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Using Wireless Sensor and Laser Technique to increase Production

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ABSTRACT- IoT, or the Internet of Things, refers to the network of physical objects, devices, vehicles, buildings, and other items that are embedded with sensors, software, and other technologies to collect and exchange data over the internet. These objects can communicate and interact with each other and with central systems, enabling them to gather and share information without requiring direct human involvement. We are focusing on the use of IoT Techniques for crop protection and crop productivity increase. As the world population is growing on, we should focus on use of IoT in field of agriculture. So that growing population food demand can be fulfilled. In the existing system, animals are raiding the crop field in a large scale. They destroy the crop field. Farmers are unable to guard the crop field day and night. They are using various fencing techniques to repel the animals away from the crop field. We are proposing a system that can detect the animal raiding by using ultrasonic sensor and LASER sensor to detect the invasion. And also increase the crop productivity by using soil nutrient sensors to properly monitor the soil nutrient level.

KEYWORDS- Internet of Things, Ultrasonic Sensor, LASER sensor, Crop Destruction, Agro-IoT Technique, Soil nutrient sensors.

I. INTRODUCTION

IoT, or the Internet of Things, refers to the network of physical objects, devices, vehicles, buildings, and other items that are embedded with sensors, software, and other technologies to collect and exchange data over the internet. These objects can communicate and interact with each other and with central systems, enabling them to gather and share information without requiring direct human involvement. The primary benefit of IoT lies in its ability to connect the physical world to the digital world, enabling smarter and more efficient operations across various industries. The Internet of Things (IoT) has the potential to revolutionize the agriculture industry by introducing a new level of precision, efficiency, and sustainability. IoT technologies can be applied to various aspects of agriculture, from crop management to livestock monitoring. Here are some key roles of IoT in agriculture. IoT sensors can be deployed in fields to monitor various parameters such as soil moisture, temperature, humidity, and nutrient levels[1]. This data can be collected in real-time and analyzed to optimize irrigation, fertilization, and other agronomic practices. Precision agriculture helps farmers make informed decisions, reduce resource wastage, and increase crop yields. IoT can be used for Livestock Monitoring[2]. IoT devices can be attached to animals to monitor their health, behavior and location. This enables farmers to identify signs of illness, track animals in real time, and implement more effective breeding and feeding strategies.

IoT-enabled irrigation systems can automatically adjust water usage based on real-time weather conditions, soil moisture levels, and crop needs[3]. This not only conserves water but also ensures that plants receive the right amount of hydration. Crop Health Monitoring: Drones and IoT sensors can be used to conduct aerial surveys of crops, identifying areas of stress or disease. This early detection allows farmers to target interventions and prevent the spread of pests and diseases.

By analyzing historical and real-time data from IoT sensors, predictive analytics models can help farmers anticipate issues such as disease outbreaks, pest infestations, and extreme weather events. This enables proactive decision-making to mitigate potential losses. IoT sensors can be integrated into storage facilities and transportation vehicles to monitor factors like temperature, humidity, and inventory levels. This ensures that produce remains in optimal condition throughout the supply chain[4].

Following are some more applications of IoT in various fields:-

A. Automated Equipment

IoT-enabled farm equipment, such as tractors and harvesters, can be programmed to operate autonomously based on predefined parameters. This leads to more efficient field operations and reduced labor costs.

B. Environmental Monitoring

IoT devices can monitor environmental conditions on the farm, helping farmers comply with regulations and sustainable farming practices. For example, monitoring soil runoff can prevent water pollution.

C. Market Insights

IoT data can be used to gather insights into consumer preferences and trends, aiding farmers in making informed

decisions about what crops to plant and how to market their products.

D. Rural Connectivity

IoT connectivity solutions can bring reliable internet access to rural areas, enabling farmers to access information, market prices, and educational resources[5].

E. Waste Reduction

IoT technologies can help reduce food waste by optimizing storage conditions and monitoring expiration dates, ensuring that food products are utilized efficiently.

Overall, IoT's integration into agriculture has the potential to enhance productivity, sustainability, and profitability while addressing the challenges of a growing global population and changing climate conditions. However, it's important to address issues related to data security, privacy, and the digital divide to ensure that all farmers can benefit from these advancements.

II. APPLICATION OF IOT IN VARIOUS FIELDS

The primary benefit of IoT lies in its ability to connect the physical world to the digital world, enabling smarter and more efficient operations across various industries. Some of the key benefits of IoT include:

A. Data Collection and Analysis

IoT devices can gather vast amounts of data from their surroundings, providing insights into various aspects such as consumer behavior, environmental conditions, machine performance, and more. This data can be analyzed to make informed decisions and improve processes[6].

B. Automation and Efficiency

IoT enables automation of tasks and processes, reducing the need for manual intervention. This can lead to increased efficiency, cost savings, and reduced human error.

C. Remote Monitoring and Control

IoT devices can be monitored and controlled remotely, allowing businesses and individuals to manage operations from anywhere. This is particularly valuable for managing complex systems, monitoring equipment health, and responding to emergencies.

D. Enhanced Customer Experience

IoT can enable personalized and context-aware experiences for consumers. For example, smart homes can adjust lighting and temperature preferences based on user behavior and retailers can offer personalized promotions based on real-time data.

E. Predictive Maintenance:

IoT sensors can monitor the health and performance of machines and equipment in real time. This data can be used to predict when maintenance is needed, preventing costly breakdowns and minimizing downtime.

F. Improved Healthcare:

In the healthcare sector, IoT devices can monitor patients' vital signs and transmit the data to medical professionals. This enables remote patient monitoring, quicker response to emergencies, and more effective healthcare management.

G. *Smart Cities*

IoT can contribute to the development of smart cities by optimizing traffic flow, managing energy consumption, improving waste management, and enhancing overall urban planning[7].

H. Environmental Monitoring

IoT sensors can monitor environmental factors such as air quality, water quality, and soil conditions. This information can be used to address pollution, conserve resources, and support sustainability efforts[8].

I. Supply Chain Optimization

IoT can provide real-time tracking and visibility into supply chains, helping businesses streamline logistics, reduce waste, and enhance transparency.

J. Safety and Security

IoT devices can be used to enhance safety and security in various contexts, such as monitoring industrial processes to prevent accidents or using smart surveillance systems for crime prevention.

While IoT offers numerous benefits, it also comes with challenges such as data privacy concerns, security vulnerabilities, and the need for standardized protocols to ensure interoperability among devices. As technology continues to advance, addressing these challenges will be crucial to fully realizing the potential of IoT across industries and everyday life.

III. EXISTING SYSTEM

In the existing system, animals are raiding the crop field in a large scale. They destroy the crop field. Farmers are unable to guard the crop field day and night. They are using various fencing techniques to repel the animals away from the crop field[9]. Those techniques are not very much effective in repelling them away.

IV. PROPOSED MODEL

Crops have been affected by a variety of indigenous animals, including buffalo, pigs, goats, birds, and fire. The existing system lacks any efficient crop protection measures[10]. Traditional agricultural methods including thread and stone, hell-kites, balloons, and firearms are also used by farmers. Typically, these techniques are brutal and ineffectual. The use of wireless sensor networks for agricultural activities has been explained in this work. These applications include solar power collecting in remote areas for use in agro-ecosystems and crop production protection against attacks by wild and domestic animals using IoT wireless sensor networks[11].

Here, we are proposing a system that can detect the animal raiding by using ultrasonic sensor and LASER sensor to detect the invasion. After detecting the animals, this technique will try to repel animals away from the crop fields[12]. This proposed model is designed to reduce the crop destruction thus insuring the productivity increase of crops.

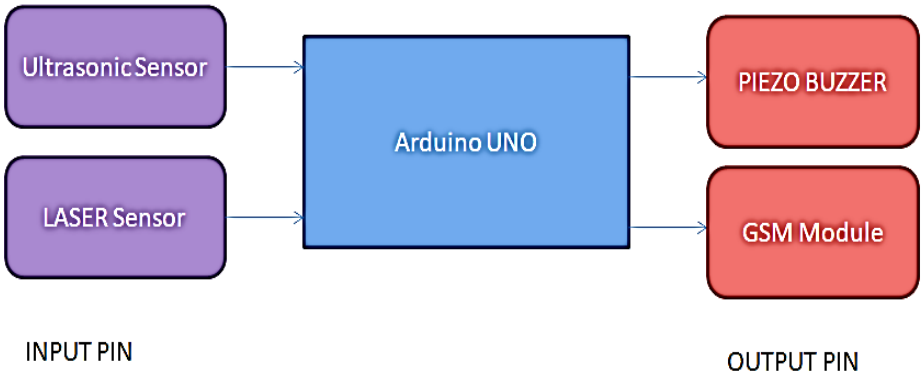

Figure 1: Block Diagram showing the basic hardware connectivity of the proposed model

Here, in this block diagram, an ultrasonic sensor and a LASER sensor is attached at the input pin of arduino board. Arduino UNO is microcontroller of the proposed system[13]. As soon as any animal tries to enter the crop field, it will be detected by the sensors and INPUT pin will be activated of arduino. This input will trigger the OUTPUT pin and buzzer will start producing alarm sound. At the same time a message will be sent to farmer's registered mobile phone number using GSM module. Thus buzzer sound will try to deviate the animal and GSM message notification will alert the farmer also[14].

V. METHODOLOGY

We conducted an experiment to analyze the repelling pattern of the above proposed model for few days. We have taken the reading for one month during day and night time and observed the number of times object got detected[15]. The total number of arrival of objects during this time period was 174 and number of times objects got detected was 152. So the efficiency of this proposed model system can be calculated as:

Efficiency= No. of times detected / No. of times arrival

Hence, Efficiency= 152/174 = 0.873563

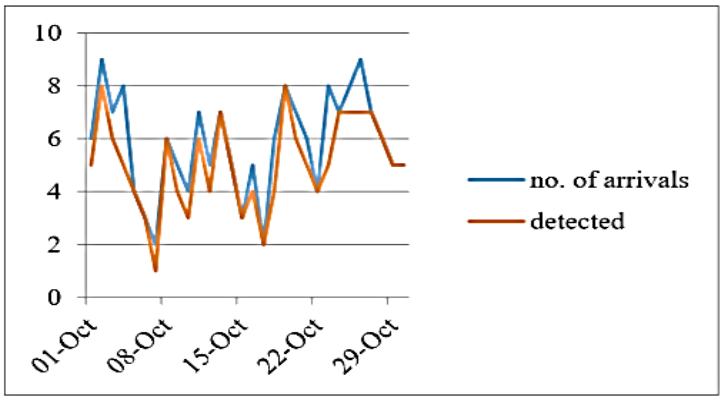

Figure 2: Graph showing the efficiency of the proposed model

Consequently, Fig 3 can be used to demonstrate the effectiveness of the suggested paradigm. It clearly demonstrates the number of times this model is able to recognize an object when it is there. Its effectiveness is therefore about 87.35%. Additionally, we conducted an ANOVA analysis to determine whether or not temperature is a component that influences how well the suggested system functions.

VI. RESULT AND DISCUSSION

In the Table 1, it can be seen clearly that F-tabulated value is 4.006873 and F-calculated value is 2.4283. We know that the experiment is significant only when F-Calculated value is less than F-Tabulated value. Here, F-Calculated value is less than F-Tabulated value. So the experiment is significant.

Table 1: ANOVA Table showing the efficiency of proposed model

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance		
no. of arrivals	30	174	5.8	3.682759		
detected	30	152	5.066667	2.96092		

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	8.066667	1	8.066667	2.428374	0.124597	4.006873
Within Groups	192.6667	58	3.321839			
Total	200.7333	59				

ANOVA Table showing the efficiency of proposed model will be explained during presentation.

VII. CONCLUSION

We can conclude that we should use IoT Techniques for crop protection and crop productivity increase. As the world population is growing on, we should focus on use of IoT in field of agriculture. So that growing population food demand can be fulfilled. Thus we can conclude that IoT must be implemented in agriculture sector in same way as being implemented in others.
Thus IoT in agricultural is very important and necessary to be implemented.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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