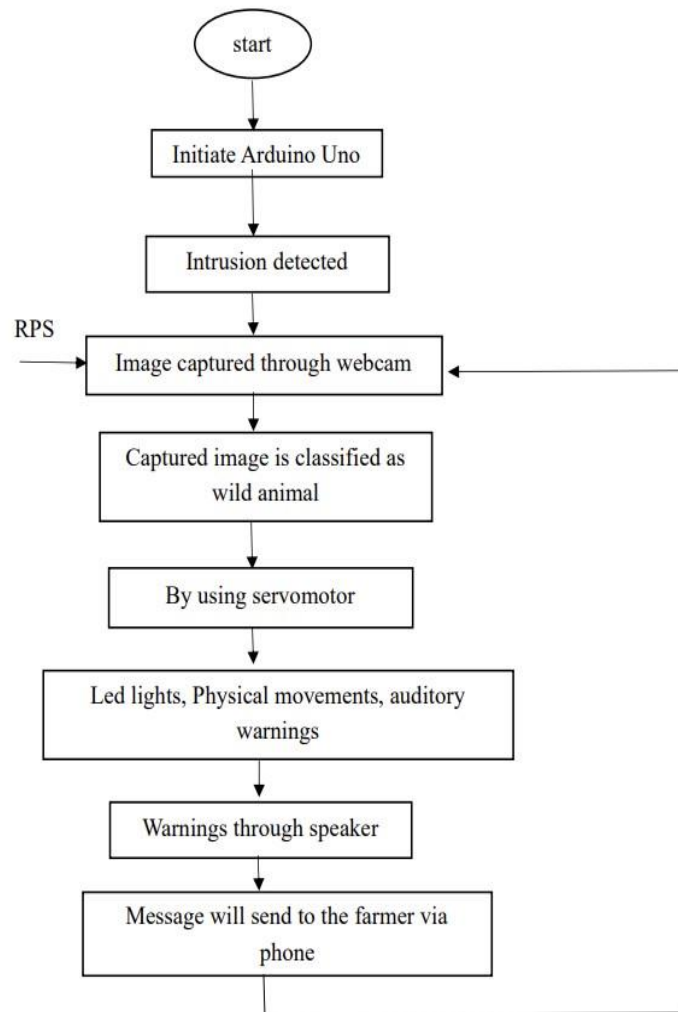
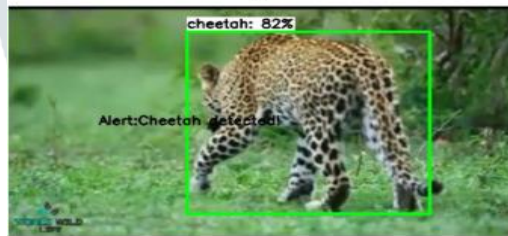
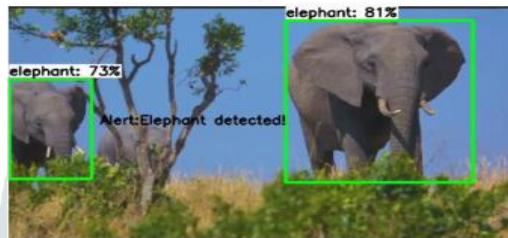


FIG 6: FLOW CHART FOR PROPOSED SYSTEM

## VII. RESULT

Intrusion Detection and repellent system for wild animals using artificial intelligence of things typically aim to detect and deter animals from entering certain areas. These systems often use sensors, cameras, and AI algorithms to detect animal presence and trigger deterrent mechanisms such as lights, sounds, physical movements etc.





## VIII. CONCLUSION

Implementing an intrusion detection and repellent system for wild animals using Artificial intelligence of things (AIOT) offers several advantages. Firstly, it enhances wildlife conservation efforts by minimizing human-wildlife conflicts and protecting both animals and human property. Secondly, it utilizes AI algorithms to analyse data from sensors, cameras, and other IOT devices, enabling real-time detection and response to animal intrusions. Additionally, such a system can be tailored to specific environments and species, optimizing its effectiveness.

Overall, combining AI and IOT technologies for wildlife management presents a promising solution for mitigating human-wildlife conflicts and promoting coexistence. Furthermore, the integration of AIOT in the intrusion detection and repellent system enables adaptive and learning capabilities. Through continuous monitoring and analysis of animal behaviour patterns, the system can evolve and improve its efficiency over time.

## IX. FUTURE SCOPE

Looking ahead, the future scope of this technology lies in further refining AI algorithms to enhance detection accuracy and minimize alarms. Additionally, integrating advanced sensors and actuators can improve the effectiveness of repellent measures while minimizing environmental impact. Collaborative efforts between researchers, wildlife conservationists, and technology developers will be crucial in realizing the full potential of AIOT-based systems for wildlife management and conservation.

## X. REFERENCES

The following are the references made during the development of this project work.

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