Smart Greenhouse Farming Based On IOT

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Abstract- *The farming sector is going to face very large challenges in order to feed the 9.6 billion people that the FAO predicts are going to inhabit the planet by 2050: food production must increase, and this has to be achieved by the suitable water and other less predictable factors, such as the effect of environment change. These drawback overcome and increase the food quality and food quantity of farming production is using sensing technology as well as internet of thing to make farms more "intelligent" and more connected through the so-called 'smart farming'. The fundamental idea of this project is to increase the growth of different varieties of crops with good quality in a closed environment usually a Greenhouse. The proposed system can monitor the changes in parameters like temperature, humidity, soil moisture by integrating the sensors to Raspberry pi and alerts the user through mobile application, and temperature, humidity, soil moisture parameter control through the exhaust fan, submersible motor and mobile application control the buzzer On or Buzzer Off as well as camera capture image and record video of the moving object to Raspberry pi and alerts the user through mobile application.*

Keywords- Internet of thing, Greenhouse, Raspberry Pi, Temprature, Humidity, Soil moisture, Pi Camera

I. INTRODUCTION

Agriculture is the main occupation of our country. and we can not live without farmers in our country. It is the duty of every person to think about agriculture and farmer and provide solution to the problems which in the field of agriculture.

Now it is the time to think about "Internet of Things" which can easy to use and provide more functionality in the agriculture. Nowadays farmers also use technology in their work. Every farmer use mobile easily. So it is easy to reach the farmers from internet. Nowadays there are not sufficient water for crop because of lack of rain. various crops needs different amount of water. So without wasting of water we provide water on their need. Basically there is a huge amount of population it is good that all people should be served. It is needed to grow sufficient yields, which will provide sufficient food for all country, proper usages in the agriculture field is the intelligence. This can be done by using the sensors & technology, which will sense and give the information about crops.Nowadays security is the most important thing which is going to be considered in every field. Same like, providing security in the agriculture is the necessary.

Information can be collected from all sensors which are located on different farm lands, so that data can be collect, stored and analyze. The smart agriculture with intelligent security system will be the suitable way to get the security to the field as well as to the grain store. In this paper we can monitor sensor data using "internet of thing" & control through android mobile application.

II. METHODOLOGY

In the proposed work, we introduce our internet based smart greenhouse farming system based on Raspberry Pi.

A. Implementation

Now we are considering four parameters in which we are interested to get the data from field and addition to this, integrating security system with the existing system.

The information can be got from the field through five types of sensors and raspberry pi act as a server which will make decision and activate controllers.
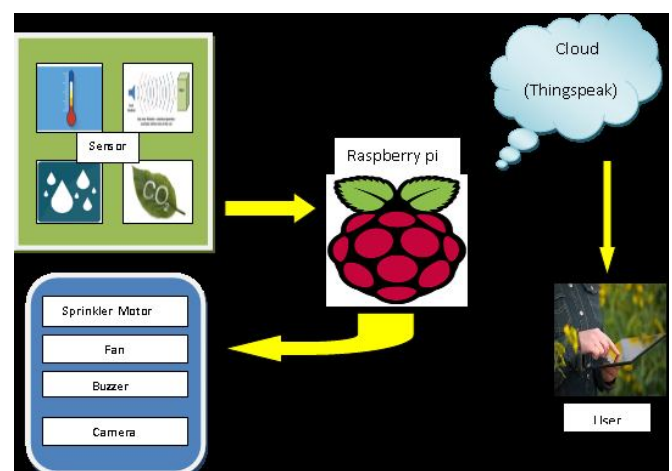

Fig. 1 System Block Diagram

These five sensors will sense the current status about the field and send it to raspberry pi which will analyze the data and make decision, which actuators can be activated based upon their respective sensor values. Example, if temperature in the soil is more than the threshold values then the motor of sprinkler will be activated to supply water to the field. Similarly for Gas –buzzer, for Humidity-Fan, for Motion-camera. Then the values taken by the raspberry pi will be sent to the android mobile application, so that user can access it and can get information about variations happened in the field. The hardware and software coordination will lead to most wonderful product and that product can be used in any application field and new ideas may get arise. As we know technology has begun to run like anything. The connection of hardware components should be done very carefully. If any mistake happens then it may lead to get damage of The sensors and controllers (actuators) should be connected to some points in the Raspberry Pi . Raspberry Pi consists of 40 pins, in that some are GPIO pins, some are GND, some are ID EEPROM pins and some are few voltage pins. Input and Output devices can be connected to the General Purpose Input Output (GPIO) pins. The connection as well as hardware kit is shown in figure 2.
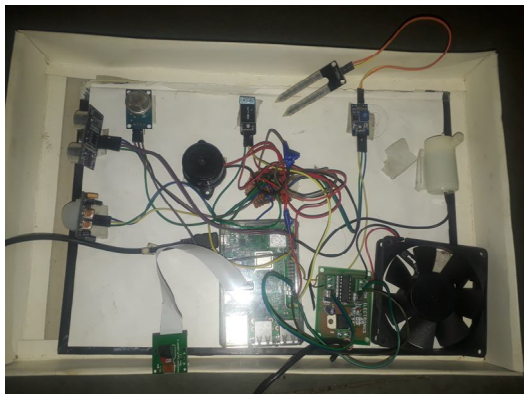

Fig. 2 System Setup

Before this, Raspbian operating system install on the SD card. To provide this we need to install software Python code in SD card. All function task which is needed for us should be written. And SD card should be inserted in the socket which is present on the Raspberry Pi hardware device. Then for giving input as text or for selecting some option keyboard and mouse are connected to USB ports. There are four USB ports for this Raspberry Pi.keyboard and mouse. And one USB port for connecting camera.

Another one socket is HDMI which provided for connecting monitor. One more socket given for internet connection which is Ethernet. We used a relay device for triggering the fan. DHT, motor driver, fan provided power through adapter. Motor driver is used which will help to run motor.

B. System Components

Raspberry Pi

This is visiting card-sized single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote the teaching of basic computer science in schools and developing countries. A Raspberry Pi is a general-purpose computer, usually with a Raspbian operating system, and the suitable for Multilanguage program. Raspberry Pi is better used when you need a fully-developed computer: driving a more difficult robot, performing multiple tasks, doing big calculations. Raspberry Pi board is a fully functional computer or fully- developed credit card sized. It has processor, and a graphics card for output through HDMI. It also runs the updated vesion of the raspbian OS. Raspberry Pi use as a video broadcasting or media streamer with a bit of effort.

Fig.3 Raspberry Pi

Soil Moisture

Soil sensor measures the moisture content insoil. This soil moisture sensor consists of two metal rods held apart at a fixed distance by some insulating material.Two metal rods pass current through the soil andresistance is measured. If the water is more, resistance is low and if the water is less, resistance is high. It also contains potentiometer to vary the sensitiveness of the sensor. Features are low power consumption, high sensitivity, Raspberry Pi compatible interface and the operating voltage is 5V.
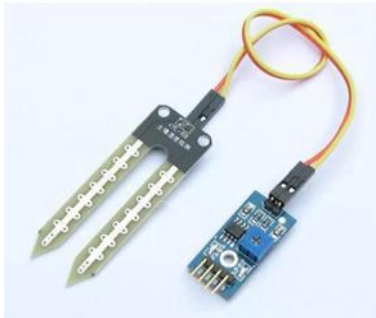
Fig.4 Soil Moisture

DHT 11 Sensor

DHT11 sensor is used to measure both temperature andhumidity. It is a low cost temperature and humidity sensor. It has high reliability, high efficiency and long-time stability. It has a thermistor for measuring the temperature and a humidity measuring component for measuring humidity.
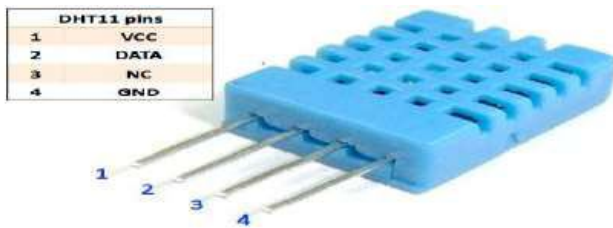

Fig.5 DHT 11 Sensor

MQ-2 Sensor

The MQ-2 Gas sensor can detect or measure gasses like CO2 and even methane. The MQ-2 sensor operating voltage is +5V. It has fast response and high sensitivity. The sensitivity of MQ-2 sensor can be adjusted by potentiometer. The sensitivity of MQ-2 sensor can be adjusted by potentiometer.

Fig.6MQ-2 Sensor

PIR Sensor

A PIR sensor means passive infrared sensor that measures infrared (IR) light radiating from objects in its field of view. They are used in PIR-based motion detectors. PIR sensors are basically used in security alarms and automatic lighting applications. PIR sensors detect moving person, but do not give information on who or what moved. For that reason, an active IR sensor is required.

Fig.7 PIR Sensor

III. SOFTWARE

Raspbian Operating System

All the information regarding installing the operating system is available at Raspberry Pi website www.raspberrypi.org. I would prefer to install Raspbian operating system on the micro SD card. The files needed for installation are available at www.raspberrypi.org/downloads. They are viz. NOOBS and RASPBIAN.

Fig.8 Raspbian OS

Python Programming Language

I would prefer to write the interfacing program in Python programming language. The Python compiler comes free with the Raspbian operating system.Python is an interpreted high-level programming language for general-purpose programming. It suitable for multiple programming language, including object-oriented &comprehensive standard library.Python interpreters are available for many operating systems. Cpython has a community-based development model, as do nearly all of Python's other implementations. Python and C Python are managed by the non-profit Python Software Foundation.

I will test each sensor individually in order to simplify the project. This means writing the interfacing

programs separately. Once all the sensors are tested OK, I will incorporate everything in a single program. Monitoring various parameters on Android mobile application.

IV. RESULT & DISCUSSION

Now this is the time to discuss about the major part of this whole implementation.

A. Cost and Analysis

In the agriculture it is mandatory to use hardware. Without hardware not possible to done farming, But we have to check low cost which will do more work and finally which is more durable one.The hardware which we have used for implementation is listed in below table 2 with their cost.
Table 1 : Cost of Component

Sl. NO.	HARDWARE	COST in rs
1.	Raspberry Pi	2800
2.	Camera	800
3.	Ultrasonic sensor	249
4.	IR sensor	110
5.	Moisture Sensor	145
6.	Humidity sensor	120
7.	Sprinkler Motor	600
8.	FAN	150
9.	Buzzer	200
10.	Other devices (approx)	900
	Total	6074

B. Data Analysis in Mobile Application

Our main goal is to provide security to the agriculture field it can be a field or Greenhouse by putting intelligent camera system in the field as well as in store room. Normally we used five sensors they are: temperature, humidity, gas, motion detection, distance sensor and as discussed above there are controllers too. Each sensor will do its work that is sensing the changes of climate, and these values will be stored and based upon them we can control the farm land. For example, when motion detected then capture snapshot image

1 & image 2 & record 20 sec video and send to Raspberry pi and then this image as well as video send to android mobile application.
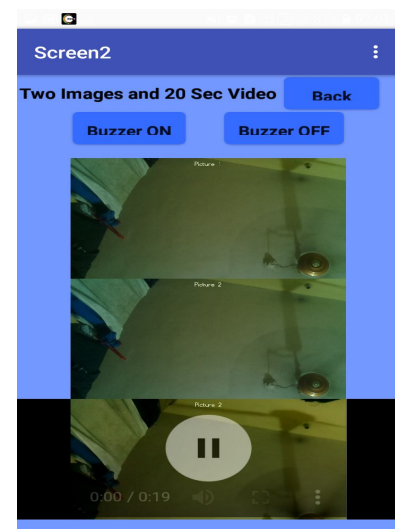

Fig.9 Monitor sensor value data

Fig.10Monitor Image & Video data

V. CONCLUSION

Greenhouses require proper environmental conditions for optimal plant growth and health. If the mixture of temperature, humidity, and soil moisture are incorrect, crops can be lost. We have to monitor and maintain the proper mix of all the above for achieving more productivity in greenhouses. Internet of things based Greenhouse can monitor and control from office, trip or anywhere so that plants are always with us. Beyond the traditional greenhouses, the proposed system can

Control temperature and humidity Automatically manage and remote monitor.

VI. ACKNOWLEDGMENT

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