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IoT Based Field Protection and Control System

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Abstract: *The IoT-based Agriculture Protection and Control System is an innovative solution designed to enhance the efficiency, productivity, and security of agricultural practices through the integration of Internet of Things (IoT) technology. This system employs a network of interconnected sensors, actuators, and communication devices to monitor and manage various environmental and crop conditions in real-time. By collecting data on soil moisture, temperature, humidity, light intensity, and other critical parameters, the system enables precise control of irrigation, fertilization, and pest management processes. Additionally, security sensors provide protection against unauthorized access and potential threats to the crops..*

Keywords: IoT, Node MCU, Infrared sensor, ESP32 cam, Motor, Buzzer, Relay

I. INTRODUCTION

Designing an IoT - based field protection and control system. Involves integrating various technologies and methodologies. optimize agricultural practices while ensuring efficient resource management and enhanced crop protection. An IoT-based field protection and control system leverages the Internet of Things (IoT) to enhance agricultural practices by integrating technology with traditional farming methods. These systems use sensors, microcontrollers, and communication modules to monitor and protect fields from various threats, such as wild animals, pests, or environmental changes.

For instance, sensors can detect motion, temperature, humidity, or soil moisture levels, providing real-time data to farmers. This data can trigger automated responses, such as activating alarms to deter animals, adjusting irrigation systems, or sending alerts to the farmer's device. By automating these processes, IoT-based systems improve efficiency, reduce manual labor, and minimize crop losses.

II. INTERNET OF THINGS (IOT)

"Today computers and, therefore, the Internet are almost wholly dependent on human beings for information. Nearly all of the roughly 50 petabytes (a petabyte is 1,024 terabytes) of data available on the Internet were first captured and created by human being by typing, pressing a record button, taking a digital picture, or scanning a bar code. Conventional diagrams of the Internet … leave out the most numerous and important routers of all - people. The problem is, people have limited time, attention and accuracy all of which means they are not very good at capturing data about things in the real world. And that's a big deal. We're physical, and so is our environment … You can't eat bits, burn them to stay warm or put them in your gas tank. Ideas and information are important, but things matter much more.

Yet today's information technology is so dependent on data originated by people that our computers know more about ideas than things. If we had computers that knew everything there was to know about things using data they gathered without any help from us we would be able to track and count everything, and greatly reduce waste, loss and cost. We would know when things needed replacing, repairing or recalling, and whether they were fresh or past their best. The Internet of Things has the potential to change the world, just as the Internet did. Maybe even more so".

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III. FIELD PROTECTION AND CONTROLLING

An IoT-based field protection and control system represents a cutting-edge approach to modern agricultural management and infrastructure security. By integrating Internet of Things (IoT) technology, this system enables real-time monitoring, data collection, and automation to enhance the efficiency and safety of fields. The primary objectives include protecting crops from pests and environmental hazards, optimizing resource usage, and ensuring the safety and security of agricultural fields and infrastructure.

This advanced system leverages sensors, actuators, and communication networks to provide farmers and field managers with actionable insights, enabling proactive decision-making and efficient control of field operations. Through the seamless integration of IoT technologies, the system aims to improve yield, reduce losses, and promote sustainable farming practices.

IV. EXISTING SYSTEM

Tamil Nadu reported a total of 7,562 incidents of crop-raiding by wild animals in the last three years. This was informed by Union Minister of Agriculture and Farmers Welfare Narendra Singh Tomar in the Lok Sabha. While Andhra Pradesh recorded 7,589 incidents, in which crops on 5,543 acres of land were damaged. October 01, 2021 11:02 pm IST – KOLLAM dappalayam, a forest-flanked hamlet in Aryankavu panchayat, has been seeing a sudden spike in the number of rogue elephants. They stray into the farms, households and even the nearby highway feting on crops and leaving a trail of destruction.

V. PROPOSED SYSTEM

To overcome all the problems faced by the farmers due to the animals, to protect agriculture lands and to make farmers to yield profits from various losses. we proposed latest IOT based technology project, which helps to detect the animals in the field and give current conditions to the farmers through their mobiles such that they can protect their fields.

Now a days most of the farmers use water from underground water resources and also water pumps that aim of the project is to turn ON and OFF water pump from anywhere using mobile phone.

VI. SOFTWARE EMPLOYED

The Arduino Integrated Development Environment (IDE) is a software platform designed for programming Arduino microcontroller boards. It provides a user-friendly interface that simplifies the process of writing, compiling, and uploading code to Arduino devices. The IDE is open-source and supports a wide range of Arduino boards, from the popular Arduino Uno to more advanced models like the Arduino Mega and Arduino Nano. Key features of the Arduino IDE include a text editor with syntax highlighting and auto-completion, making it accessible even to beginners in programming and electronics. Additionally, the IDE includes a library manager that allows users to easily install and manage libraries of pre-written code, enabling faster development of projects by leveraging existing functionalities such as sensors, communication protocols, and display drivers.

In addition to its basic functionality, the Arduino IDE supports debugging tools and serial monitor features that aid in troubleshooting and real-time communication between the Arduino board and a connected computer. This capability is crucial for monitoring sensor outputs, debugging code logic, and verifying system behaviour during development. Moreover, the Arduino IDE is platform-independent, compatible with Windows, macOS, and Linux operating systems, ensuring broad accessibility across different user environments. Overall, the Arduino IDE serves as a foundational tool for hobbyists, educators, and professionals alike, empowering them to create interactive and innovative projects using Arduino microcontrollers with ease and efficiency.

VII. RESULT AND DISCUSSION

This project consists of mainly two functions:

- protecting the field
- controlling the field

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When we switch ON the kit the wifi module will get connected and the Node MCU connectivity starts. Then LIR-sensor will gets active whenever the motion is detected by the ESP CAM the buzzer gets active and the alert message as a photo is sends to the telegram app.

When we pass a command as "/motor on" through the telegram app the motor gets started and the flow of water starts.

When we pass a command as "/motor off" through the telegram app the motor gets OFF

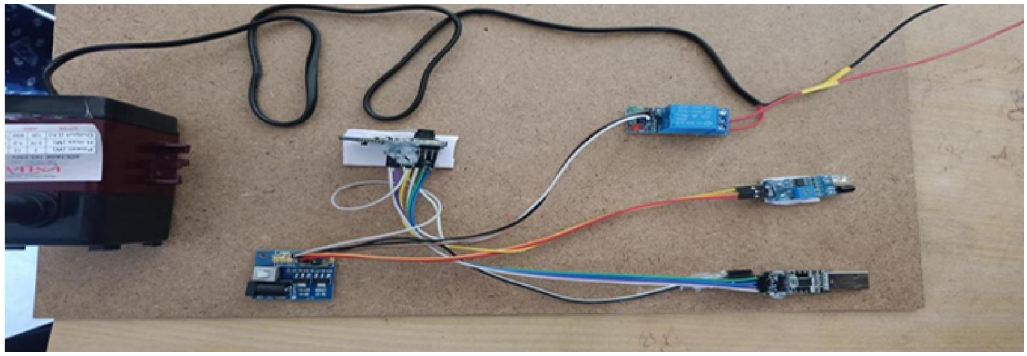

Figure 1: Circuit Board

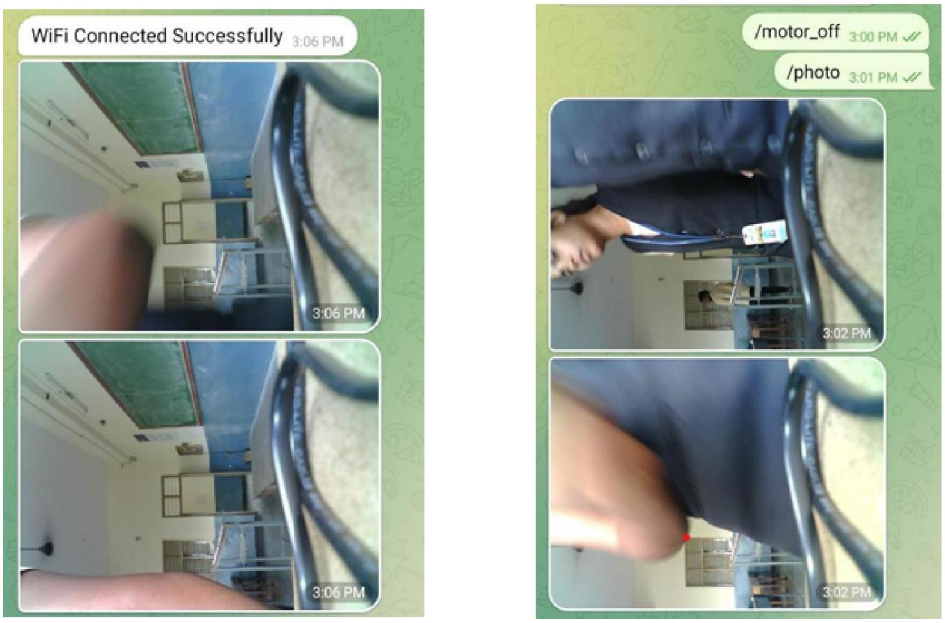

Figure 2: Result

VIII. CONCLUSION

IoT-based field protection and control systems represent a transformative leap in managing and safeguarding various sectors, from agriculture to industrial operations. By providing real-time monitoring, automated control, and detailed data analytics, these systems enhance operational efficiency, reduce costs, and improve safety. Despite these benefits, challenges such as cybersecurity threats and the need for robust infrastructure must be addressed to ensure reliable and secure system performance.

The IoT-based field protection and control system represents a significant advancement in agricultural and environmental management. By leveraging interconnected devices, sensors, and real-time data analytics, such systems enhance efficiency, and improve resource utilization. Moreover, they empower farmers and stakeholders with actionable insights, enabling better decision-making. Ultimately, the integration of IoT technologies into field

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protection systems marks a step forward toward sustainable and resilient agricultural practices that can address the growing demands of food production and environmental conservation.

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