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Automatic Soil Detection Using Sensors

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***Abstract*—** Soil fertility is an important factor to measure the quality of the soil as it indicates the extent to which it can support plant life. The fertility of soil is measured by the amount of macro and micronutrients, water, pH etc. The concept of Smart Agriculture is becoming a reality as it evolves from conceptual models for the development of crop at different stages. Previously the agriculture is the cultivation of the plants which is used to sustain and enhance human life. Now the Smart Agriculture has come into the picture globally. Smart Agriculture is nothing but the usage of the resources in a smarter way. Resources include sustainable land usage, fresh water usage, and usage of pesticides and insecticides which increases the crop production and supports the farmers' income. Firstly the developed Sensor kit will be checking the Soil type and Soil Quality. Later the different tests are performed on soil such as bulk density test, respiration test, moisture test and it also needs to check the water quality. By considering the results obtained by the above tests the device suggests the crop for the farmer and it also helps him for the maintenance of the crop. To keep the services of Smart Agriculture the IOT plays a key role.

Keywords – *Soil fertility; sensors; crop detection.*

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I. INTRODUCTION

As the world is trending into new technologies and implementations it is a necessary goal to trend up in agriculture also. Many researches are done in the field of agriculture.

Most projects signify the use of wireless sensor network collect data from different sensors deployed at various nodes and send it through the wireless protocol. The collected data provide the information about the various environmental factors. Monitoring the environmental factors is not the complete solution to increase the yield of crops. There are number of other factors that decrease the productivity to a greater extent. Hence automation must be implemented in agriculture to overcome these problems. So, in order to provide solution to all such problems, it is necessary to develop an integrated system which will take care of all factors affecting the productivity in every stage. But complete automation in agriculture is not achieved due to various issues. Though it is implemented in the research level it is not given to the farmers as a product to get benefitted from the resources. Hence this paper deals about developing smart agriculture using IoT and given to the farmers. Techniques for automatic seeding, weeding, herbicide spraying, harvesting the crops has been proposed and implemented. Use of advanced techniques like automatic systems for irrigation and modern crop varieties reduced the dependence on manual labor and increased the yield obtained at the same time.

In this paper we firstly check the Soil type and later the Soil Quality is to be tested using sensors. Here the quality of the soil can be decided by considering different soil tests like humidity test, temperature test, moisture test. The results obtained by the tests are to be considered and according to the results we suggest the farmer which type of crop is suitable for that particular soil.

II. LITERATURE SURVEY

The existing method and one of the oldest ways in agriculture is the manual method of checking the parameters. In this method the farmers they themselves verify all the parameters and calculate the readings. [1] An automated system has been developed for the controlled addition of fertilizers in order to avoid excess/ deficient fertilizers in the soil.[2]It aims at making agriculture smart using automation and IoT technologies. The highlighting features are smart GPS based remote controlled robot to perform tasks like weeding, spraying, moisture sensing, human detection and keeping vigilance. [3]The cloud computing devices that can create a whole computing system from sensors to tools that observe data from agricultural field images and from human actors on the ground and accurately feed the data into the repositories along with the location as GPS coordinates.[4]This idea proposes a novel methodology for smart farming by linking a smart sensing system and smart irrigator system through wireless communication technology.[5]It proposes a low cost and efficient wireless sensor network technique to acquire the soil moisture and temperature from various location of farm and as per the need of crop controller to take the decision whether the irrigation is enabled or not.[6]It proposes an idea about how automated irrigation system was developed to optimize water use for agricultural can be decided by considering different soil tests like bulk temperature test, humidity test, moisture test. The results obtained by the tests are to be considered and according to

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III. PROPOSED WORK

In the field section, various sensors are deployed in the field like temperature sensor, moisture sensor and PIR sensor. The data collected from these sensors are connected to the microcontroller

GSM MODULE

GSM Modem can accept any GSM network operator SIM and it can act just like a mobile phone with its own unique phone number. The necessity to use this is it can use RS-232 protocol which can be easily connected to the controller. It can be used like a phone where it can send and receive SMS and make a call.

The GSM modem is connected to the controller through RS232. The SMS is sent through the terminal to the number using AT Commands. “AT-Attention” commands which is used by the controller to control the GSM to perform the desired function. It also has reverse voltage protection and the LED notifications. It is operated in 900/1800 MHz.

TEMPERATURE SENSOR

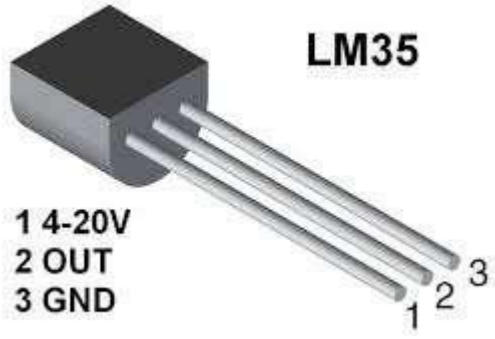

Figure 2: Temperature Sensor

The LM 35 sensor is highly used because its output voltage is linear with the Celsius scaling of temperature. It does not provide any external trimming. It has a wide operating range. The maximum output is 5V. The output will increase 10mV for every one degree rise in temperature. The range is from -55 degrees to +150 degrees. There are three terminals

SOIL MOISTURE SENSOR

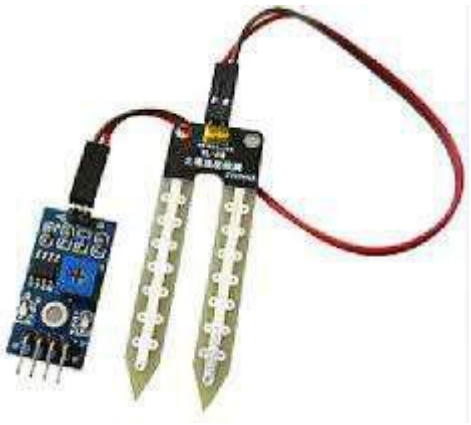

Figure1:Soil Moisture Sensor

Soil moisture sensor is a sensor which senses the moisture content of the soil. The sensor has both the analog and the digital output. The digital output is fixed and the analog output threshold can be varied. It works on the principle of open and short circuit. The output is high or low indicated by the LED. When the soil is dry, the current will not pass through it and so it will act as open circuit. Hence the output is said to be maximum. When the soil is wet, the current will pass from one terminal to the other and the circuit is said to be short and the output will be zero.

as Vcc, Ground and the analog sensor. It consumes minimum amount of electricity. Thus, it is energy efficient. It is very efficient in horticulture. It is user friendly to use.

HUMIDITY SENSOR

Figure 3 : Humidity sensor

A humidity sensor (or hygrometer) senses, measures and reports both moisture and air temperature. The ratio of moisture in the air to the highest amount of moisture at a particular air temperature is called relative humidity. Relative humidity becomes an important factor, when

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looking for comfort. Humidity sensors work by detecting changes that alter electrical currents or temperature in the air. There are three basic types of humidity sensors: capacitive, resistive and thermal. All three types of sensors monitor minute changes in the atmosphere in order to calculate the humidity in the air.

IV. Soil Quality Testing

The Soil Quality Testing plays a key role in the Smart Agriculture, because based on the results obtained by the tests performed on the soil we suggests the crop to the farmer.

There are two fundamental ways to assess soil quality:

1. Take measurements periodically over time to monitor changes or trends in soil quality.

2. Compare measured values to a standard or reference soil condition.

Type of Soil	Crop
Black Soil	Cereal crops,Sunflower
Red Soil	Maize ,groundnut
White Soil	Soyabean
Alluvial Soil	Cotton ,Rice, wheat

Table Describes 5 types of Soil and Crop suggested for that particular Soil.

V. Implementation Strategy

1. HTML and CSS

Hypertext Markup Language (HTML) is a markup language used for creating web pages or other information to display in a web browser. The structured documents are created by using structural semantics for text such as headings, links, lists, paragraphs, quotes etc. CSS (Cascading Style Sheets) is designed to enable the separation between document content (in HTML or similar markup languages) and document presentation. This technique is used to improve content accessibility , provides more flexibility and control in the specification of content and presentation characteristics. This enables multiple pages to share formatting and reduce redundancies.

2. PHP and Java

PHP (recursive acronym for PHP: Hypertext Preprocessor) is a widely-used open source general-purpose server side scripting language that is especially suited for web development and can be embedded into HTML.

Java is a general-purpose computer-programming language that is concurrent, class-based, object-oriented and specifically designed to have as few implementation dependencies as possible.

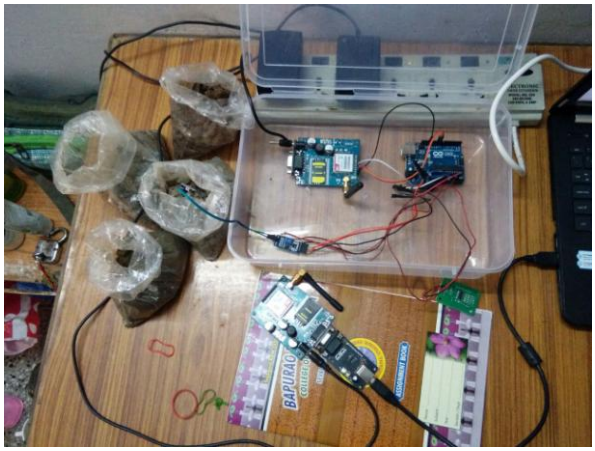
3. MySQL

MySQL is the most popular open source RDBMS which is supported, distributed and developed by Oracle. In the implementation we are using it to store Soil data which are of different types

VI. EXPERIMENTATION & RESULTS

The hardware is interfaced with all the sensors in the board. The hardware components include the microcontroller, GSM module and all the sensors interfaced. The board is inserted with a SIM card which is used to communicate with the owner and the recorded values.

The output show the temperature, soil moisture condition and the intruder detection. The second result is the output from the Android Application that is developed in the mobile phone. It determines the temperature, humidity, moisture and the intruder detection.



VII. CONCLUSION

The Smart Agriculture has to be used for an effective growth of the crop and by using it we can maintain the health of the crop. This is relatively a modern research field and it is expected to grow in future. There is lot of work to be done on this emerging area. Here we get a basic knowledge that how the soil quality can be tested and based on the tested results the kit suggests the crop to the farmer which helps for the better growth of the crop and crop production, in farming of the Smart Agriculture.

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REFERENCES

[1] Amrutha A, Lekha R, A Sreedevi"Automatic Soil Nutrient Detection and Fertilizer Dispensary System"2016

[2] K.Lakshmisudha, Swathi Hegde, Neha Kale, Shruti Iyer, " Smart Precision Based Agriculture Using Sensors", International Journal of Computer Applications (09758887), Volume 146-No.11, July 2011.

[3] Nikesh Gondchawar, Dr. R.S.Kawitkar, "IoT Based Smart Agriculture", International Journal of Advanced Research in Computer and Communication Engineering (IJARCCE), Vol.5, Issue 6, June 2016.

[4] Chetan Dwarkani M, Ganesh Ram R, Jagannathan S, R. Priyatharshini, "Smart Farming System Using Sensors for Agricultural Task Automation", IEEE International Conference on Technological Innovations in ICT for Agriculture and Rural Development (TIAR 2015).

[5] 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

[6] Joaquín Gutiérrez, Juan Francisco Villa-Medina, Alejandra Nieto-Garibay, and Miguel Ángel PortaGándara, "Automated Irrigation System Using a Wireless Sensor Network and GPRS Module", IEEE Transactions on Instrumentation and Measurements.

[7] Dr. V .Vidya Devi,G. Meena Kumari, "Real- Time Automation and Monitoring System for Modernized Agriculture" ,International Journal of Review and Research in Applied Sciences and Engineering (IJRRASE) Vol3 No.1. PP 7-12, 2013.

[8] Meonghun Lee, Jeonghwan Hwang, Hyun Yoe, "Agricultural Protection System Based on IoT", IEEE16th International Conference on Computational Science and Engineering, 2013.

[9] Monika Jhuria, Ashwani Kumar, Rushikesh Borse, "Image Processing for Smart Farming: Detection of Disease and Fruit Grading", IEEE Second International Conference on Image Information Processing (ICIIP), 2013.