SMART AGRICULTURE USING LOW COST SENSORS

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Abstract: Internet of things (IoT) plays a crucial role in smart agriculture. Smart farming is an emerging concept, because IoT sensors capable of providing information about their agriculture fields. IoT plays an important role in agriculture industry which can feed 9.6 billion people on the Earth by 2050.Smart Agriculture helps to reduce wastage, effective usage of fertilizer and thereby increase the crop yield. The paper aims making use of evolving technology i.e. IoT and smart agriculture using automation. In this work a system is developed to monitor crop field using sensors (Soil Moisture, temperature and humidity). The data from the sensors are send to aws cloud and through aws the notifications regarding the field were sent to farmer's mobile periodically. The farmers' can able to monitor the field conditions from anywhere.

I. INTRODUCTION

Agricultural lands are the heart of any country for economic development. Thus it is the primary duty of the Government to preserve and protect the fields by any means. Science and new technologies have evolved but nothing could replace the dependency on agricultural farm lands. At present, India holds the 2ndpositionin the farm output. Over 70% of the rural households depend on agriculture as their principal means of livelihood. Growth in agricultural sector is necessary for the development of economic condition of the country. Unfortunately, many farmers still use the traditional methods of farming which results in low yielding of crops and fruits. But wherever automation had been implemented and human beings had been replaced by automatic machineries, the yield has been improved. Hence there is need to implement modern science and technology in the agriculture sector for increasing the yield. If we consider the traditional methods nearly 80% of the 140 million Indian farming families hold 2 acres of land. As land holdings are small, more people invariably work on the farms in rural areas and coupled with the obsolete technology of traditional manual methods, thus productivity gets limited and farm incomes come down.

1. Inefficient Soil Condition Testing:

Sometimes it happen when the seeds failed to germinate properly or abnormal growth or dysfunction of a plant (ex. white mole). The reasons could be improper soil preparation, planting in cold soil, extremes of watering, improper use of fertilizer etc. It is very much disappointing to have prepared the soil and sown the seed, only to have a partial or complete failure of germination. That's the reason it is very much essential to test the soil before seeding. Only by seeing the field or by experience it is quite difficult to get an accurate assumption of the soil moisture, pH level, temperature and humidity. It is impossible for the farmers to keep update about the conditions of the agricultural lands all the time

.2. Lack of Data Management System:

When a farmer have to manage more than one field, due to the lack of proper technology he/she has to memorize all the condition (or status) of the fields and take appropriate decisions but there is a chance that farmer may not memorize properly and takes a wrong decision.

3. Incompetent Scarecrow Many crops are damaged by birds, with a little knowledge available of actual economic loss is done by House Sparrows, House Crow etc. Often animals are derided as pests as they cause damage to agriculture by feeding on crops or parasitizing livestock. Farmers generally keep a scarecrow in the land to distract the birds but birds getting cleverer and they ignore those scarecrows as they don't take any action, and also it is impossible for the farmers to remain all the time in the field to them away from the farms.

II. METHODOLOGY

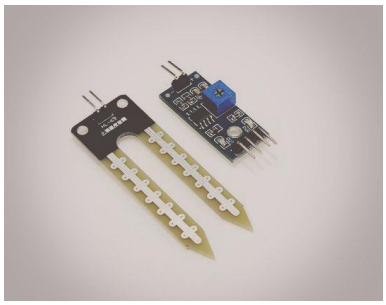
To solve the above mentioned problems and to reduce the manual effort of the farmers we took a step towards automation and develop these smart system and here, we address each and every module as a component of the "Smart Agricultural System".

RASPBERRY PI: A Raspberry Pi is a general-purpose computer, usually with a Linux operating system, and the ability to run multiple programs. Raspberry Pi board is a fully functional computer or full-fledged credit card sized. It has all the trappings of a computer, with a dedicated memory, processor, and a graphics card for output through HDMI. It even runs a specially designed version of the Linux operating system and it is easy to install in most Linux software, and used the Raspberry Pi as a functioning video game emulator or media streamer with a bit of effort. Though the Raspberry Pi doesn't offer internal storage, we can use SD cards as the flash memory in

the total system, allowing you to quickly swap out different versions of the operating system or software updates to debug. Because of this device is independent network connectivity, you can also set it up to access via SSH, or transfer files to it using FTP. It is having 512 MB RAM, 700 MHz microprocessor and hardware support for SPI, I2C and Serial.

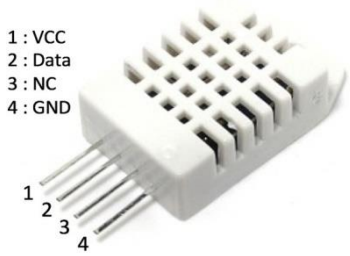
Soil & Surrounding Testing Module:

A solution to resolve the difficulty of manual soil testing and the surrounding environment will be very much helpful for the farmers. An automated analysis can be done by this module with which a farmer will be aware of the soil moisture level, pH, temperature, humidity. It will be further helpful for the farmer to make the decision that if seeds can be sprout or more water and fertilizer is required or not. The module will show every details of the soil condition on a LCD screen. The module is made of different sensors like moisture sensor (YL69), temperature sensor (LM35), pH sensor (SEN0161), humidity sensor (DHT11).By pressing a button a farmer can know about various conditions of the soil. It helps the farmer to increase the knowledge of the environment.



Temperature and Humidity Sensor:

The DHT11 is a basic, low-cost digital temperature and humidity sensor. It gives out digital value and hence there is no need to use conversion algorithm at ADC of the microcontroller and hence we can give its output directly to data pin instead of ADC. It has a capacitive sensor for measuring humidity. The only real shortcoming of this sensor is that one can only get new data from it only after every2seconds.



Rain Alert System A rain sensor or rain switch is a switching device activated by rainfall. There are two main applications for rain sensors. The first is a water conservation device connected to an automatic irrigation system that causes the system to shut down in the event of rainfall. The second is a device used to protect the interior of an automobile from rain and to support the automatic mode of windscreen wipers.

Electronic Scarecrow: Equipment is required to help the farmer to get rid of this unsustainable problem. So, when it comes to keep birds, raccoons and other pests away from the farmland, the Electronic Scarecrow (PIR sensor) Unit is one of the best ideas we have encountered. Electronic scarecrow can be used to keep pests off from farmland. It is not like an ordinary scarecrow, used to distract or to scare the birds or animals, but a unique module to keep the threats away from the crops. PIR sensors are made of pyro-electric material

which has two slots in it. When an object like bird passes by, it first intercepts one half of the sensor which causes positive differential change between the two halves and when the object leaves the reverse happens which generate a negative,

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Thus changes of pulses are detected. HT-7133 voltage regulator, BIS0001 micro power PIR motion detector IC, Fresnel lens helps for the operation. When any object is detected the unit will perform some actions to keep them away from the crops. A buzzer may be used in this module to make a noise to keep the unwanted species away.

AWS Cloud: Amazon Web Services (AWS) is Amazon's cloud web hosting platform that offers flexible, reliable, scalable, easyto-use, and cost-effective solutions. This has been used as back end for processing the data. This is the basic structure of AWS EC2, where EC2 stands for Elastic Compute Cloud. EC2 allow users to use virtual machines of different configurations as per their requirement. It allows various configuration options, mapping of individual server, various pricing options, etc.

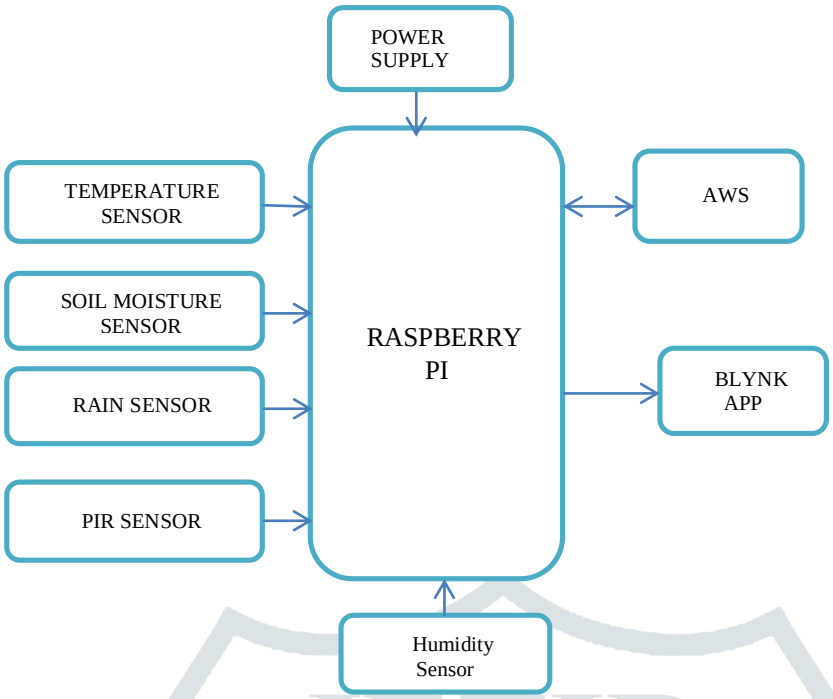
Raspbian Operating System: Raspbian operating system is free and open source operating system which debian based and optimized for Raspberry Pi. It provides the basic set of programs and utilities for Raspberry Pi. It comes with around 35,000 packages which are pre-compiled software's that are bundled in a nice format for hustle free installation on Raspberry Pi .It has good community of developers which runs the discussion forms and provides solutions to many relevant problems. However, Raspbian OS is still under consistent development with a main focus on improving the performance and the stability of as many Debian packages as possible. Raspbian uses PIXEL, Pi Improved Xwindows Environment, Lightweight as its main desktop environment as of the latest update. • It is composed of a modified LXDE desktop environment and the Open box stacking window manager with a new theme and few other changes. • The distribution is shipped with a copy of computer algebra program Mathematica and a version of Minecraft called Minecraft Pi as well as a lightweight version of Chromium as of the latest version.

Python:

Python is an interpreted high-level programming language for general-purpose programming. Here for this system we use python programming language to sense the data from sensors through raspberry pi. Python has a design philosophy that emphasizes code readability, and syntax that allows programmers to express concepts in fewer line of code. . It provides constructs that enable clear programming on both small and large scales.

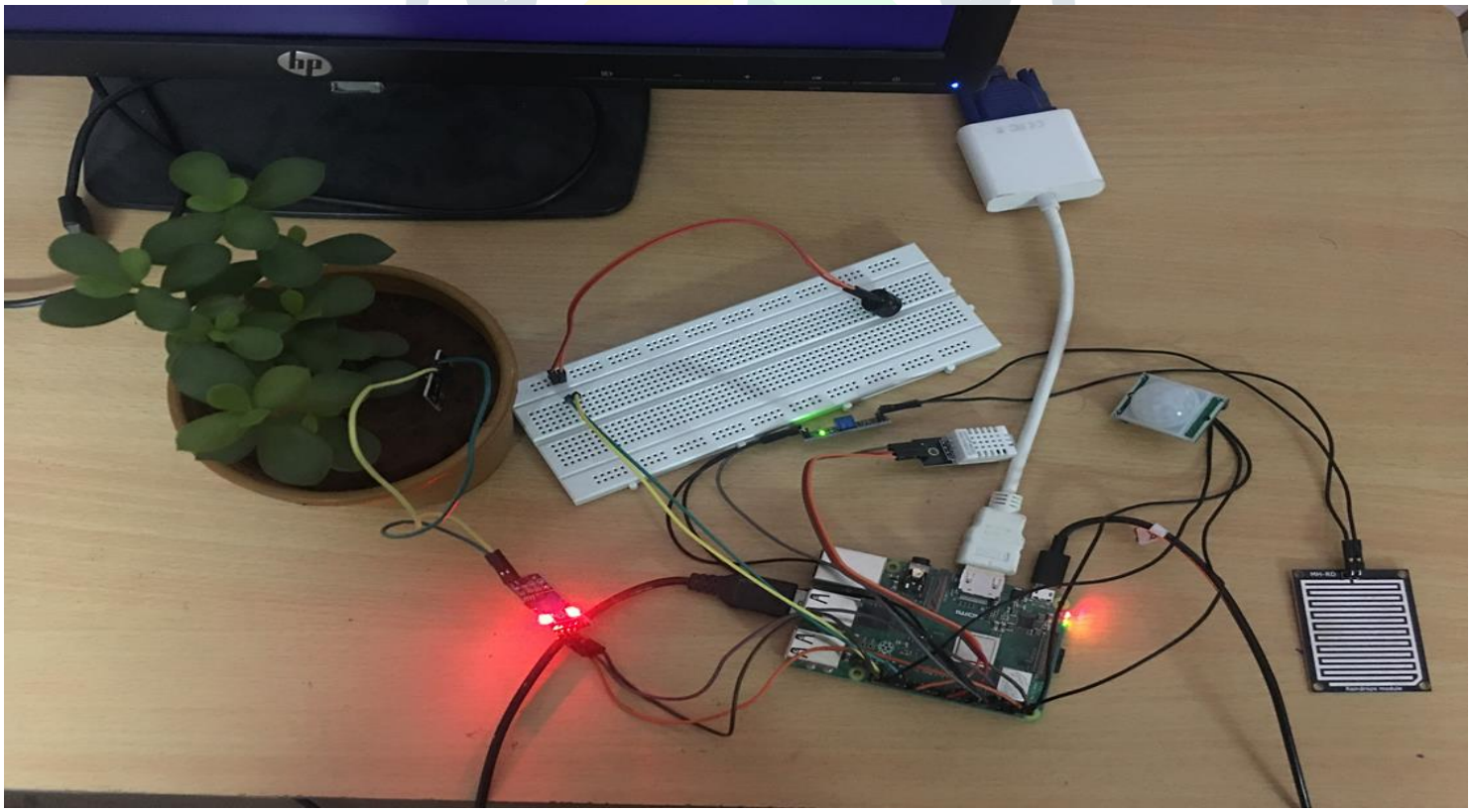
III. SYSTEM DESIGN

The block diagram of the Smart Agriculture System where sensors been connected to the raspberry pi and the power supply has been given to the system where soil moisture sensor senses the moistures of the soil which helps the crop to yield properly also the humidity and temperature sensors which the sense the temperature and humidity of the place and gets updated at every 5 minutes and then the rain detecting sensor it is used to give an alert regarding the rain and finally the pir sensors which helps to know the motion of the thing or person where the farmers get sms alerts through aws system and through the blynk app they view the data. AWS System (Amazon Web Services) is a cloud system where the data from raspberry pi stored in cloud and the clients or the farmers get the notifications through aws (sns) through these service the aws sends notifications to client when the sensors values crosses its threshold value.



IV. EXPERIMENTAL SETUP

The sensors are connected to raspberry pi and power supply is given. The raspberry pi reads the values from Sensors and posts the information to the cloud server. If the values are less than the already set threshold values, then the farmers get the alert notifications i.e. for example if the temperature and humidity were more than the normal temperature then soil content will be dry which leads to the low moisture in soil where the crops doesn't yield properly. Also the people can view the data in blynk app. The connections of the experiment are shown below.



V. CONCLUSION

There are many reasons to implement a smart agriculture solution into commercial and local farming. In a world where the Internet of Things (IOT) is accelerating adoption of automation and data gathering, an important industry such as agriculture can surely be benefited and our project of making agriculture in a smarter way will definitely help in the growth of this industry. By testing the soil with our module, farmers and gardeners will have an accurate data on the condition of the soil i.e. the temperature, pH, moisture level and also the humidity of the surrounding testing soil helps to increase the productivity by identifying soil nutrients or soil chemical factors that are limiting plant growth and increases fertilizer use efficiency by indicating appropriate rates for different soils and crops. 'Smart Agriculture Solution' can be used in so many platforms or organizations related to agriculture or cultivation. Ex- Farmers, Gardeners, Institute of Food and Agricultural Sciences, Ministry of agriculture, Horticulture: Greenhouse Cultivation, Nursery Cultivation.

VI. REFERENCES

1. J. John, V. S. Palaparthy, S. Sarik, M. S. Baghini, G. S. Kasbekar, "Design and implementation of a soil moisture wireless sensor network", 2015 Twenty First National Conference on Communications (NCC), pp. 1-6, 2015.

2. Chetan Dwarkani M, R Ganesh Ram, S Jagannathan, R. Priyatharshini, "Smart agriculture system using sensors for agricultural task automation", 2015 IEEE International Conference on Technological Innovations in ICT for Agriculture and Rural Development (TIAR 2015)

3. S. R. Nandurkar, V. R. Thool, R. C. Thool, "Design and Development of Precision Agriculture System Using Wireless Sensor Network", IEEE International Conference on Automation, Control, Energy and Systems (ACES), 2014