Innovative Approaches to Crop Protection: Integrating Wild Animal Detection Systems

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Abstract: ***One of the biggest problems facing farmers around the world is the growing risk of wild animals destroying crops. Crop protection techniques like hand patrols and fencing are expensive and ineffective. In order to detect wild animals in real time, this study proposes an AI and IoT-based crop protection system that uses motion-sensitive cameras and machine learning algorithms. While automated alarm systems notify farmers of possible dangers, Convolutional Neural Networks (CNN) are used for animal classification. The suggested methodology guarantees sustainable farming methods, lowers crop losses, and increases agricultural security.***

Keywords:ineffective,sensitive

INTRODUCTION

Agriculture plays a significant importance in India. To put it another way, farmers are the foundation of our nation. Over 50% of Indians rely on agriculture for their livelihood. However, the crops provide a number of challenges for Indian farmers. The purpose of the Crop Protection and Animal Intrusion Detection System is to safeguard crops and keep animals out of the fields. The goal is to protect fields from animals, capture rainwater, avoid crop damage from excessive rainfall and other extreme weather conditions, identify animal penetration, take appropriate action, and notify

LITERATURE SURVEY

In order to learn more about the current state of work in the field of embedded system design employing Internet of Things technology and related applications, the literature reviewed a number of research articles.

Bird intrusion detection using a wireless sensor and buzzer is part of the "Animal Intrusion Detection System Using Wireless Sensor Networks," which was proposed by Dr. P. Uma Maheshwari et al. However, this technique is limited in its applicability to other animals because it is exclusively used for birds. [5]

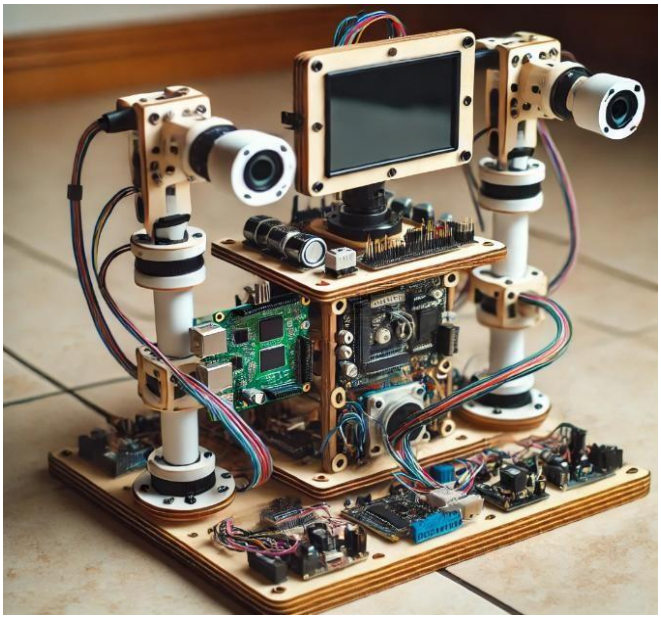
"Rain Sensor Automatically Controlled Drying Shed for Crop Yield Farms," a method proposed by P. Goutham Goud et al., uses a microcontroller unit, DC motor, and rain sensor to automatically safeguard crops. However, this approach does not allow for energy conservation. [2]

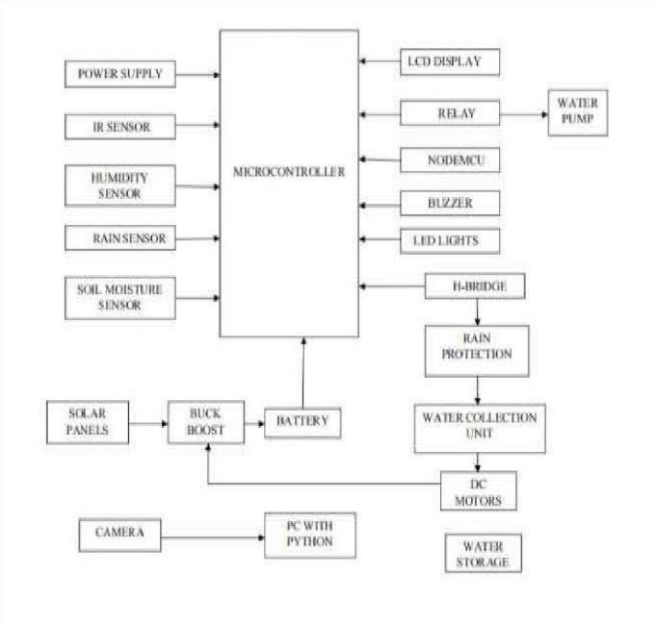
An "Automatic Tracking System" was introduced by Nirit Datta et al.

PROPOSED SYSTEM

The system consists of strategically positioned .motion-sensitive cameras and sensors that detect the presence of wild animals in farmlands. The main components include:

- AI-based Detection: CNN models trained on diverse animal datasets for classification.
- Real-time Monitoring: Live feeds from cameras processed using computer vision techniques.
- Alert Mechanism: Instant notifications sent to farmers via SMS or mobile applications.
- Automated Response System: Activation of deterrents such as ultrasonic sound emitters or flashing lights to ward off animals.





SYSTEM ARCHITECTURE

System Architecture The system follows a client-server model where AI-based image processing is performed on the server, and alerts are sent to registered farmers through a web or mobile interface. The data flow involves: Motion sensors detecting movement in the field. Cameras capturing images and sending them to an AI module. CNN processing and classifying the detected animal. If a threat is identified, an alert is sent to the farmer. Optional activation of deterrents based on predefined rules.

System Architecture The system architecture consists of three layers:

- Data Collection Layer: Sensors and cameras capture real-time data from the field.
- Processing Layer: A cloud-based AI model processes data and classifies threats.
- Response Layer: Actuators and deterrent mechanisms activate when an animal is detected.

METHODOLOGY

A database is created to store a collection of sample images. The program consists of key functions such as Index Image, Image Set, and Retrieve Image.

Image Set holds a collection of images.

Index Image is used to create an image search index, which aids in efficiently retrieving images.

Retrieve Image utilizes the indexed data to search for and fetch relevant images.

As part of a security system, IR sensors and a camera act as the first line of detection. When animal movement is detected by the sensor, it

triggers the camera to capture an image. This image is then sent to a PC, where it undergoes classification to identify the animal. The captured images are stored in the database for further analysis and retrieval .

OBJECTIVE

The objective of a journal on crop protection and wild animal detection is to explore innovative strategies and technologies that safeguard agricultural productivity from threats posed by pests and wildlife. It aims to highlight advancements in pest management, precision agriculture, sensor-based monitoring, and AI-driven animal detection systems. The journal seeks to bridge the gap between traditional farming practices and modern solutions, promoting sustainable and eco-friendly approaches to mitigate crop damage while ensuring coexistence with wildlife .

CONCLUSION

In conclusion, effective crop protection and wild animal detection are essential for ensuring agricultural sustainability and food security. By integrating advanced technologies such as AI, IoT, and sensor-based monitoring with traditional farming practices, farmers can minimize crop losses while promoting wildlife conservation. Sustainable and eco-friendly approaches not only enhance productivity but also support biodiversity. Incorporating real-time monitoring and automated response systems can further improve the efficiency of crop protection measures. Collaborative efforts between researchers, farmers, and policymakers are crucial to developing holistic strategies that balance agricultural needs with environmental conservation. Future advancements in machine learning and data analytics will continue to refine wild animal detection systems, making them more accurate, accessible, and adaptable to diverse farming environments worldwide.

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