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Smart Agriculture Fencing Using IOT

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Abstract

Agriculture is the backbone of the Indian financial system hence it deserves security. Security is for not only resources but also agricultural goods. It needs protection from attacks of rodents or animals, in fields or grain stores. Electric fences are broadly used to protect agriculture crops from both domestic and wild animals such as boar, beaver, goats, buffaloes, etc. The combination of traditional methodology with latest technology as Internet of Things can lead to agricultural revolution. In this paper, we studied the six layer fence security system which guards the whole farm. Each of the layers of the fence having different current flows gets activated when any animal makes contact with sensors. This controls the animals by giving them a short, sharp but safe shock that teaches them to stay away from the fence. The status of all sensors will be available on the android application. The main advantage is that the power is only needed when an animal comes in range of sensors and so the less power consumption is used.

Index Terms: *IOT, PIR Sensor, Ultrasonic sensor, A*rduino, *Bluetooth module*

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1. INTRODUCTION

Agriculture is the backbone of nationwide income for India. The main source of raw materials to major industries such as cotton, sugar, edible and non-edible oils is agriculture. Furthermore, many other industries get their raw materials mainly from agriculture. Agriculture not only provides food and raw material but also employment breaks to a very large proportion of population.

In agriculture, unwanted intrusion has turned out to be a growing problem which has given the way for a newer technology which detects intrusion accurately. Almost all organizations have their own conventional arrangement of protecting their zones by constructing high wall, wire fencing, power fencing or employing guard for manual observation. In case of large areas, manually observing the perimeter is not a feasible option. The main disadvantage is that if any one of the above technique is not properly functioning then there might be no means to identify how the problem was created.[1]

Hence electric fencing has been widely used to keep animals out of an area. A strong fence around the farm can keep wild animals from trespassing or damaging crops or bothering stock as well as keep out intruders and thieves, you can keep stock within the confines of a field or hutch.

Electric fencing has been widely used both for temporary fences and as a means to improve the security of fences made of other materials. It is most commonly made by using lightweight thin wires attached to poles with insulators made of plastic. Synthetic web or rope with thin wires interwoven to carry the electrical charge has become useful. This type of fencing needs electric supply all the time which is quite costly.

To solve this type of problem we are proposing a smart electric fencing system using Internet of things, where the high performance PIR sensor will detect the human intrusion and ultrasonic sensors will detect animals and activates the electric signals to give little shock to the person or animals and sends the status of all sensors on the android application. This Fencing is typically build to give a sharp shock but not to kill the animals, the thieves or intruders that teaches them to stay away from the fence. The main advantage is that the power is only needed when an animal comes in range of sensors and so the less power consumption is used.[2]

1.1Internet of Things in the fencing system

The Internet of Things is the technology of connecting any device to the Internet and to other connected devices. The IoT is a massive network of connected things and people, all of which collect and share data about the way they are used and about the environment around them. The devices that use the IoT also called as smart devices or connected devices. The IoT can be communicated with different devices like as sensors, electronics software, embedded systems, etc.

The use of Internet of things to make the devices smart is enormous. There are so many ways to share the data in the network by connecting devices. To build the smart fencing structure we need to use the IoT technology to make the life of farmers easier. Internet of things gives the security and efficiency of working of electric fencing. The connectivity of Bluetooth module to the mobile application is possible due to Internet of things. Farmer can get the status of sensors on his mobile application.[3]

2. SYSTEM ANALYSIS:

In our project, we are using PIR sensor and ultrasonic sensors. Human body emits certain radiations in the infrared region at the wavelength which is undetectable to the human eye, but it can be detected by electronic devices which are meant for such purposes.

. Fig 2.1 shows the architecture of the fencing system consisting of various components. In this fencing system, the sensors are connected to the poles of the fencing at specific distance and with proper spacing. Any of the sensors will detect obstruction, electric fence will be activated. The buzzer will be activated as soon as any sensor will be active. The sound will alarm the farmer and it can also frighten an obstructer.

If the PIR sensor detects the human presence then the current will be flowing through the fence and if human presence is not detected then there is a presence of animal and when it makes the contact with the ultrasonic sensors then it will send that data to Arduino board. Arduino board will activate the electric supply to the fencing wires which will give a small but sharp current varying according to the layers. The current will be flowing through the fence and the current will be adjusted to certain value so that the animal will get the shock but that shock which will not cause the death of the animal.

After the activation of electric fence the Bluetooth module connected to arduino will send data to the android application, also the android application will show the status of the sensor i.e. active or inactive. User can visualize the data collected from the sensors.

The inactiveness in this case refers to the fact that sensor devices do not produce or emit any energy for detection purposes. PIR sensors work totally by detecting the energy given off by human. PIR sensor does not detect or measure heat, instead they detect the infrared radiation emitted or reflected from an object, while ultrasonic sensors emit short, high-frequency pulses at a uniform time. If they come into contact with an object, then they are reflected back as echo signals to the sensor, which itself computes the distance to the target based on the time-span between producing the signal and receiving the echo.

2.1 Hardware components:

Smart fencing system consists of following hardware.

1. Arduino: It is an open source microcontroller board based on the microchip ATmega 328P microcontroller.
1. Relay: They are used where it is necessary to control a circuit by a separate low power signal or where several circuits must be controlled by one signal.
2. HC-05 Bluetooth module: It has typical -80dBm sensitivity up to +4dBm RF transmit power 3.3 module to 5v I/O.
3. Ultrasonic sensor: It has range from 2cm to 400 cm or 1" to 13 feet.
4. PIR Sensor: It has range between 5m to 10m.
5. Buzzer: To alarm the farmer.
6. Mobile phone: It is required for display of android application.

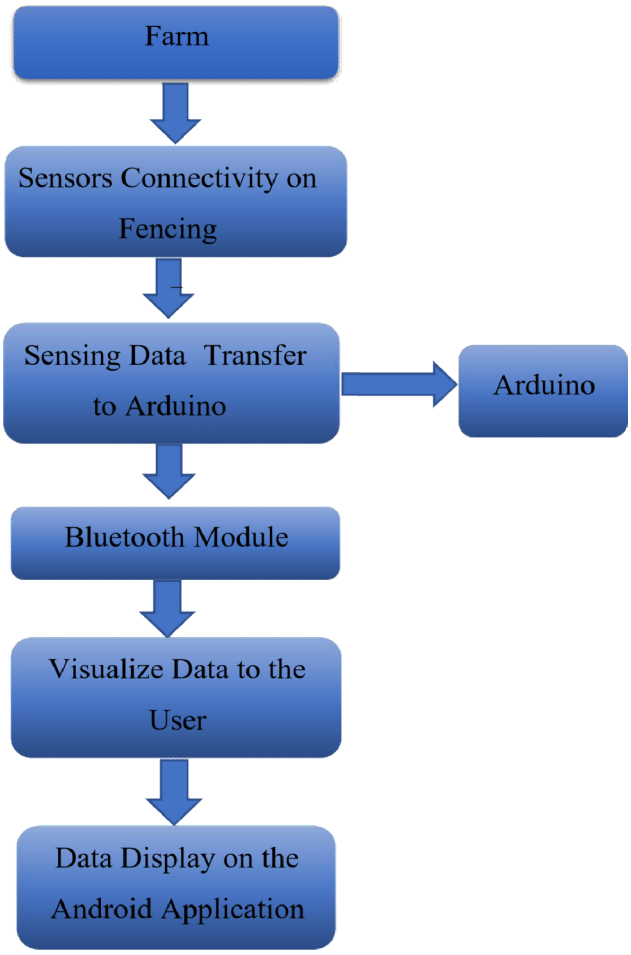

Fig-2.1: System architecture

2.2 Proposed work

Fig 2.2 illustrates the proposed system module. The proposed system gives you an idea about the working of smart agriculture fencing system with help of internet of things.

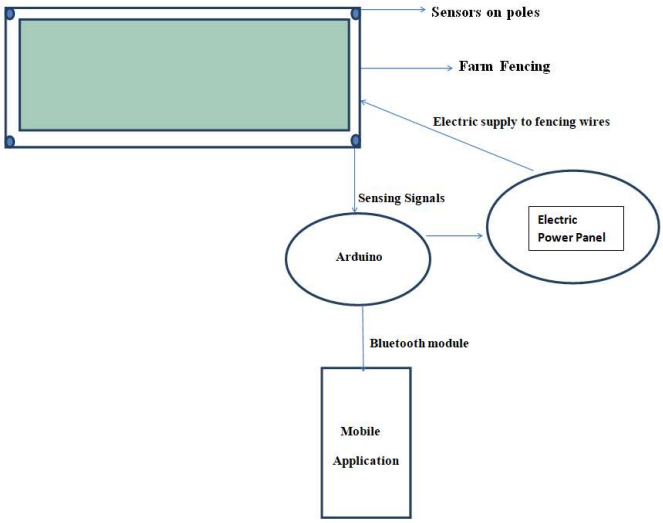

Fig-2.2: Proposed system module

The electric wires in the fencing system should be of proper spacing and distance. The 6 layers can be differed according to animal having different heights. The voltage will vary on the each layer along with the animal resistance power. This will help us to produce small but effective current to keep the intruders away from the farm. Table 2.1 shows the Table of layers according to animals and as per voltage.

Table - 2.1: Table of layers according to animals and their voltage range

Layers	ANIMALS	VOLTAGE
Layer 1 (From ground to 0.5 feet)	Bandicoot Rat, Squirrel, Rabbit, Chicken, monitor lizard	700- 1500 V
Layer 2 (0.5 to 1.2 feet)	Rodent, Dog, Kitten, Beaver, Raccoon	1000- 2000 V
Layer 3 (1.3 to 2 feet)	Piglet, Lamb, Calf, Dog, Cat	2000- 3000 V
Layer 4 (2 to 3 feet)	Wild boar, Goat, Sheep, pig	3000- 4000 V
Layer 5 (3to 4 feet)	Human, Horse, Cow, Buffalo	4000- 5000 V
Layer 6 (4 to 5 feet)	Human, Ox, Bull, Knicker	5000- 6000 V

2.3 Benefits:

This system is useful for the farmers as it does not require manual monitoring, reducing man power. No Electric consumption is less because electric supply is only needed when sensors become active otherwise we do not need constant electric current flowing through the wires. This can reduce the electric bill. Android application helps us to keep an eye on the sensors activation and working.

- No need of constant manual monitoring.
- Less man labour.
- Electric consumption is less.
- Protection to farm.
- Reliable system.
- Varying voltage according to animals and their voltage range.
- Sensor activation display on android application.

2.4 Drawbacks:

- Constant supply to the sensors is mandatory for accurate working of the whole system.
- Regular maintenance of system is required.

3. CONCLUSION

In this paper, we have proposed smart agriculture fencing with the help of Internet of things. It focuses on providing smart system which is a modern method to protect the agriculture area as trespassing and intrusion by animals is major concern. We can provide a reliable system to detect the intrusion by the sensors which will enable the electric supply to fencing wires and send the data to farmer's mobile application. This system has a primary importance. The implementation of this system will be beneficial for the farmers of the India as most of the villages do not have constant electricity. So this system has main significance to decrease the power consumption as traditional electric fencing requires high voltage electric supply. Unlike conventional system, this fencing system does not harm animals or human having variable electric supply to the different layers.

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