

IMPLEMENTATION OF SOIL NUTRIENT MEASUREMENT USING RASPBERRY PI

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Abstract - Developments of agriculture victimization technology are significantly helpful in cultivation .For a brand new agricultural, while not knowing or watching the necessary parameters of the mineral of the soil, cultivation is less .Then the farmers suffer monetary losses. This paper provides a quick summary of the mineral soil victimization sensors. Different mineral soil sensors to measure temperature, wet and lightweight, humidness and pH worth are used. The signal from the sensors to the Raspberry pi device and it sends to the cloud. Finally we will see the data saved to cloud. The requirement of the crop minerals are comparing with sensor value. Any minerals deficiency in the soil. The farmer will be add requirement level to the mineral, therefore this advanced technology helps the farmers to grasp the correct parameters of the soil therefore creating the soil testing procedure easier.

Key Words: Agriculture, Sensors, Cultivation, Soil Parameter, Temperature

1. INTRODUCTION

Soil monitoring is a basic procedure which is required for farming. 26% of the Earth's surface is uncovered as land. All mankind lives on the earthbound, strong Earth included bedrock and the weathered bedrock called soil. Soil is a blend of inorganic mineral particles and natural matter of differing size and arrangement. The particles make up around 50 % of the dirt's volume. Pores containing air and water involve the rest of the volume. The vital parameters should have been measured in the dirt are temperature, dampness, mugginess and light. Nowadays, an agricultural industry is one part that is an imperative wellspring of economic growth. Horticulture is viewed as the nation's best field that productive.

1.1 Proposed System

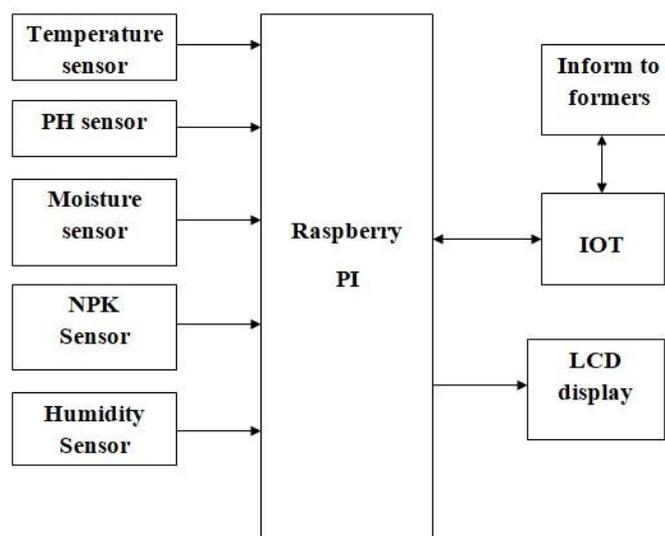


Fig- 1: Proposed diagram

In this paper it was proposed to actualize a remote sensor organize associated with unified essential hub utilizing ZigBee, which was Central Monitoring Station (CMS) through Global System for Mobile (GSM) technologies or General Packet Radio Service (GPRS). A rural part utilizes the labor to work, for example, utilizes the manual framework to screen the dirt condition yet they not effectiveness and temperamental to gather information. What's more, by utilizing the manual framework; a great deal issue can happen, and for instance, it will diminish the efficiency and nature of the item. No sensor to control the clammy and makes trouble to people to investigate the dirt condition. It will take more expenses to research or screen the issue and sit around idly or vitality to get the outcome.

1.2 Working Principle

This framework infers checking different factors, for example, moistness, soil dampness and gives remote observing utilizing ZigBee which sends information remotely to a focal server which gathers information to enable it to be shown as required and further more absent to the customer versatile. In this project we design the system which is useful for the agriculture. The temperature sensor, analog moisture sensor, humidity sensor and PH value should be kept in the soil of two samples. This raspberry pi Module sends the information to the cloud then the user can see the soil parameter information on the mobile phone as well as laptop using web browser in the form of graph.

2. MATERIALS AND METHODS

We are using Raspberry pi, PH sensor, Temperature Sensor, Moisture Sensor, NKP Sensor, Node MCU for this project.

2.1 Raspberry PI

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation. The original model became far more popular than anticipated, selling outside its target market for uses such as robotics. It does not include peripherals or cases. However, some accessories have been included in several official and unofficial bundles. The Raspberry Pi is a capable little computer which can be used in electronics projects, and for many of the things that your desktop PC does, like spreadsheet, word processing, browsing the internet, and playing games.



Fig- 2: Raspberry Pi

2.2 Temperature Sensor

Temperature sensors are devices used to measure the temperature of a medium. There are 2 kinds on temperature sensors: 1) contact sensors and 2) noncontact sensors. However, the 3 main types are thermometers, resistance temperature detectors, and thermocouples. All three of these sensors measure a physical property (i.e. volume of a liquid, current through a wire), which changes as a function of temperature. In addition to the 3 main types of temperature sensors, there are numerous other temperature sensors available for use. Contact Sensors Contact temperature sensors measure the temperature of the object to which the sensor is in contact by assuming or knowing that the two (sensor and the object) are in thermal equilibrium, in other words, there is no heat flow between them.



Fig- 3: Temperature sensor

2.3 Soil Moisture Sensor

Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighing of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

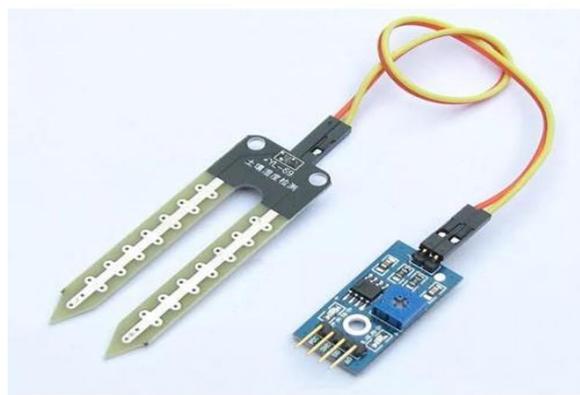


Fig- 4: Soil Moisture Sensor

2.4 Humidity Sensor

Humidity Sensor is one of the most important devices that has been widely in consumer, industrial, biomedical, and environmental etc. applications for measuring and monitoring Humidity. Humidity is defined as the amount of water present in the surrounding air. This water content in the air is a key factor in the wellness of mankind. For example, we will feel comfortable even if the temperature is 200C with less humidity i.e. the air is dry. But if the temperature is 100C and the humidity is high i.e. the water content of arising ,then we will feel quite uncomfortable. Humidity is also a major factor for operating sensitive equipment like electronics, industrial equipment, electrostatic sensitive devices and high voltage devices etc. Such sensitive equipment must be operated in a humidity environment that is suitable for the device. Sensing, measuring, monitoring and controlling humidity is a very important task.

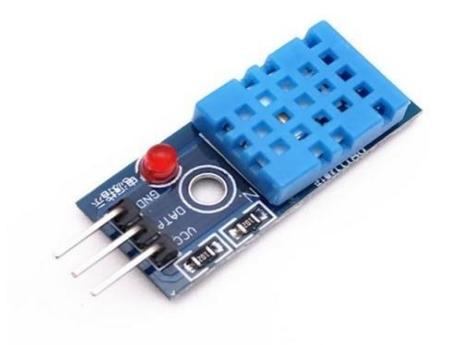


Fig- 5: Humidity sensor

2.5 PH Sensor

The pH amplifier inside the handle is a circuit which allows the standard combination pH electrode to be monitored by a lab interface. The cable from pH amplifier ends in a BTA plug. The pH Sensor will produce a voltage of approximately 1.75 volts in H7 buffer. The voltage will increase by about 0.25 volts for every pH number decrease.



Fig - 6: PH sensor

The voltage will decrease by about 0.25 volts/pH number as the pH increases. The Venire gel-filled pH Sensor is designed to make measurements in the pH range of 0 to 14. The gel-filled reference half cell is sealed. It cannot be refilled.

2.6 Node MCU

The Microchip Technology Inc. MCP3204/3208 devices are successive approximation 12-bit Analog to Digital (A/D) Converters with on-board sample and hold circuitry. The MCP3204 is programmable to provide two pseudo-differential input pairs or four single ended inputs. The MCP3208 is programmable to provide four pseudo-differential input pairs or eight single ended inputs. Communication with the devices is accomplished using a simple serial interface compatible with the SPI protocol. Low current design permits operation with typical standby and active currents of only 500 nA and 320 μ A, respectively. The MCP3204 is offered in 14-pin PDIP, 150 mil SOIC and TSSOP packages. The MCP3208 is offered in 16-pin PDIP and SOIC packages.



Fig- 7: Node MCU

3. SYSTEM IMPLEMENTATION

In below fig 5.1 consist of pH sensor, temperature sensor, moisture sensors, NPK sensor, node mcu. Soil moisture sensors measure the volumetric water content in soil. Humidity Sensor is one of the most important devices that have been widely in consumer, industrial, biomedical, and environmental etc. applications for measuring and monitoring Humidity. After collecting all the information about plant, the background python coding can send to the database image. Then it can be send to the farmer mobile.



Fig- 8: Soil nutrient measurement system

4. CONCLUSIONS

Time is the critical factor for soil nutrient detection since the variability of soil nutrient levels may be quite high over time. Due to complex soil pretreatment and chemical analysis, standard testing time for NPK is time consuming. This approach for measuring the soil parameters is used for the efficient plant growth. The results obtained from the measurement have shown that the system performance is quite reliable and accurate. The important parameters of the soil such as temperature, moisture, humidity and pH value are checked by the respective sensors. The measured parameters are transmitted to the cloud through the raspberry pi. Finally we can see the graph of soil parameter and suitable crop for this parameter on mobile phone as well as laptop through browser.

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