IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

IOT BASED DIGITAL SOIL TEST

Prof. Anandraddi N[1] , Omkar Kulkarni[2] , Mallikarjun Umadi[3]

[1] Professor at S.G.Balekundri Institute of Technology, Belgaum [2],[3] Students at S.G.Balekundri Institute of Technology, Belgaum

ABSTRACT:

In agriculture field, farmers are facing many problems, but the one major problem here is to know which type of soil is suitable for cultivating plants. So we are doing this project to show digitally, which type of soil is helps to grow the plants to increase the yield.

The major aim of this research is to use color sensor for the detection of NPK, Nitrogen (N), Phosphorus(P) and Potassium (K) level in soil. A color sensor is used to measure and to detect the presence of NPK content of soil. The color sensor's photodiode is designed to decide the amount of additional contents of these nutrients that has to be added into the soil to increase soil richness and fertility. The color sensor is implemented as a nutrition detection sensor which consists of four LEDs as light source and a photodiode as a light detector. Color of soil is changed with the help of capsule. The light from LEDs falls on soil mixture and reflected back after absorption. The TCS3200 color sensor is associated with 8*8 arrays of photodiodes with four different filters. By selecting the photodiode filter's readings, able to find the intensity of the various colors. The nutrient absorbs the light from LED and the photodiode convert the remaining light that is reflected by reflector (sample) to current. The color sensor has a current-to-frequency converter that converts the photodiode's readings and results into square waveform with a frequency that is directly proportional to the light intensity of the chosen color. This frequency is then, read by the Arduino uno. The output from the color sensor is converted to digital readable form. Then LCD display shows which growth is suitable for the tested soil by comparing output with database.

Keywords: Color Sensor,NPK, LED, photodiode, wifi module.

INTRODUCTION:

Production of crop depends on the interaction between soil and plant properties. Maximization of production of crops is reflected by biological, physical, chemical condition of the soil. Root absorbs required amount of nutrients and water from the soil where biochemical reactions takes place. Plant rate of nutrient absorption depends on the minerals available in the soil. Production of crops degrades with the insufficient rate of supply of any necessary nutrients. Although the requirement of particular nutrient is determined by the plant in the soil, some of the nutrients are necessary for all the plants in great amount known as Macro moles or Macronutrients. Root environment of the plant can be changed by supplying the nutrient from outside the soil is known as fertilization.

However proper distribution of fertilizer is required for proper crop production. Over and under provisioning of the fertilizer can greatly reduce the harvest production rate. Traditional fertilization system in Bangladesh relies on farmers experience in cultivation and weather condition. This type of manual fertilization without proper justification of soil condition is error prone. To fulfil the increasing demand of growing population over years there is a need of

increasing food production. Improper use of fertilizers in turn results into poor quality in fruits, vegetable lagging in size, taste, quality, quantity.

Essential nutrients:

- Primary nutrients: also known as macronutrients, are those usually required in the largest amounts. They are carbon, hydrogen, nitrogen, oxygen, phosphorus, and potassium.
- Secondary nutrients are those usually needed in moderate amounts compared to the primary essential nutrients. The secondary nutrients are calcium, magnesium, and sulfur.
- Micro- or trace nutrients are required in tiny amounts compared to primary or secondary nutrients. Micronutrients are boron, chlorine, copper, iron, manganese, molybdenum, and zinc.

METHODOLOGY:

As we mentioned above problem, to solve this problem we are using IoT. Production of crop depends on the interaction between soil and plant properties. Maximization of production of crops is reflected by biological, physical, and chemical condition of the soil.

The roots absorb the required amount of nutrients and water from the soil where a biochemical reaction takes place. Absorption rate of the nutrients from the plants depends on the minerals available in the soil. Production of crops degrades with the insufficient rate of supply of any necessary nutrients. Although the requirement of particular nutrients determined by the plant in the soil, some of the nutrients are necessary for all the plants in great amount known as Macromolecules or Macronutrients. Root environment of the plant can be changed by supplying the nutrient from outside that is known as fertilization.

Our aim is to display the presence of nutrients in the soil, using colour sensor. First we convert the nutrients which are present in the soil in to coloured solution with the help of some chemicals then using colour sensor we display the nutrients present in the soil. And we are also using PH sensor to know the PH of the soil, finally display which cultivation of plant is suitable for the soil. As our Literature survey says that, using electrode sensor we can determine the only information about Nitrogen (N), Phosphorus (P), Potassium (K), but these are not sufficient to decide the suitable crop, so we are using colour sensor. Actually our idea is to display how much amount of nutrients is present in the soil in the form of percentage

1. REQUIREMENTS:

ARDUINO UNO:

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.

FIG 1. Arduino Uno

Technical specification:

- Operating Voltage: 5 Volt
- Input Voltage: 7 to 20 Volts
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 20 mA
- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by boot loader
- SRAM: 2 KB
- EEPROM: 1 KB
- Clock Speed: 16 MHz
- Length: 68.6 mm

General Pin functions:

- **LED**: There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.
- **VIN**: The input voltage to the Arduino/Genuino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- **5V**: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.
- **3V3**: A 3.3 volt supply generated by the on- board regulator. Maximum current draw is 50 mA.
- **GND**: Ground pins.

  IOREF: This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.

- **Reset**: Typically used to add a reset button to shields which block the one on the board.

COLOR SENSOR (TCS34720):

The Color Sensor is a complete color detector. It consists of a TAOS TCS34720 RGB sensor chip and 4 white LEDs. It can detect and measure a nearly limitless range of visible colors to a certain degree.

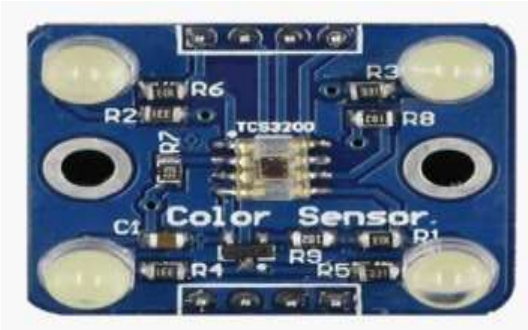


FIG.2. Color sensor

Color	Wavelength interval	Frequency interval
Red	~ 700–635 nm	~ 430– 480 THz
Orange	~ 635–590 nm	~ 480– 510 THz
Yellow	~ 590–560 nm	~ 510– 540 THz
Green	~ 560–520 nm	~ 540– 580 THz
Cyan	~ 520–490 nm	~ 580– 610 THz
Blue	~ 490–450 nm	~ 610– 670 THz
Violet	~ 450–400 nm	~ 670– 750 THz

WIFI MODULE:

The **ESP8285** is an ESP8266 with 1 MiB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi.

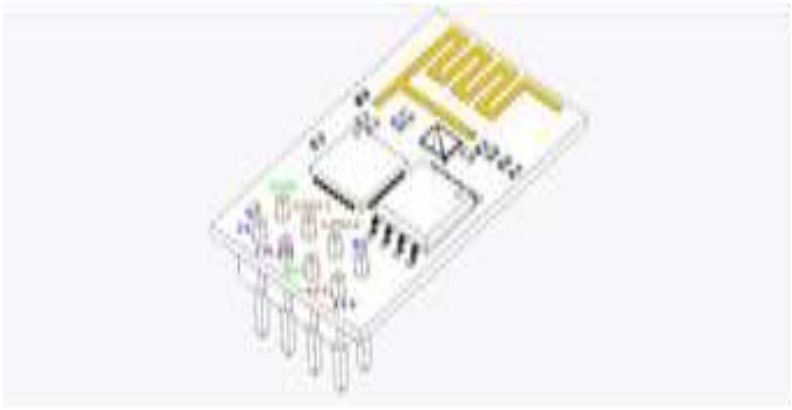


FIG 3. Wi-Fi module

The pinout is as follows for the common ESP-01 module:

1. VCC, Voltage (+3.3 V; can handle up to 3.6 V)
2. GND, Ground (0 V)
3. RX, Receive data bit X
4. TX, Transmit data bit X
5. CH_PD, Chip power-down
6. RST, Reset
7. GPIO 0, General-purpose input/output No. 0
8. GPIO 2, General-purpose input/output No. 2

LCD Display (16*2):

FIG 4. LCD display(16*2)

Features of 16×2 LCD module:

- Operating Voltage is 4.7V to 5.3V
- Current consumption is 1mA without backlight
- Alphanumeric LCD display module, meaning can display alphabets and numbers
- Consists of two rows and each row can print 16 characters.
- Each character is built by a 5×8 pixel box
- Can work on both 8-bit and 4-bit mode
- It can also display any custom generated characters
- Available in Green and Blue Backlight.

DESKTOP AND DEVELOPMENT ENVIRONMENT:

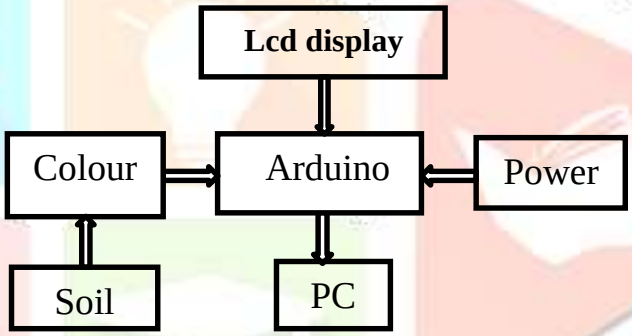
Arduino Software (IDE): It makes easy to write code and upload it to the board. This software can be used with any Arduino board.

MySQL: Cluster enables users to meet the database challenges of next generation web, cloud, and communications services with uncompromising scalability.

2. HOW IT WORKS?

The experiment is conducted by placing color sensor at a distance of 3 cm from the soil mixture sample. The perfect distance is set up by varying the length between sample and reflector, and then selecting a distance which is most accurate for the angle of incidence and reflection. In sensor, the LED and photodiode are designed in parallel direction such that they are facing in the same direction i.e. towards the sample. The four LED's illuminate the soil sample and photodiode collects reflected light after absorption by soil sample. The schematic diagram of the experimental setup for measuring soil sample. Then the input is compared with MySQL database on the basis of database output will be displayed on 4*4 LCD display.

FLOW CHART:



CONCLUSION:

This research concludes that, the color sensor TCS3200 with ardiuno and wifi module is used for determination of the nutrients N, P and K in the soil research can reduce the problems of fellow farmers in determining and calculating the amount of nutrients in soil with a cheaper cost compare to other devices. It can likewise decrease the undesired utilization of fertilizers to be added to the soil. This can be determined by light absorption of nutrients from led's of color sensor and display the values for NPK of soil. In the future, with the help of this research we can predict suitable crops for that soil and we can use our soil predictor in laboratories for accurate and fast results.
This project will helps farmers to grow suitable crop to there farm field, and improves the quality of yield.

REFERENCE:

1. https://www.jove.com/science- education/10077
2. https://herb.co/news/health/nutrients-will- give-plants-ultimate-yield/
3. Soil Nutrient Management
4. The University of Hawai
5. http://www.ijera.com
6. R.Sindhuja and B.Krithiga Volume 1, Issue 4, Pages 40-42, May 2017
7. Jianhan Lin, Maohua Wang* , Miao Zhang, Yane Zhang, Li Chen Key Laboratory of Modern Precision Agriculture System Integration, Ministry of Education, Beijing, China, 100083
8. R.Sujatha. R.Anitha Nithya. Int. Journal of Engineering Research and Application ISSN: 2248-9622, Vol. 7, Issue 11, (Part - 6) November 2017, pp.55-59.