Smart Ultrasonic Animal & Insect Repeller Through IOT

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Abstract **- In different countries every year, animals and insects cause distress to agricultural economy. Animals attacks plants and field gradually but it causes huge harm in agriculture area and those dangerous animal harms the farmers and their community. In recent times the numbers of these kinds of conflicts are increasing. So, this zone is to be monitored continuously to prevent entry of this kind of animals or any other unwanted intrusion. Human-animal conflicts arises due to encroachment and poaching, humans move into the forest to satisfy their livelihood, for claiming of land for agricultural practices and rapid industrialization causes spreading of urban ground and animals enter the nearby villages for water during the summer due to dryness in water body. Through this device, it helps to avoid human and animal conflict. However, those animals or insects cannot be recognized in their curable stage and farmer could usage the pesticides and insecticides without knowing it. Then this could reduce the efficient state. So, these paper presents that, I have used the design of an Automated Ultrasonic-insects and animal repeller that is embedded with Piezo-Electric Buzzer, an IR-Sensor and ATmega16 Microcontroller. The existence of animal is proved by the IR Sensor. Once presence of animal or insect is confirmed by the sensor, ATmega16 Microcontroller starts Piezo-Electric Buzzer by which the animal or insect moves away from that area without causing any damage to the crops.**

Index Terms **- ATmega16 Microcontroller, Piezo-Electric Buzzer and IR sensor.**

I.INTRODUCTION

Greengard [1] once said that the IoT is still in its early stage and how it creates conceptual and practical framework for a connected world. In this context, I have tried to explore through IoT in agricultural field. So, I brought up the idea of developing an animal repeller to be installed in agricultural fields to drive away harmful animal for the protection of crops. Now-a-days, animal attacks are very common headlines in most part of the world. Due to the inadequate detection systems, animal attacks farmers and lack of safety measures destroy their crops. Hence a suitable detection system could help to preserves the crops. Farmers cannot always fence the paddy fields for protecting the crops. If the suitable measures are not taken, then this could lead to huge wastage of crops production. So, in this paper, I have highlighted specifically to an urban as well as rural IoT based system that are characterized by their specific application domain. Urban and rural IoTs are designed to support the vision of Smart City as well as smart village, which aims to support value added services for the citizens as well as farmers too. Therefore, this paper provides a survey which is suitable for application of technologies, protocols, and architecture for an urban and rural IoT. Additionally, this paper will present and discuss the technical solutions and best-practice adopted in the rural and urban projects.

This research works not only for the benefits of farmers but also provide benefits in the productivity. Disastrous atmosphere of micro-organism on farming production are affected by insects. This research explains that ultrasonic-sound generated from the Piezo-Electric Buzzer, also decreases the combine as well as an imitation of numerous pests and animals [10]. Ultrasonic sound with a frequency range more than 20,000 Hz which cannot be received by human ear. Because the eardrums of human will not vibrate rapidly, whereas the insects can listen to this ultrasonic sound effectively [7]. Ultrasonic sound creates repellent and noisy climate which repels animal and insects. Cockroaches, spiders, beetles etc. have unique hairs to identify the ultrasonic audio. In this device, ultrasonic sound is used to repel animals and insects those are menace for human and crops both.

II.OBJECTIVE

The objective of this project is to provide protection from the intrusion of the insects and animals to

eliminate the probable loss to the farmers as below steps:

1. To design a security system for farm protection.
2. To detect intrusion around the field rotates in 360°.
3. To take suitable action by releasing ultra-sonic sound.
4. The sensor continuously monitors the field whole day.

III.LITERATURE SURVEY

Anjali Rose Rajan and Dr. P. Uma Maheswari [2] proposed a system for bird intrusion which is being detected with the help of wireless sensors and buzzers which produce acoustic sounds. When any bird is being detected by the sensors in the farmland area the acoustic sounds get activated, due to which the birds get irritated and they will fly away as they cannot be adoptive to that sound. Hence the destruction caused by the birds in the farmland can be reduced. These acoustic sounds generated by the buzzer will be produced only when the bird is detected and continue until the birds fly away.

Mr. Vikas S. Bavane, Dr. P. M. Jawandhiya and Prof. A.P. Bawane [3] has proposed a system using a Raspberry Pi board, sensors and camera embedded into system. When PIR sensors goes high on detecting the motion within a radius of 10 meters, the camera will get turned ON and capture an image initially and then records the video of about five to ten minutes which then stored on board as well as on cloud, simultaneously a message will be generated through SIM900A module to a registered number along with the details like temperature and humidity with the help of dht11 temperature and humidity sensor. This image and video is further processed using Haar-like feature based cascade classifier for object detection and decide if the entity is a human or an animal intruder. If the motion is detected by the authorized person have a valid RFID, his attendance will get recorded automatically.

Sneha Nahatkar et al, [12] proposed a provision of home security surveillance system which assess the development of a low cost security system, using small PIR (Pyroelectric Infrared) sensor that is built around a microcontroller with ultra-low alert power. It generates the signal through PIR sensor detecting the presence of an intruder not at thermal equilibrium with the surrounding environment. It triggers an alarm when it detects any unauthorized person & set up a call to a predefined number through a GSM modem. After the MCU sends the sensor signals to the embedded system, the program starts the Web camera which then captures the images that can be viewed and analysed later.

IV. STRATEGIES TO PROTECT CROPS

Some farmers always seek to find out the satisfactory level of crop protection from animals and insects using one of technique given below [8]:

1. Fencing the agricultural land-

The quality of fences depends on its structure and material. Depending on how it is made and what it is made of some permanent fences can last up to 30 years. Farmers generally use one of the below mentioned types of fences:

- Wire fencing,
- Electric fencing,
- Plastic fencing.

2. Natural repellents-

Some farmers favour using natural protective measure instead of any form of chemical protective technique. There are a variety of ways to protect crops from animals and insects, including:

- Smoke gas some farmers burn elephant dung or other materials that create heavy smoke.
- Fish or garlic natural emulsion which helps repels rabbits and deer.
- Castor oil is a natural repellent that keeps away burrowing animals such as moles.
- Lavender and beans are excellent repellents against rabbits.
- Egg based repellent is a home-produced repellent for deer.

3. Chemical repellent such as Anthraquinone, Butanethiol, and Methyl Anthranilate is a vigorous substance can be used to keep animals away from crops.

4. Biophysical barriers fences made of bamboo sticks, coconut tree bunches, or some other available bushes

are low-cost practice but not much efficiency in protecting crops from animals.

V.PROPOSED SYSTEM

This device consists of two units which are given as follow:

1. ATmega16 Microcontroller,
2. L293D Motor Driver.

Ultra-sonic sound originating unit is capable to generate static and dynamic range of sound on sensation of animals and insects. The Printed Circuit Board unit consists of three types of components. Such as:

1. IR Sensor,
2. Piezo-Electric Buzzer, and
3. DC motor.

A. Charging Unit:

For charging function, 12 Volt and 2 A adaptor have been used that provide power to the system. So LM7805 is used to provide 2A current with managed 5V supply which also provides internal thermal protection. LM7805 output is able to provide definite voltage with accuracy, which is very helpful for specification of the components. This 5V is then supplied to the Controller ATMEGA16.

B. DC MOTOR:

The DC motor i.e. Direct current motor converts the direct current to the mechanical energy. A DC motor consist of a rotor, an armature, a stator, and a commutator with brushes. Generally, rotor is placed inside the motor, while the stator is placed outside. The rotor containing coil windings which are powered by DC current and the stator contains either permanent magnets or electromagnetic windings. When DC current is supplied to the motor, a magnetic field is generated within the stator, attracting, and repelling the magnets on the rotor. Due to which rotor starts rotating.

When the rotor gets aligned with the magnetic field, it would stop spinning. So, to keep the rotor rotating, the motor has commutator, that would reverse the current through the stator, this way reverses the magnetic field. This keep the rotor keep rotating.

Fig: 1 DC Motor

C. Micro-Controller:

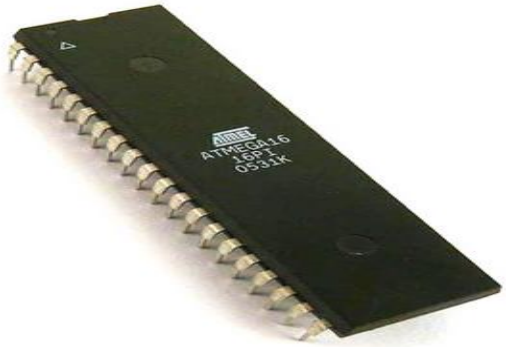

Fig: 2 ATmega16 Microcontroller

ATmega16 microcontroller is an 8-bit high performance microcontroller from the Atmel's Mega AVR family [6]. Atmega16 is 40 pin microcontroller which is predicted on enhanced RISC (Reduced Instruction Set Computing) architecture with 131 powerful instructions. Atmega16 has a 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 Bytes. EEPROM has endurance of 100,000 write/erase cycle and that of flash memory is 10,000. In one machine cycle most of the instructions are executed and can work on a maximum frequency of 16MHz. ATmega16 pin diagram should clarify things a bit as shown in Fig: 3.

The AVR core combines a rich set of instruction with 32 general purpose working register. These registers are directly connected with the Arithmetic Logic Unit (ALU), among which two independent registers allow to access in one single instruction executed in one clock cycle. The RISC architecture is more code

efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers.

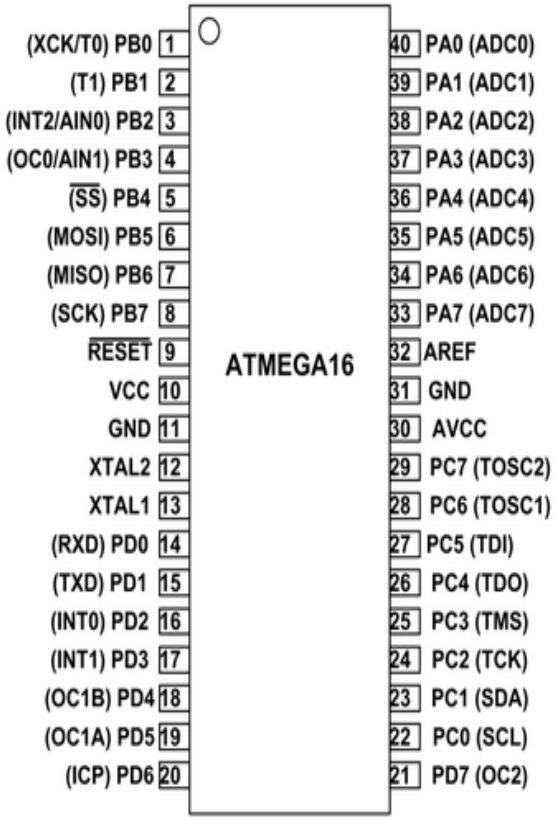

Fig: 3 ATmega16 Pin Diagram

D. Working of the system:

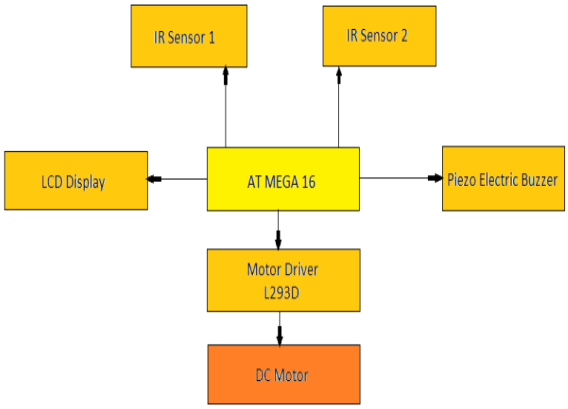

Fig: 4 Block diagram of Animal Repeller

The proposed system uses an ATmega16 microcontroller which is the main heart of the system, the IR sensors and the buzzer are embedded to the system. As soon as the IR sensors go high on detecting an obstacle, the signal will be send to the ATmega16 Microcontroller which then processes the signal and turn on the Piezo-Electric Buzzer.

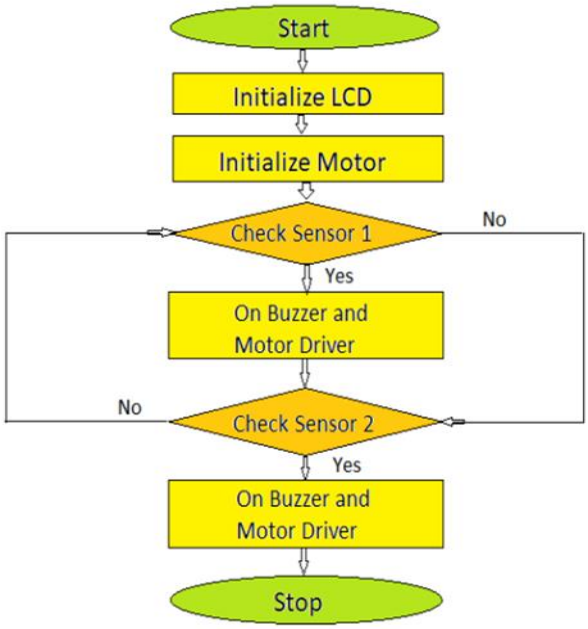

Fig: 5 Flowchart of Animal Repeller

VI. MERITS AND FEATURES

The system is very effective and carries following features and merits in comparison to the other solutions that exist in the current time.

1. Effective, accurate and adaptive:
The system is very efficient in repel off the animals and insects from the fields and keeping them away. It determines the presence of animals in the fields and activates the Piezo-Electric Buzzer. The Piezo-Electric Buzzer is very efficient against animals.

2. Requires no human interaction:
The system requires no human interaction, except the task of switching the system on or off. The system is capable of turning the Piezo-Electric Buzzer on automatically and repel off the animals thus protecting the field from any damage.

3. Cost-effective:
The system is cost-effective as compared to many of the existing solutions like electric fences, brick walls and manual supervision of the fields. Therefore, it saves considerable amount of money of the farmer.

4. Causes no harm to animals and humans:
The system is totally harmless. It does not injure animals in any way. It does not cause any harm to

humans as well. Also, this system requires very less power hence it reduces the hazards of electric shocks.

VII. CONCLUSION

Majority of population of India depends on agriculture. Our farmers are facing lots of problem like intruders or animals attack in agricultural field which eventually lead to economic issues, starvation, or poverty. Up till now this kind of conflicts have been recorded in National Bulletin. So in this project, the main aim of the device is to monitor or vigilant agricultural land by installing sensor which is connected with the buzzer that will drive away animals and prevent them to enter in agricultural land, by creating ultrasonic sound frequency. It has a futuristic provision in the system according to the demand.

VIII. ACKNOWLEDGEMENT

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