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Agri-Assistant Using Internet of Things

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Abstract:

Agriculture is the primary source of livelihood for India's large population and plays vital role in the development of the country. It also provides large ample employment opportunities to the people . But the nadir development of agriculture have been always hindering the development of the country. The solution to country's under developed agricultural facilities is smart agriculture by modernizing the current traditional methods of agriculture. This paper proposes the application of IoT in the agriculture domain. The project aims at making agriculture efficient using technologies like Internet of Things. The concept of IoT is to connect things with internet, millions of device are connecting with it. This development of IoT leads to the idea of communication in which two machines can communicate to each other and also exchange all the data which was previously with private server can now is available on internet so the user can access it remotely. A healthy agriculture is a combination of right amount of resources like appropriate crop and fertilizer that are compactable with the soil. The foundational idea is collect all soil parameter such as moisture, pH, humidity from the agricultural fields and predict the accurate crops and fertilizer. This paper proposes a system capable of measuring all these parameter and predict the right fertilizer and crops. An Android application is also developed in order to access all these agricultural parameters and also observing he results.

Keywords—IoT, ESP32 DEVKIT,CJMCU-34725 TC34725 color sensor RGB Module, DHT11, PH Sensor Kit

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I. INTRODUCTION

.Agriculture plays vital role in the development of the country. Agriculture is considered as the basis of life for the human as it is the main source of food

and other raw materials. Unfortunately, due to traditional methods of farming which results in low yielding of crops and fruits.Therefore, understanding the nature and quality of the soil, also determining the suitable crops for cultivation is very Agriculture plays vital role in the development of the country. Agriculture is considered as the basis of life for the human as it is the main source of food and other raw materials. Unfortunately, due to traditional methods of farming which results in low yielding of crops and fruits.Therefore, understanding the nature and quality of the soil, also determining the suitable crops for cultivation is very important. To implement
precision agriculture the benefits of IOT has been utilized. The fundamental idea is to sense all the required parameter from the agriculture field and take decision to control the actuator. The problem concerning agriculture have been the under development of the country's agricultural facilities, the only solution to this problem is smart agriculture by modernizing the current traditional methods of agriculture. It is essential to increase the productivity of agriculturaland farming processes to improve yield with technologies such as IoT. This system focuses mainly on identifying the quality of the soil by using certain parameters like moisture, pH, humidity using sensors. This helps the farmers by providing faster soil test results and identifies appropriate crops for their land. In this work, we present a farming assistant system based on Internet of Things. The system contain wireless sensors, web services and android mobile platform. The hardware design of sensor nodes, data acquisition, data transmission together with data visualization are illustrated in detail.
Long-term experiment of the system shows that this is feasible and reliable.

II. EXISTINGSYSTEM

In an existing soil testing process, farmers have to take soil samples from their agricultural fields and approach their respective agriculture office for testing and for further processes. This creates difficulties for farmers residing in rural areas away from the nearby government office. This, in turn increases the expense the farmers have to suffer in order to get better yield. Soil analysis is done by the agriculture department by examining the sample of interested area manually.The sample will be sent to the soil testing laboratories. The soil testing however is done in only a few laboratories making it time consuming task.Between 5-7 days are required to obtain theresult for routine analysis from the laboratory.So the farmers have to wait for the test results. Therefore it is necessary to conduct sampling early in the season. There is a significant delay in traditional system of soil testing at government facilities. The way in farmers collect the soil, deliver it to the labs and wait for the results is time consuming and wastage of effort and crop yield. The problem is to make it more efficient in less amount of time.

III. PROPOSEDSYSTEM

This system proposes the application of IoT in the agriculture domain. The goal of this system is to accurately predict crop and fertilizer within a limited amount of time with greater efficiency. The fundamental aspect of this work contains various components namely, temperature sensor, humidity sensor ,pH sensor ,microcontroller unit (MCU along with a WiFi module) and color sensor along with a web for information access and an android application. The farmer can also market their products and also purchase from the market.
There is a conventional login and registration for the farmers and other users. The authenticated farmerscan add and update their personal as well as farming details. There is an admin login for

monitoring all the activities of all levels of users. Admin has a confidential id and password.

The details of a wide variety of crops along with their suitable growing conditions like pH, temperature and humidity are set as a threshold values, which helps in the accurate prediction. This way farmers will be introduced to new breeds as well as crops that produce high yield. Sufficient This system proposes the application of IoT in the agriculture domain. The goal of this system is to accurately predict crop and fertilizer within a limited amount of time with greater efficiency. The fundamental aspect of this work contains various components namely, temperature sensor, humidity sensor ,pH sensor ,microcontroller unit (MCU along with a WiFi module) and color sensor along with a web for information access and an android application.

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use of fertilizers make soil healthy and do not cause any adverse effect on the environment. This contribute to more yield and high productivity. The farmer will now follow a farming plan based on soil nature.

Through sensors, we acquire some important soil parameters like temperature, humidity, color and pH values and with which suitable crops and sufficient fertilizer can be predicted. The sensors are connected by using a microcontroller,ESP32 DEVKIT.

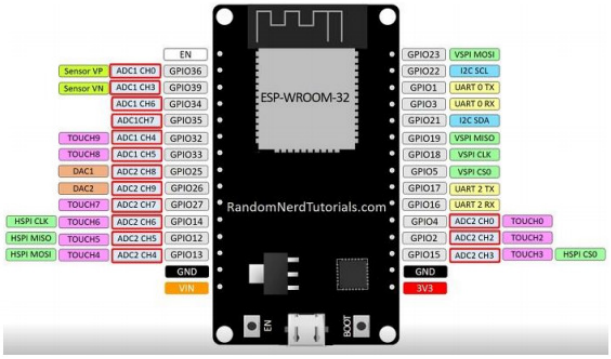

Fig. 1:ESP32 DEVKIT

The ESP32 can be programmed in different programming environments. You can use the Arduino IDE, Espressif IDF (IoT Development Framework), Micropython, JavaScript, LUA, etc. Here we use programming the ESP32 with the Arduino IDE. The main specification of ESP32 is that it is dual core, this means it has 2 processors, It has built-in Wifi module, It runs 32 bit programs, the clock frequency can go up to 240MHz and it has a 512 kB RAM, it have particular board has 30 pins, 15 in each row, It also has wide variety of peripherals available, like: capacitive touch, ADCs, DACs, UART, SPI, I2C and much more. Another main feature of this is it comes with the ESP-WROOM-32 chip. It has a 3.3V voltage regulator that drops the input voltage to power it aalso contain a CP2102 chip that allows you to plug the ESP32 to the computer to program it without the need for an FTDI programmer.

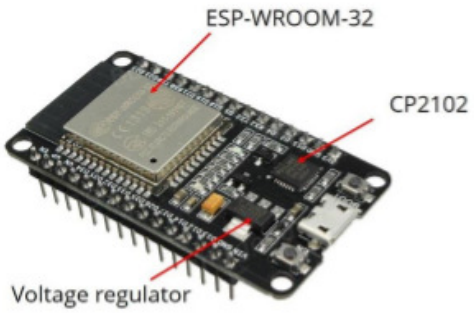

Fig. 2:ESP- WROMM chip

The board has two on-board buttons ENABLE and BOOT button. The ENABLE button, it reboots ESP32. Hold down the BOOT button and then press the enable, the ESP32 reboots in programming mode.

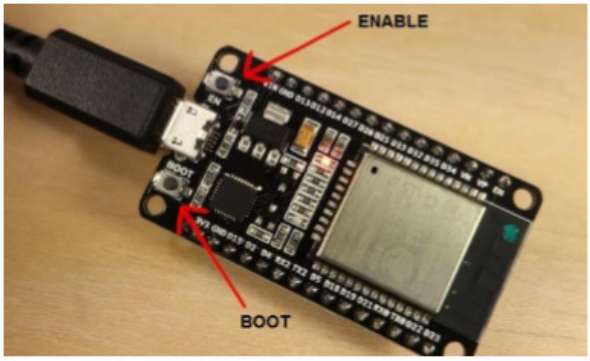

Fig. 3:ESP32 Buttons

For sensing both humidity and temperature DHT 11 is used .It is a single device with having both humidity sensor and temperature senor. It detect humidity using capacitive sensing technology and senses temperature with the help of thermistor embedded inside the small cabinet. It gives output form of integers it is connected to the input of MCU. The feature of DHT11 is its operating voltage is 3.5v to 5.5v, produce serial data output, the temperature ranges from 0 to 55°c and humidity ranges from 20% to 90%. DTH11 measures the humidity by the presence of water vapor measuring the electrical resistance between the two electrodes.

It have a moisture holding substrate with electrode it is applied to the soil surface. The water vapor is absorbed by the substrate ions are released, which increases the conductivity between the electrodes. The change in resistance between the two electrodes gives the humidity. DH11 measures the temperature with a surface mounted NTC temperature sensor.

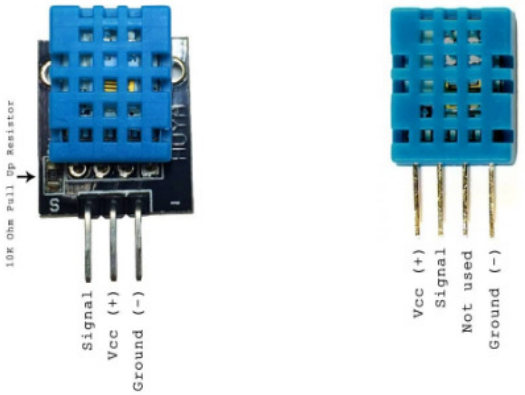

Fig. 4: DTH11

DTH11can be easily connected to MCU.

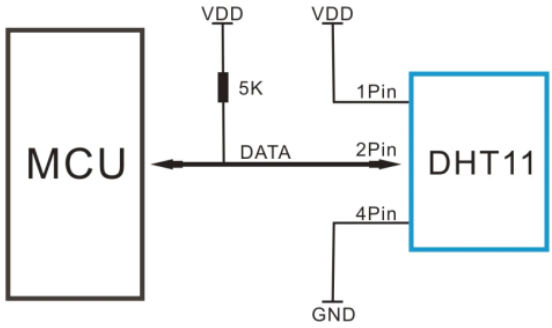

Fig. 5: DTH11 connection to MCU

We use analog PH sensor kit for sensing the PH from the soil . The analog PH sensor kit is particularly designed for Arduino controllers and has a built in simple, convenient and practical connection and feature. It has an LED which works as the power indicator, a BNC connector and plug the PH2.0 interface into the analog input port of any Arduino controller.

Fig. 6: PH Sensor Kit

The CJMCU-34725 TC34725 color sensor RGB Module provide digital return values for red, green, blue and bright light sensing digital Mingguang induction return value. Color sensitive photodiode integrated cut and localized infrared shading filters, to reduce the incident infrared spectrum components this make color sensing more accurate. High sensitivity, wide dynamic range and IR shading filter makes this sensor ideal for varying light condition and through attenuating materials.

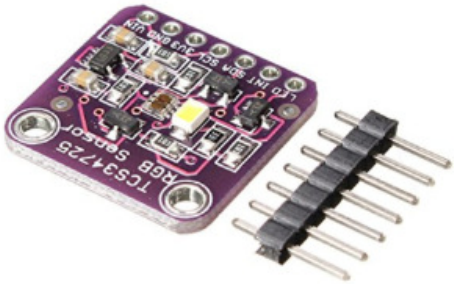

Fig. 7: CJMCU-34725 TC34725

There is also a provision for selling and purchase of yield through the application making the most out of the yield. This helps the farmer to be self dependent and sell their products without interference from a third party.

IV. IMPLEMENTATION AND RESULTS

The ESP32 is not breadboard friendly. However we can make our breadboards ESP32 friendly. We detach one power rail from the breadboard and repeat this with the second breadboard. Then insert the ESP32 into the two breadboards. TCS34725 Color Sensor RGB Module contains We connect the SCL pin and SDA pin of the TCS34725 sensor to the GPIO22 and GPIO21 pins of ESP32 respectively. Then we connect the GND of TCS34725 to GND of ESP32 and give voltage of 3V to the VCC of TCS34725 module. Hence the RGB module connection is complete.

Then we place the DHT11 has a positive pin to which the 3V of ESP32 is applied. The negative pin of DHT11 id connected to the GND of ESP32. The USB is connected to Visual Studio code and the code is executed and the OUT pin of DHT11 is connected to GPIO2 of ESP32 .

Now for the pH sensor, Connect equipment according to the graphic, that is, the pH electrode is connected to the BNC connector on the pH meter board , and then use the connection lines, the pH meter board is connected to the analog port 0 of the Arduino controller. When the Arduino controller gets power, you will see the blue LED on board is on. Upload the sample code to the Arduino controller .Put the pH electrode into the standard solution whose pH value is 7.00 , or directly shorted the input of the BNC connector. Open the serial monitor of the Arduino IDE, you can see the pH value printed on it, and the error does not exceed 0.3. Record the pH value printed, then compared with 7.00, and the difference should be changed into the “Offset” in the sample code. For example, the pH value printed is 6.88, so the

difference is 0.12. You should change the "# define Offset 0.00" into "# define Offset 0.12" in your program .Put the pH electrode into the pH standard solution whose value is 4.00. Then wait about one minute, adjust the gain potential device, let the value stabilize at around 4.00. At this time, the acidic calibration has been completed and you can measure the pH value of an acidic solution.After acquiring the parameters, to predict the crop with best yield , we can either use Decision Tree Classifier or Decision Tree Regression. But then we'll get only one crop. To avoid that we use one of the following methods, a)Predict Crop using Decision tree(CART) b) predict full crop details using Select Query. And then displayed in the Android application. To get the mineral composition, we actually need a spectrometer. The analyser and meter is huge expense we can't handle, so we skip thatpart.

V. CONCLUSION AND FUTURE SCOPE

A system has been proposed that includes sensor nodes along with the IOT application in the domain of agriculture.The proposed system is capable of sensing data, analyse data to predict the crops and fertilizer compactable to the soil which further is accessed by the user in the mobile phone through an android application. The primary aim of this work is to save precious time that farmers have early invested on soil testing and also increase the agricultural yield by choosing crops as well as fertilizer according to agricultural field which makes farming more cost effective while reduce the harmful impact on the surroundings. In future this work can be carried out by improving capable of sending the data to the cloud and also perform a spector analysis using a spectrometer analysis the composition of the soil in a profound level.

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