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A Unique Solution for Security of Agriculture Produce Using IOT

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Abstract:
Agriculture sector being the backbone of the Indian economy deserves security. But very little is done to protect the grains from being eaten by rodents, pests, etc. The integration of traditional methodology with latest technologies has Internet of Things and Wireless Sensor Networks can lead to agricultural modernization.

Keywords: Internet of Things (IOT); Agriculture; Security; Raspberry pi; Sensors; Wireless Sensor Network (WSN).

1. INTRODUCTION

Over the past years information and communication technologies has been introduced in agriculture, but there was no security given for it. The lack of information transmission and data analyzing has been solved by integration of Internet of Things [1]. Internet of Things (IOT): This term was proposed by Kevin Asthon in 1999. It means that connection of each and every thing to the Internet. And maintains relationship between people-people, people- things & things-things.

TABLE.1.

TABLE 1

COMPARISON BETWEEN HIV-AIDS AND LEPTOSPIROSIS BASED ON DEATHS AND CASES FOUND(PHILIPPINES)

Source:Grant R.Singleton.2010, "Impacts of rodents on rice production in Asia", & PIDS,NEC,Department of Health ,Philippines

Disease	2008		Jan-Oct 2009	
	Cases	Deaths	Cases	Deaths
HIV-AIDS	528	4	629	1
Leptospirosis	832	41	2777	161

Describes the comparison between HIV-AIDS and LEPTOSPIROSIS diseases. Leptospirosis is caused due to impacts of rodents on rice production in Asia. In 2015, 11 out of 16 deaths caused due to delay in treatment. Leptospirosis was the cause of 74 deaths in 2016, a year in which there were a total of 752 cases nationwide. IOT is implemented in an Agriculture sector that will lead to protect 20-30% loss of agriculture products.5-10% loss of rice crops, In Asia due to rodents. The significant challenge facing the security in agriculture is the interaction between security devices and to provide them intelligence to control other electronic devices such as cameras, repellers etc to enhance security in various fields. For example: A basic CCTV camera installed in grain store that can't be used until recorded media is accessed and it also can't process information about What is happening at particular location?, In implementation and adoption of information and communication technologies, cost is also major fact it is not easy to achieve exchange of information among Devices upgrading their functionality while keeping the cost to reasonable level. So the internal conclusion is that the security and monitoring systems must be responsible for transmitting data over network, analyzing the information and notify the user with the real time information of surroundings. This lack of information transmission and data analyzing has been "solved" by integration of internet of things with currently available security devices in order to achieve efficient food preservation and productivity. The IoT consists of objects, sensor devices, communication infrastructure, computational and processing unit that may be placed on cloud, decision making and action invoking system [2]. A sensor network that can provide access to information anytime, anywhere by collecting processing analyzing data [3], the paper presents WSN as the best way to solve the agricultural problems related farming resources optimization, decision making support, and land monitoring. This approach provides real time information about the lands and crops that will help farmers make right decisions [4].

2. LITERATURE SURVEY

Tanmay Baranwal et.al [1] proposed Internet of Things and Wireless Sensor Network that lead to agricultural modernization. Keeping this scenario they 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. In this device mentioned sensors and electronic devices are integrated using Python scripts. And in this system IP based CCTV security cameras require network connectivity for monitoring from remote location.

Abhinav V.Deshpande et.al [2] proposed work of fencing which is used as sensor. When animals come in contact with this open cable the circuit will be grounded and we get initial input signal that indicates presence of animals at fencing. After getting that initial input signal followed by amplifier circuit passed it for further processing. Then it will be given to microcontroller. The system will be activated, immediately buzzer will be on, at the time of night flash light will be on and message will be sent to the farmer. Power supply will be given by solar panel or regulated power supply.

Dhananjay Singh et.al [3] proposed a novel architecture model for IoT with the help of Semantic Fusion Model(SFM). And this paper presents a discussion on Internet oriented applications,

services, visual aspect and challenges for internet of things using RFID, 6lowpan and sensor networks. The basis of tracking is indeed RFID tags which are placed on object, human beings, animals, logistics etc. RFID tag reader may be used in all the intermediate stages for tracking anything which has the RFID tag in it. This object position identification can be smartly used to trigger an alaram, event or a specific interface regarding a specific subject.

Farhad Mehdipour et.al [4] proposed a Smart Pest Control (SPeC) solution particularly a Rat Detection System (RDS) in order to provide an infrastructure for monitoring rats in agriculture field. The system can help pest control experts in reducing tremendous cost for rat's control as well as huge amount of crop waste, and environment contamination, They obtained a solution based on cyber-physical system (CPSs).The main goal of the project is to develop an intelligent sensing network for detecting episodic environment events and understanding their consequences to lake dynamics.

3. EXISTING SYSTEM

Agriculture sector being the backbone of the Indian economy deserves security. Security is 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 day or 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. According to previous research in crop's security, developing countries which are using traditional storage facilities for staple food crops can't protect them, leading to 20-30% loss of agricultural products such as rice, corn, etc.

3.1 DISADVANTAGES OF EXISTING SYSTEM

- 5 to 10% loss in crops on average, in Asia is damage caused by rodents.
- As in Asia and Pacific countries death rate due to rodent borne disease is higher in comparison with some illness such as HIV-AIDS.
- CCTV camera installed in grain store can't be used until recorded media is accessed and it can't process the information about what is happening at particular location.
- Man power is required.
- Rodenticides sides are dangerous to human life.

4. PROPOSED SYSTEM

To develop intelligent security systems with ability to analyze data and transmit information over network to the remote location. The system uses the concept of IoT to detect motion and recorded data can be used analyze. The sensory information is analyzed in order to activate electronic devices and raspberry pi used as a server to analyze data and transmit information to user. 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.

4.1 ADVANTAGES OF PROPOSED SYSTEM

- By providing security using modern techniques.
- Web camera is used to take the snap shot of the rodents.
- No man power is required.
- No pesticides are used.
- Raspberry pi is used to connect all the devices in its GPIO pins and stores the data in it.
- It gives the exact distance of the rodents or pests using the ultrasonic ranging device.
- Sensor technology is used in emergency response.

5. IMPLEMENTATION

5.1 SYSTEM ARCHITECTURE

System architecture is the conceptual model that defines the structure, behavior, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviors of the system. In the proposed system, the overall system comprises of a hardware module, a server side and client side. The hardware module consists of a raspberry pi, in which the sub-devices like Ultra Sonic Sensor, IR Sensor, Web camera and Buzzer are in turn connected to raspberry pi. When the rodents come in contact with IR sensor, the IR sensor senses and automatically send the signal to raspberry pi, and also in parallel the ultra-sonic sensor measures the distance between the obstacle and the device and send the measured distance to the raspberry pi. The raspberry pi pass the signal to camera to take the picture of the obstacle, the camera is enabled and take the pictures and send back to the raspberry pi. When the rodent detected the buzzer buzzes the sound. The raspberry pi has in built hotspot so it can create a network and to that network laptop and module is connected. So whenever user wants to know information about rodents then he can just type the URL and access the information and also the user can understand the behavior of the rodents.

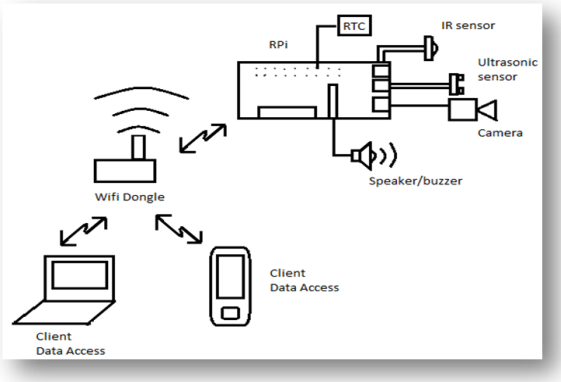


Figure.1. System Architecture

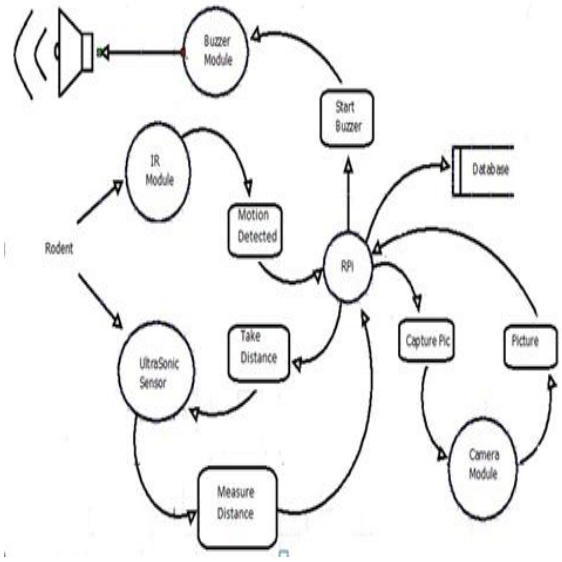


Figure.2. Data flow diagram

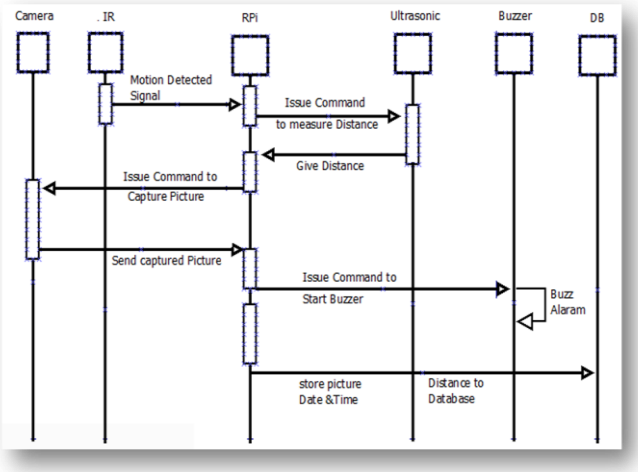


Figure.3. Sequence Diagram

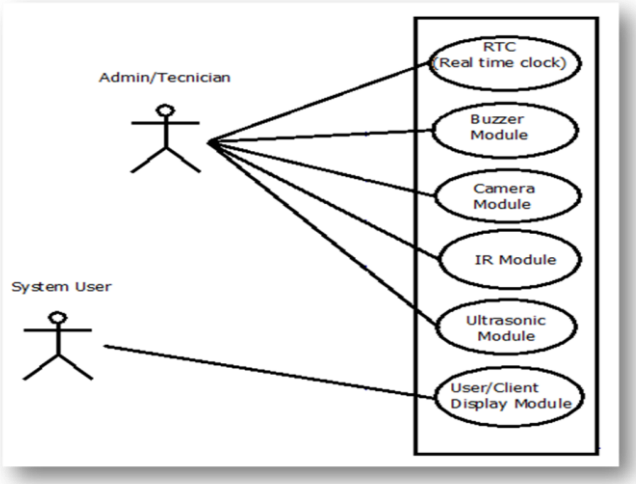


Figure.4. Use case Diagram

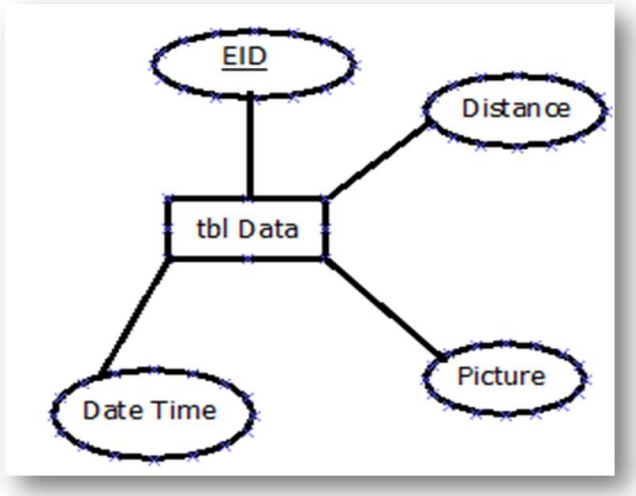


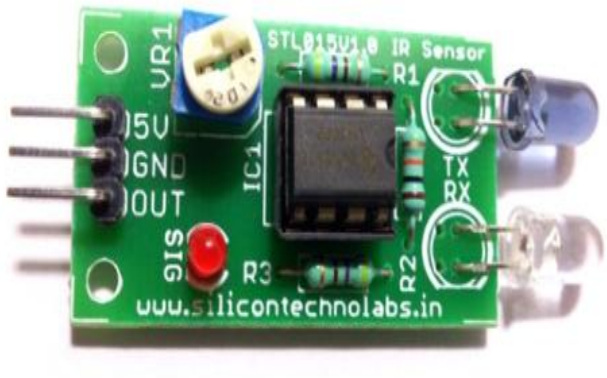
Figure.5. E-R Diagram

Software and Hardware Interfaces:
The raspberry pi hardware module uses raspbion OS and runs on the basis of python scripts. And here software used is putty. And by using correct python command user can able to run raspberry pi. Python scripts comprise the code for (IR Sensor, Ultrasonic Sensor, Web camera, RTC and Buzzer) to perform the system operation with Raspberry pi. MySQL database is used to store the information of rodents into Database. Through the web interface by using PHP scripts user can able to access the information about rodents.

Communication Interfaces:
A raspberry pi creates its hotspot as mypi3, where user can want to access the information about the rodents then first he need to connect with mypi3. And later he can access the information about rodents by using web interface.

5.2 PROPOSED APPLICATION

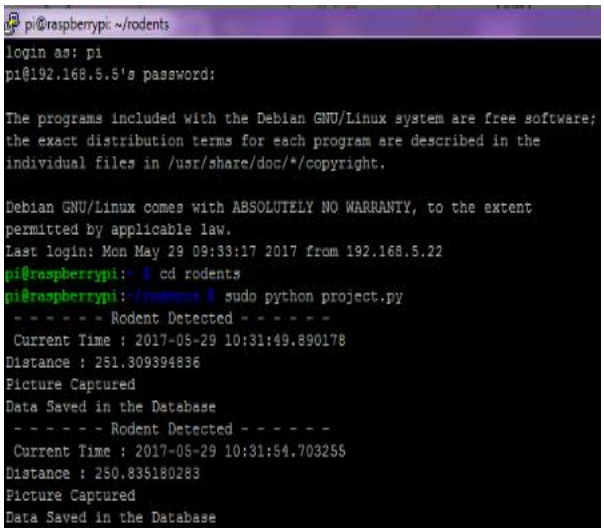
1) Detection of the motion: By the help of IR Sensor (Infrared Sensor) any motion detected at its point can be recognized and this data (i.e Sensed data) will be sent to the raspberry pi and then at the same time ultrasonic sensor gets activated.



The above figure shows IR Sensor

2) Measuring the distance: By the help of ultrasonic sensor the exact distance of the rodent can be measured from its system through the transmitter and receiver components. And that data will sends to raspberry pi memory and stored in database.

The above figure shows the Ultra- Sonic Sensor

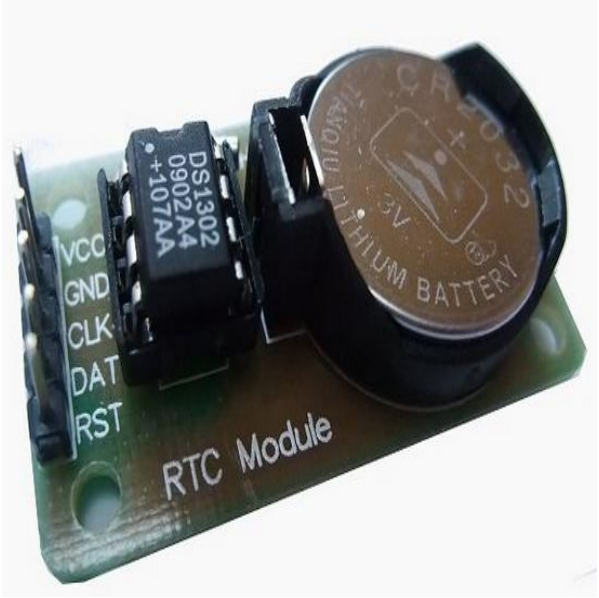


The above screenshot is about distance measuring

3) Producing the Beep Sound: Buzzer can be able to produce irritating sound to repel the rodents from the grain stores. This is done in fraction of seconds when motion is detected by the IR sensor.

The above figure shows Buzzer

4) Notifying the time: RTC (Real Time Clock) can be able to notify the time, at what time rodents may get activated. And at what time they may come, these data will be stored in Database.



The above figure shows RTC

Rodents Logged Data

Sl No	Distance	Time	Picture
1	3.80587577782	2017-05-21 16:23:25.089152	May-21-2017_162327.png
2	22.5596427917	2017-05-21 16:24:17.923380	May-21-2017_162421.png
3	7.7009210498	2017-05-21 16:24:25.317513	May-21-2017_162428.png
4	3.45125460971	2017-05-21 16:24:42.575624	May-21-2017_162445.png
5	4.2079309845	2017-05-21 16:24:49.622875	May-21-2017_162452.png
6	31.1954353333	2017-05-21 16:30:36.000303	May-21-2017_163040.png
7	9.2978477478	2017-05-21 16:30:44.523504	May-21-2017_163047.png
8	22.3205089569	2017-05-21 16:30:48.794534	May-21-2017_163051.png
9	23.1513977051	2017-05-21 16:30:52.985272	May-21-2017_163056.png
10	5.27037849426	2017-05-21 16:31:01.875837	May-21-2017_163105.png
11	7.40909576416	2017-05-21 16:31:13.695143	May-21-2017_163117.png
12	90.3196834839	2017-05-21 16:33:04.309589	May-21-2017_163307.png
13	2.24137306213	2017-05-21 16:33:13.055211	May-21-2017_163316.png
14	104.72035408	2017-05-21 16:33:55.131354	May-21-2017_163358.png
15	7.27534204128	2017-05-21 16:34:37.697485	May-21-2017_163441.png

The above screenshot is about notifying the time

5) Capture the Image: Web camera is used to capture the Images of the rodents in fraction of seconds when motion is detected at IR sensor and that (captured image) data will be stored in Database.

The above picture shows the web camera

The above screenshot is about capturing image

6. CONCLUSION

'Internet of Things' is widely used in connecting devices and collecting information. IoT is a system of interrelated computing devices. Here the system is designed for identification of rodents in grain stores. Once the IR Sensor detects the motion of the rodents, then it will calculate the distance and capture the picture of the rodent. After collecting and analyzing the data, it stored in database and it can be retrieved by the user through the web interface (URL). Through this the user will get an idea of the rodent behavior and hence the user can protect the grains from getting destroyed by the rodents.

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