



Smart Crop Protection System Using LoRa Module

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ABSTRACT

Crops in farms are many times damaged by animals like buffaloes, cows, goats, birds and wild elephants. This causes major losses for the farmers. Farmers cannot stay on the field for 24 hours and protect it. To overcome this problem, an animal detection system has been designed to detect the presence of animals and it offers a warning and divert the animal without any harm. The designed system will continuously check for any animal to enter the field. IR sensors and ultrasonic sensor are used in this project to detect animal movement and to give a signal to the controller. Further the animals are being diverted by generating sound and signals, and this signal is being transmitted to and instantly give farmers warning, so the farmers will be aware of the difficulty and available to the spot just in case the animals do not show off by the alarm. The complete safety of crops was ensured by this system from animals thus protecting the farmer's loss.

Keywords: IR Sensor, protect, farmers, safety, arduino

1. INTRODUCTION

Crops in farms are many times invaded by local animals like buffaloes, cows, goats, birds etc. This leads to huge losses for the farmers. It is not possible for farmers to barricade entire fields or stay on field 24 hours and guard it. So here we propose automatic crop protection system from animals. This is a PIR and LoRa module-based system. This system uses a PIR sensor to detect wild animals approaching near the field. In such a case the sensor signals the Arduino to take action.

Agriculture is the primary source of livelihood for about 58% of India's population. Agriculture is an important sector of Indian economy and it contributes about 17% to the GDP. Agriculture also provides employment to 60% of population. But due to various climatic changes and animal intervention the farmers are facing major losses. There are many traditional

methods that are being used by the farmers like scarecrows, electric fences, etc., In some areas farmers uses smoke to prevent their farmland, the burn elephant dung or other materials that create heavy smoke. In some areas people also use fish or garlic natural emulsion, castor oil to repels the animals. But these are not very effective to save the farms from animals. Hence, we have designed this affordable system to surveillance and to protect the farm effectively.

In the world, the economy of many countries is dependent upon agriculture. In spite of economic development agriculture is the backbone of the economy. Agriculture is the main stay of economy. It contributes to the gross domestic product. Agriculture meets food requirements of the people and produces several raw materials for industries. But because of animal interference and fire in agricultural lands, there will be huge loss of crops. Crop will be totally getting destroyed. There will be large amount of loss of farmer. To avoid these financial losses, it is very important to protect agricultural field or farms from animal and fire. To overcome this problem, in our proposed work we shall design a system to prevent the entry of animals into the farm by using PIR Fig.5 Our main purpose of project is to develop intruder alert to the farm, to avoid losses due to animals and fire. These intruder alert protect the crop from damaging that indirectly increase yield of the crop. The develop system will not harmful and injurious to animal as well as human beings. Theme of project is to design an intelligent security system for farm protection by using Embedded system-based on Arduino.

2. LITERATURE REVIEW

M. Jaya Prabha et al. [1] using IR sensors and ultrasonic sensors a system is designed to warn and divert animals without any harm. The author suggested further work as this project is further enhanced by wireless sensor network. The type of

sensors like finding the moisture content of the soil, growth of the crop and nutrition content in the soil. Balaji Bhanu et al. [2] The purpose of this is to design and develop an agricultural monitoring system using wireless sensor network to increase the productivity and quality of farming without observing it for all the time manually. The author suggested further work as the security can be increased by implementing surveillance cameras. Dr. M. Chandra et al. [3] using Arduino a smart crop protection system can be implemented for protection from living objects and fire. The author suggested further work as fire distinguishers can be implemented to protect crops from fire and an alarm system to scare out living beings. Y. Song et al. [4] integrating hybrid and electric vehicles for farmers to reduce their cost of work and traveling. The author suggested further work as providing farmers with an interface to farmers to monitor them from remote places. Anjana, Sowmya et al. [5]. In order to increase the productivity of the crops and to minimize the expenses of agricultural practices we adopt smart agriculture techniques using IOT. It includes various features like solar power generation and advancement in modern agriculture crop protection using greenhouse/polyhouse. It makes use of GSM technology for intimating the cultivators about various environmental factors continuously via SMS. The author suggested further work as fencing the crops to protect them from animals.

Tanmay Baranwal et al. [6] Agricultural products needs security and protection at very initial stage, like protection from attacks of rodents or insects, in fields or grain stores. Such challenges should also be taken into consideration. M. Sathishkumar1 et al. [7] using GSM module and PIR sensor a smart surveillance system is built to protect and watch over plants and crops. T. Gayathri et al. [8] the author has proposed the system for monitoring the growing status of the corn (maize) plant continuously and intimate the agriculturist using wireless sensor network (WSN). P. Deotale et al. [9] using IoT devices a smart crop protection system is built to protect crops from animals. The author suggests further work as implementing fencing around the field to protect farms from invasion. M. F. Shaik et al. [10] Intelligent secure smart crop protection from wild animals in which the harm from the wild animals and solution to the issue is discussed. In this project the solution offered is installing IR sensor and PI camera by which the farmer can get the alert of animal invasion and also in which region the animal has invaded. H.-W. Lim et al. [11] This system is constructed is a quadcopter crop protection and monitoring from wild animals in which a quadcopter is used monitor the field from the above. In this a camera is connected to monitor and record the actual footage. The quadcopter have four rotors. The only disadvantage is that it will require some sort of monitoring. The author suggested the further work as the quadcopter should not require any sort of monitoring it should be fully independent.

S. Yadahalli et al. [13] This is the project about smart intrusion detection system for crop protection using Arduino. In this system an Arduino is used to detect the intrusion happened in

the field. The author suggested the further work as we can use IoT in the system to send data over network. R. Mapari et al. [14] This project is about Agriculture protection using smart scare crow system. In this system a scarecrow is situated in the crops and whenever birds sit or try to enter in the crop it will scare them away by producing some sort of noise. The author suggested further work as we can install cameras in the scarecrow to watch over the field remotely. Ms. G. Patil et al. [15] This project is about crop field protection using wireless technology. In this a wireless technology is used to protect the crops such as wireless sensor network. K. S. Asawale et al. [17] An IoT based Smart Greenhouse Crop protection, Monitoring and Controlling System using Arduino Uno. This system is based on IoT and Greenhouse to protect, monitor and control the crop using Arduino Uno.

J. Dias et al. [18] This project is Smart Farming, Crop Protection and Fertilizer Prediction using IoT in which IoT is used to do smart farming, Crop protection and Fertilizer prediction. In this Smart farming tips are suggested to farmers also the need and which Fertilizer should be used is also suggested. Along with this two the crop protection is also achieved by IoT. A. Ramkumar et al. [19] IOT solution for crop protection from wild boar attack. This project is about providing solution for wild boar attack with the help of IoT. The Author suggested the further work as this project can be enhanced by installing the fences with electric shock this will stop wild boar from entering the field. S. Katta [20] Smart irrigation and crop security in agriculture using IoT. In this project a system is established to monitor the irrigation and provide the security to crops. This all is achieved by IoT. IoT will take care of when the irrigation is needed to the crops and the system will watch over the crops. The Author suggested the further work as we can implement smart fertilizer system for fertilizers.

3. PROPOSED TECHNOLOGY

The basic idea of the system is to provide the protection or alert from any animal invading the crops. For that the implementation of system needs to be done in such a way that it should work according to our needs. For that we first need to learn the working of system.

The PIR sensor senses the animals and transmit the signal to the circuit where Arduino process the signal and converts it into transmittable data further with the help of LoRa module this data is transmitted to the receiver end of another LoRa module where again another Arduino processes the transmitted data and then display it on to the LCD screen. Along with buzzer to get alerted about the invasion.

LoRa is a method for transmitting radio signals that use a chirped, multi-symbol format to encode information. It is a proprietary system made by chip manufacturer Semtech. Other manufacturers can license the LoRa IP. These standard ISM band radio chips can use LoRa (or modulation types like FSK)

to convert radio frequency to bits. This modulation means no one needs to write code to implement the radio system. This lower-level physical layer technology can help applications outside of a wide area. LoRa is also based on chirp spread spectrum modulation which the alliance claims maintain low-power characteristics and significantly increases communication range. Chirp spread spectrum has been used in military and space communication for decades, but LoRa is the first low-cost implementation for commercial usage. Communication between end-devices and gateways is spread out on different frequency channels and data rates. The selection of the data rate is a trade-off between communication range and message duration. Due to the spread spectrum technology, communications with different data rates do not interfere with each other and create a set of “virtual” channels increasing the capacity of the gateway. LoRaWAN data rates range from 0.3 kbps to 50 kbps.

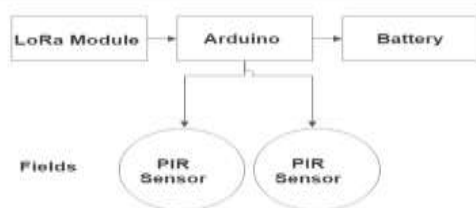


Figure 1: On Field System.

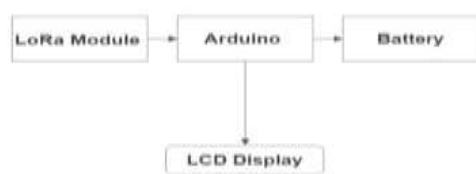


Figure 2: System at Farmer's End.

4. RESULTS AND DISCUSSION

The expected result in the whole system is that the PIR sensor senses the invasion by detecting intruder and transmit the signal to the circuit where Arduino process the signal and converts it into transmittable data further with the help of LoRa module this data is transmitted to the receiver end of another LoRa module where again another Arduino processes the transmitted data and then display it on to the LCD screen. Along with buzzer to get alerted about the invasion so in the case the farmer can immediately rush to the field and look into the matter.

5. CONCLUSIONS

Farmers encounter severe threats in rural parts of India like damage done by animals. Hence, to overcome this issue we have designed a system. The designed system is affordable and

useful to the farmers. The designed system won't be harmful to animals and person, and it protects the farm areas.

In this way we have design our smart crop protections system using IOT These different components are helps us to build the mythology of this project and improve the more feature with the help of IOT devices.

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