International Journal of Trend in Research and Development, Volume 4(2), ISSN: 2394-9333
www.ijtrd.com

Prevention of Agricultural Crops from Animals Using Distributed Wireless Sensor Networks

[1]M. Vivekanandan, [2]S.Naveen Kumar, [3]V.Mithun Kumar and [4]S.Manoah Jason,
[1]Assistant Professor, [2,3,4]UG student,
[1,2,3,4]Information Technology Department, Easwari Engineering, College, Chennai, TamilNadu, India

Abstract – India's economy depends on agriculture and it's the backbone of India. Security features are not provided properly to preserve the crops and it's good to provide security in the initial stage of cultivation. The aim of the project is to monitor and protect the crops from animals using distributed wireless sensor networks.The existing system does not help to redirect the intruders, Electrical fences are used to prevent animals from entering the field and Live streaming is not provided, so user have to rush without knowing the situation in the existing system.The proposed system has capability of monitoring and preventing the damages from the wild animals. PIR and the ultrasonic sensor helps to find the intruder (wild animals) and their range. Using camera, through an URL this system also transmitting live video data in the emergency situations and re-direct them. All the devices are integrated in a raspberry pi chip. No animals are harmed in the proposed system and the system is cost effective. Mentioned sensors are integrated with a python script. By this it's possible to achieve 80% of test cases.

Keywords -Distributed wireless sensor networks; Agriculture; Raspberry pi; PIR sensor; Ultrasonic sensor; Live streaming ; Monitoring and Prevention

I. INTRODUCTION

Technology started playing a vital role in all the field and especially in agriculture sector, people are more likely to welcome technology in agriculture sector. This kind of innovation helps in food protection and transportation, the difficulties is to provide interaction between the security device and the electronic devices like camera and other sensors like PIR sensor and ultrasonic sensors[5][1].Installing camera and monitoring the system over a period is considered to be waste of time and waste of energy and so here live streaming is provided only when it is really needed and not done regularly but the system monitors the range regularly [3].

Ultrasonic sensor is used to detect the obstacle or intruders in the range and PIR sensor is used check whether it's a human or an animal, after which the live streaming is started [5][11][12].All these devices are integrated using a raspberry pi chip. The video is stored in the chip for the future reference. Once the camera is turned on an alert message is sent as an SMS to the user the SMS contain an URL which is used to stream the video[3].

WIRELESS SENSOR NETWORKS

WSN is used to monitor continuously the environmental conditions like temperature, etc. and the data is passed through the network to the host location[4][8]. The recent networks are modern which are bi-directional, enhances the control of sensor activity. Battlefield monitoring in the military was essential for the development of wireless sensor networks. The main advantage of WSN is the scalability to large size environment and the ability to withstand harsh environmental conditions[8][10]. Collection of nodes is how the WSN are built. Every node is connected to sensors and the sensor networks contains radio transceiver along with internal antenna connected to external antenna, microcontroller is present for interfacing of external source. The WSNs is framed from simple star network to a high level multi-hop wireless mesh network.

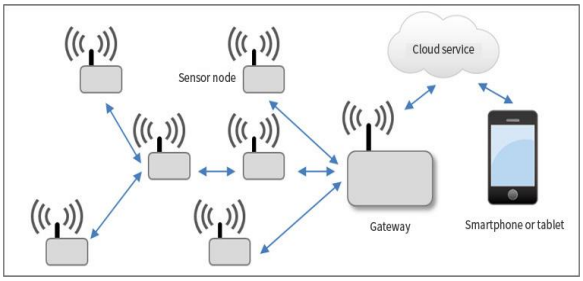


Fig (I- a): Wireless Sensor Networks

ULTRASONIC SENSOR:

The ultrasonic proximity sensor uses special sonic transducer that helps in alternate transmission and reception of sound waves[3][11]. The transducer act as both transmitter and receiver, sonic wave are emitted by them are reflected back by an object. Once the sonic wave is emitted the transducer tends to switch to receiver mode Sonic waves are best reflected from hard surfaces[11]. Targets may be solids, liquids, granules or powders. The sensor is mounted perpendicular to the surface. Object detection can be ensured if the signal is long enough. The signals intensity depends on the size of the object. The sensors reference axis is positioned perpendicular to the target

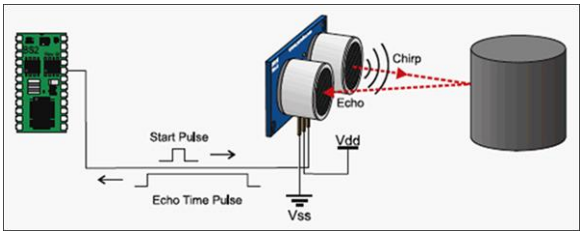


Fig (I- b): Working Of Ultrasonic Sensor

The distance of the object can be identified using the time elapsed between the emitted wave and received wave.

PIR SENSOR:

The passive infrared sensor checks and measures the infrared light radiated from an object in its field of view. PIR based motion detector are constructed using the PIR sensor[3][12].

Apparently motion can be detected using the temperature of one source, such as human's passes in front of another temperature say wall. All body emits black body radiation which cannot be seen through human eyes but can be identified by the electronic devices designed for such purpose[5][12]. The term passive means this PIR device does not emits infrared beams but accepts incoming infrared radiation. "Infra" means below the visual range "red" represents the lowest energy level that our eyes can sense before it becomes invisible.



Fig (I- c): PIR Module

Specification:

PIR sensor requires 3.3 to 5 VDC power supply. Communication is through single bit high/low output. It can be operated in 32 to 122 °F(0 to 50 °C).

II. RELATED WORKS

In the year 2016 Tanmay Baranwal , Nikita , Pushpendra Kumar Pateriya presented a paper on "Development of IoT based smart security and monitoring devices for agriculture" This paper explains about the agriculture sector being the backbone of the Indian economy deserves security. Security not in terms of resources only but also 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. Security systems which are being used now a days are not smart enough to provide real time notification after sensing the problem. The integration of traditional methodology with latest technologies as Internet of Things and Wireless Sensor Networks can lead to agricultural modernization. Keeping this scenario in our mind we have designed, tested and analyzed an 'Internet of Things' based device which is capable of analyzing the sensed information and then transmitting it to the user. This device can be controlled and monitored from remote location and it can be implemented in agricultural fields, grain stores and cold stores for security purpose. This paper is oriented to accentuate the methods to solve such problems like identification of rodents, threats to crops and delivering real time notification based on information analysis and processing without human intervention. In this device, mentioned sensors and electronic devices are integrated using Python scripts. Based on attempted test cases, we were able to achieve success in 84.8% test cases.

In the year 2015 Y. Kaneta , T. Sato, M. Hikita presented a paper on "Study on movement detection in care environment using precise ultrasonic distance measurement at 40 kHz installed in sensor network", This system tells Sensor network which connects many sensors via small-scale private wireless network such as ZigBee and Z-Wave has been studied all over the world these days. In the future, it will provide home/office-circumstance monitoring, i.e. taking care of old people, preventing crime and maintaining security. In this paper, we have proposed a new care-environment monitoring system using novel ultrasonic distance-measurement and movement-detection method installed in ZigBee-based sensor network. Comparison between our method at 40 kHz and the conventional millimeter-wave radar mounted on high-end vehicles will be illustrated. Developed automatic-measurement system and fundamental experimental results will be presented.

III. PROBLEM STATEMENT

Electrical fences are used to prevent animals from entering the field. Live streaming is not provided, so user have to rush without knowing the situation. Growth level of crop is only monitored and it will check for intruders(wild animals).Security alerting devices is not enabled in the existing system and so the crops get damaged from the animals.

IV. SYSTEM ARCHITECTURE

More pronounced damage gets caused by wild animals in agricultural land adjacent to forestarea during summer, due to food and water shortage in the forests.Farmers and officials plead helpless in solving this perennial problem, and say they only try todrive the wild animals away manually. But in our proposed system we can able to drive awaythe animals using Wireless sensor networking technology.When animals from the forest area enters the agricultural field it will be detected by the PIRsensor and the Ultrasonic sensor.PIR sensor and the Ultrasonic Sensor are fixed at the log of the wood near the agricultural field.

Animal emits thermal energy of wavelength passive Infrared Sensor or pyroelectric sensor isan electronic device which is designed to detect this IR wavelength when animal is in itsproximity .This signal when detects the presence of the animal Send the echo message to thereceiver.Similarly when comes to the Ultrasonic sensor it emits the ultra sound at 40,000 Hz whichtravels through the air and if there is an animal it will bounce back to the module consideringthe travel time and the speed of the sound you can calculate the distance. The trigger pin will beused to send the signal and the Echo pin will be used to listen for returning signal.Once the intruder have been detected the Buzzer alarm and the infrared camera turns on andcapture the live streaming of the agriculture field and sends the URL link to the user throughcloud from which user can able to see the live video without visiting it .At end the video will bestored in the SD card for future reference.The captured data is transmitted to SD card using the nearby antenna and then it is dispatchedto the cloud and to the nearby antenna through which the message will be arrived to the user.

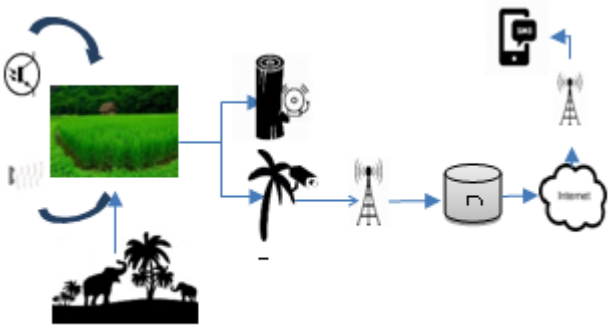


Fig (III- a): System Architecture

IV. DESIGN METHODOLOGY

A. Detection of animals using sensors (PIR and Ultra-sonic)

Ultrasonic sensor is placed in such a way that it covers maximum of the area and PIR sensor is placed along with that, if there is any line of sight of animals then the ultrasonic sensor triggers the PIR sensor, as PIR sensor checks only the line of sight the sensor is tilted based on the obstacle which the ultrasonic senor finds

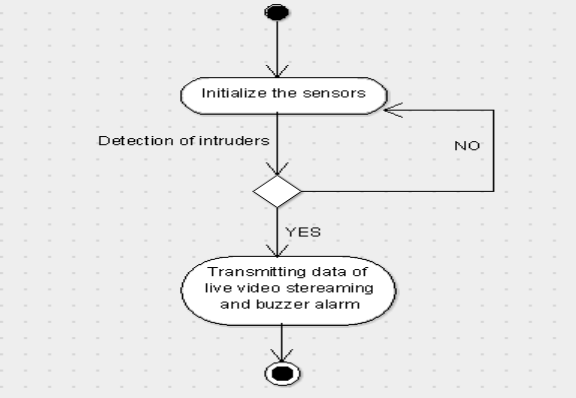


Fig (IV- a)

If both the sensor confirms there is any intruders, they tends to trigger the buzzer alarm and the camera.

B. Transmitting of live video streaming and buzzer alarm:

Once the intruder get into the range the buzzer alarm and the camera is turned on. The buzzer alarm is turned on to drive out the intruder in the other direction. And the camera is used to start the live streaming to user.

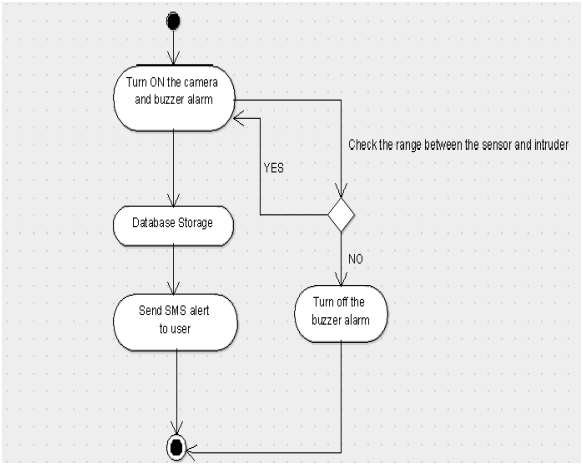


Fig (IV- b)

When the camera is on the video is stored in the database as a buffer storage, then an alert message is sent to the user with an URL link through which the user can watch the live streaming. The video is also stored in the database for the future reference

C. Continues monitoring and storage:

The user can have a direct contact with the field and decision can be taken instantaneously, it is possible to identify the risk of the situation without rushing to the field

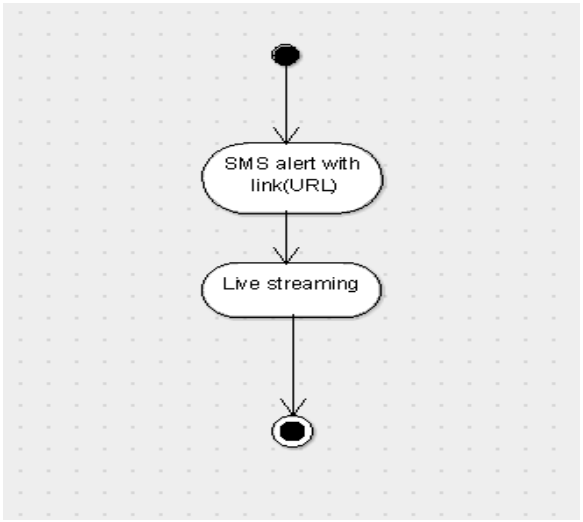


Fig (IV- c)

Work Experience

Effective thoughts in preparing and delivering a successful paper on our concept that will communicate your concept in higher level was experienced, marking a good impression on the listeners, and enlighten further conversations that can help you project furthermore and learn the improvements.

Result and Conclusion

This can be further improved by providing the information about the animal to the forest ranger and the animal can also be driven back to forest with their help. This method can also use solar power in case of power cut and so it's easy to provide continuous monitoring.

References

[1] R.Beckwith,D.Teibel,P.Bowen(2004), "Report from the field:Results from an Agricultural wireless sensor network" –IEEE,ISBN:0-7695-2260-2.

[2] K.Langendoen,A.Baggio,O.Visser, (2006)"Murphy loves potatoes: Experiences from a pilot sensor network deployment in precision agriculture" -IEEE,ISBN:1-4244-0054-6.

[3] Ravi Kishore Kodali, Vishal Jain, Suvadeep Bose and Lakshmi Boppana(2016)"IoT based smart security andhome automation system" -IEEE,ISBN: 978-1-5090-1666-2/16

[4] Scottmatics,Todorfay,(2014)"Titling for live streaming and file based broadcast workflows"–IEEE,ISBN:978-1-61482- 957-7.

[5] Tanmay Baranwal,Nitika,Pushpendra Kumar Pateriya,(2016)"Development of Iot based smart security and monitoring device for agriculture"–IEEE,ISBN:978-1-4673-8203-8.

[6] Mujahid Tabassum,Kartinah Zen(2015)"Performance evaluation of ZigBee in indoor and outdoor environment"-IEEE,ISBN: 978-1-4799-9939-2

[7] D. Niyato, E. Hossain, M. M. Rashid, and V. K. Bhargava,(2007) "Wireless sensor networks with energy harvesting technologies: a game-theoreticapproach to optimal energy management", -IEEE,ISSN:1536-1284.

[8] Hui Liu; Zhijun Meng; Maohua Wang,(2009)"A wireless sensor network for cropland environmental monitoring"- IEEE,ISBN: 978-0-7695-3610-1.

[9] Kavi Kumar Khedo; Mohammad RiyadHosseny; Mohammad Ziyad Toonah,(2014)"Potato Sense: A wireless sensor network system for precision agriculture" ,IEEE,ISBN: 978-1-905824-44-1.

[10] HuiLiu; Zhijun Meng; ShuanghuCui,(2007)"Wireless sensor Network prototype for environmental Monitoring in greenhouses",-IEEE, ISBN:1-4244-1311-7.

[11] Y. Kaneta, T. Sato, M. Hikita,(2015)"Study on movement detection in care environment sing precise ultrasonic distance measurement at 40 kHz installed in sensor network",- IEEE,ISBN: 978-1-4799-8182-3.

[12] R C Jisha, Maneesha V. Ramesh, GS Lekshmi,(2010)"Intruder tracking Using wireless sensor network",-IEEE,ISBN: 978-1-4244-5967-4.