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Pest Management using IoT

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***Abstract*— Integrated Pest Management (IPM) is a one of the method to prevent pests. It is an important part of agriculture. Pest management using IoT is inevitable, as it involves database collection using various tools from chemical, biological and mechanical field. IoT simplifies the farmer's task in controlling pests and getting good yield.**

***Index Terms*— Integrated Pest Management; Ultrasonic; IoT, Moisture sensor, Thermistor, ArduinoUno.**

I. INTRODUCTION

Extreme use of pesticides on crops increases the danger to human beings and environment. According to World Health Organization (WHO) every year there are millions of cases of pesticides poisoning and death occurring. Farmers do not have information about accurate application of pesticides and it causes harmful effect on other organisms [1]. Exposing to pesticides leads to health effects like reduced speed of response to stimuli and other health effects like allergies and asthma.

Various types of technologies are emerging for good quality of life. In this work we use Electronic devices to avoid pests. Getting away from the pest is a crucial task because it can affect the hygiene of human beings health. Different pests exist at different range of frequency.

Pest causes many problems to human from centuries. Thus, different methods are implemented like glue boards, toxic baits, pesticides and others were used to kill the pests. These above mentioned methods will also affects human being and environment, thus Ultrasonic was chosen to evict away the pests.

The internet of things has brought the huge opportunities for development of science and social economic. Internet of Things will play an important role for making full use of IoT to develop modern agriculture and current agricultural development.

Almost pests are predicted advance through change in weather changes and moisture level in soil and leaves. These all values are given to or stored in the ontology or any storage can be used by farmers. Changes in the weather like temperature and humidity are measured using weather stations or through sensors for a particular area of coverage. Precautionary measures to be taken are provided through devices like phones and tablets. Users or farmers will get awareness or alerts about the pests on time and can avoid yield loss and when to use pesticides.

In this paper we describe in detail about techniques for avoiding pest. The paper is organized as follows: In section II we discuss about the identification of pests, followed by removal of pests using ultrasonic in section III and about crop cultivation through moisture sensor in section IV followed by conclusion in section V.

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II. Identification of Pest

In this section arrival of pest is identified through the change in atmosphere i.e. most of the pests are identified through change in temperature, moisture of soil and pigment on leaves. Whenever pest arrives the sensed data from the temperature sensor is given to the arduino board. Depending on the pest arrived the ultrasonic sensor will generate the required amount of frequency to kill the pest or to evict the pest from the field. Used temperature sensor in this paper is thermistor, thermistor is one of the type of temperature sensor whose name indicates the words THERM-ally sensitive re-sistor. It is a type of sensor which changes its physical state when it comes in contact with external atmosphere.

III. Pest Removal

Pest control is based on ultrasonic sound. The system should be configurable for various ultrasonic parameters to investigate the effectiveness of the configuration. Sensed data from the temperature sensor is given to the arduino board if any pest is present means it will generate the needed frequency to evict pest from the field. It is known that pests like mice and rats are repelled by ultrasonic frequency between the ranges of 30 kHz to 50 kHz, which human beings cannot hear this high frequency of sounds. But all pests do not react at the same ultrasonic frequency, which some pests get repelled at 35 kHz to 40 kHz.

III. Crop Cultivation

In this section the sensed data from the sensor is taken from moisture sensor and obtained data is given to the decision making process where the data is compared with the sensed data. Stored information web service or any storage like Gmail (free storage in the web service) is compared with the sensed data from the moisture sensor. If the match occurs between the sensed data and the stored value corresponding crop it will display as output through GSM module (Message) and Gmail to the given mail id. Depending on the output users or farmers will decide which crop should be grown for that season.

IV. Block Diagram

Below shown is block diagram of the proposed system which consists of mainly two applications. One of the applications based on the pest management i.e. avoiding pest from the field that is done through the sensed data from the temperature sensor is given to the processor which is used is ARDUINO board. Arrival of pest mostly known by change in atmosphere, if the pest arrive means it is killed or evicted from the field through generating the ultrasonic waves from Ultrasonic sensor. Generated frequency depends on according to the pest arrived, every pest is evicted for different range of frequencies.
The other application is cultivation of crops depend on the contents of the soil. The contents of soil is sensed by the moisture sensor, sensed data from the moisture sensor is compared with stored values if the match occurs it is decided which crop should be grown in that soil. This information will be forwarded to user or farmers through a message.

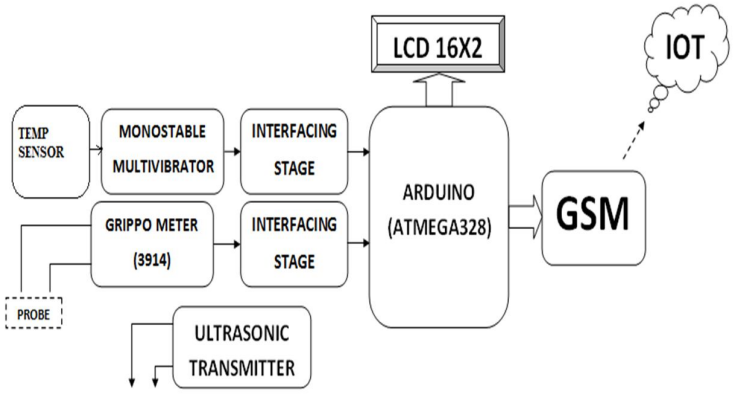

Fig 1. Block diagram of proposed system

V. FLOW DIAGRAM

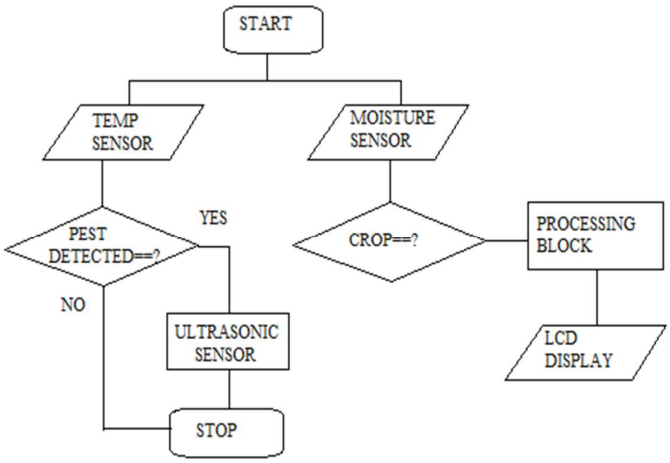

Fig 2. Flow Diagram of proposed system

Above shown fig.2 is flow diagram of the proposed system. This has two applications as shown. In this sensed data from the sensor is given to the decision block, if the data matches it is given to the Ultrasonic sensor to kill the pest otherwise it will stop. The other application is sensing the data from the soil through moisture sensor and given to decision block and decided which crop should be grown on that soil.

VI. RESULTS

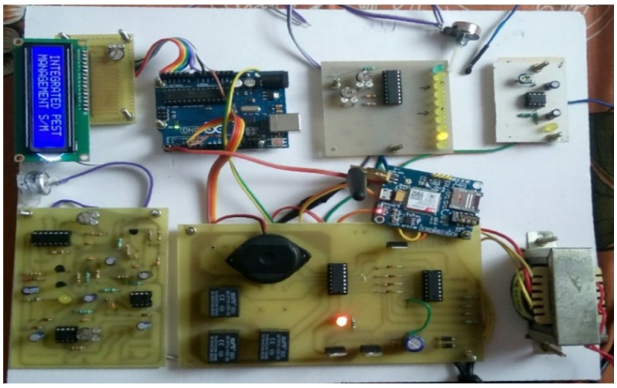

Fig 3. Experimental Hardware

A. Pest Detection

Fig.4. LCD display for pest detection

Above shown fig.4 is LCD display for pest detection. Whenever the temperature is varied through thermistor, then sensed data is obtained, we will get information to the user mobile through GSM module (via message).

B. Crop Cultivation

Fig 5. LCD display for Crop 1

Above shown fig.5 indicates which crop should be grown in the farm, where the sensed data from the soil is taken and decided which crop which should be cultivated.

Fig 6. LCD display for Crop 2

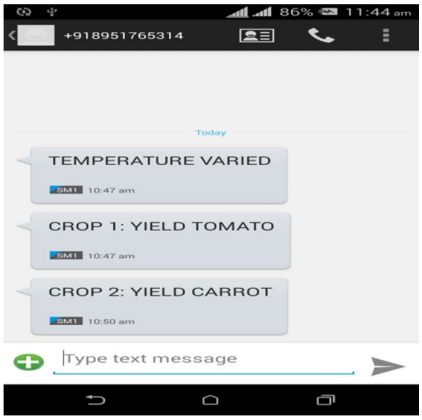

Fig 7.Message received on user's module

Above fig.7 shows the results of the proposed system i.e. messages are received from the module to the given number, which crop should be grown on that soil and temperature variation in field which will indicates the arrival of pest.

VII. Conclusion

Pesticides have severe side effects on human being, therefore it is necessary to give an awareness to the farmers about an Integrated pest Management (IPM), From IPM the farmers will get to know about the clear idea about the different idea of pests and also the usage of different types of sensors to avoid pests, based on the different cultivation they have adopted.

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