

AGRICULTURE BED FROMATION

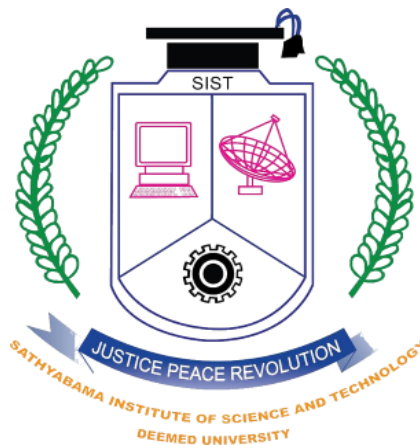
Submitted in partial fulfilment of the required for the award of

Masters of Computer Science

by

SANJAY KUMAR P

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DEPARTMENT OF COMPUTER SCIENCE

SCHOOL OF SCIENCE AND HUMANITIES

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with Grade “A” by NAAC

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APRIL 2024



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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the Bonafide work of **SANJAY KUMAR P (42734020)** who carried out the project entitled “**AGRICULTURE BED FORMATION**” under our supervision from JANUARY 2024 to APRIL 2024

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I am, SANJAY KUMAR P (4273420) here by declare that the Project Report entitled “AGRICULTURE BED FORMATION” done by us under the guidance of MS.SHAMILI.V, M.SC., Assistant Professor, Department of Computer Science at SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY,Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai-600 119 is submitted in partial fulfillment of the requirements for the award of Master of Science degree in Computer Science.

DATE:20.04.2024

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ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to Board of Management of **SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY** for their kind

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SANJAYKUMAR

ABSTRACT

The integration of Internet of Things (IoT) technology in agriculture has led to significant advancements in farming practices. One such innovation is the Agriculture Bed Formation System, which leverages IoT sensors and actuators to automate and optimize the process of bed formation in agricultural fields. This system utilizes real-time data on soil moisture levels, temperature, and other relevant environmental parameters to dynamically adjust bed formation parameters such as depth and width. By continuously monitoring and analyzing field conditions, the Agriculture Bed Formation System ensures optimal bed structures for various crops, leading to improved yields and resource efficiency. This abstract paragraph highlights the potential of IoT-driven solutions in revolutionizing traditional agricultural practices for enhanced productivity and sustainability. IoT devices to form themselves in cluster formation then establishes a reliable uplink communication backbone for data transmission. Use of multifrequency, multi power transmission, and mobile sink make it possible to reduce power utilization of IoT devices as much as possible. The proposed scheme is evaluated by using simulation models and practical experiments. It is found working outclass as compare to all existing systems.

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CHAPTER 1

INTRODUCTION

Agriculture is the major source of income for the largest population in India and is major contributor to Indian economy. However, technological involvement and its usability have to be grown still and cultivated for agro sector in India. Although few initiatives have also been taken by the Indian Government for providing online and mobile messaging services to farmers related to agricultural queries and agro vendor's information to farmers. Based on the survey it is observed that agriculture contributes 27% to GDP, and Provides employment to 70% of Indian population.

IoT is changing the agriculture domain and empowering farmers to fight with the huge difficulties they face. The agriculture must overcome expanding water deficiencies, restricted availability of lands, while meeting the expanding consumption needs of a world population. New innovative IoT applications are addressing these issues and increasing the quality, quantity, sustainability and cost effectiveness of agricultural production. Agriculture is the backbone of Indian Economy. In today's world, as we see rapid growth in global population, agriculture becomes more important to meet the needs of the human race. However, agriculture requires irrigation and with every year we have more water consumption than rainfall, it becomes critical for growers to find ways to conserve water while still achieving the highest yield. But in the present era, the farmers have been using irrigation technique through the manual control in which they irrigate the land at the regular interval. According to statistics, agriculture uses 85% of available freshwater resources worldwide, and this percentage will continue to be dominant in water consumption because of population growth and increased food demand. There is an urgent need to create strategies based on science and technology for sustainable use of water, including technical, agronomic, managerial and institutional improvements. Agricultural irrigation based on Internet technology is based on crop water requirement rules. By using Internet technology and sensor network technology we can control water wastage and to maximize the scientific technologies in irrigation methods. Hence it can greatly improve the utilization of water and can increase water productivity. The Internet of Things (IoT) is a technology where in a mobile device can be used to monitor the function of a device. The Internet of Things (IoT) is concerned with interconnecting communicating objects that are installed at different locations that are possibly distant from each other.

Internet of Things (IoT) is a type of network technology, which senses the information from different sensors and makes anything to join the Internet to exchange information. It can also be used to modify the status of the device. The central processing unit will also include communication device to receive data from the sensors and to be relayed to the user's device. This will be done using a higher communication device such as a Wi-Fi module. The data processed by the central module is converted to meaningful data and relayed to the user. The user can view the data with the help of a handheld device such as a mobile phone or a tablet.

Nowadays water scarcity is a big concern for farming. This project helps the farmers to irrigate the farmland in an efficient manner with automated irrigation system based on soil moisture. The proposed system has been designed to overcome the unnecessary water flow into the agricultural lands. Temperature, moisture and humidity readings are continuously monitored by using temperature, moisture and humidity sensor and send these values to the assigned IP address. Android application continuously collects the data from that assigned IP address. Once the soil moisture values are exceeded the particular limit then the relay, which is connected to the arduino microcontroller controls the motor. The android application is a simple menu driven application, with 4 options. This includes motor status, moisture, temperature and humidity values. The motor status indicates the current status of the pump.

Although we selected the correct irrigation method when to supply water to crop is also a very important thing to consider. The oversupply of water to the crop may lead to unwanted situations. Therefore the crop should be watered only when it needs. Hence a smart technology is needed to know when the crop needs the water. All these technologies are aimed to improve the yield of the crop. In that direction, the multi-crop system is most efficient. In a multi-crop system, farmers plant different types of crops that suit the soil to increase the crop yield and to make sure that the minerals of the soil are eventually supplied. In this paper, we are proposing a smart irrigation system using IoT in the multi-crop system. In the agricultural domain, people need smart farming technologies to reach all specification where smart farming methods are used in several ways by using IOT technologies. [1] proposed a low cost and efficient wireless sensor network technique to acquire the soil moisture and temperature from various locations of farm and as per the need of crop controller take the decision to make irrigation ON or OFF. [2] proposed an ease and proficient remote sensor arrange system to obtain the dirt dampness and temperature from different areas of homestead and according to the need of harvest controller take the choice to make water system ON or OFF.

Smart precision based horticulture makes utilization of remote sensor systems to screen the farming condition [3]. Zigbee and raspberry pi-based agribusiness observing framework fills in as a dependable and proficient technique for checking rural parameters. Remote checking of field not just enables client to diminish the human power, however it likewise enables client to see exact changes in it. A keen framework in light of exactness horticulture would make ready to another transformation in farming. The client can screen the farming condition from a remote area, hence giving a nursery condition to the plants. [4] Proposed a mechanized water system framework was made to enhance water use for green yields. The structure has a dispersed remote arrangement of soil-moistness and hot sensors put into the root zone of the plants. [5,6] authors built up the choice openly solid framework to gauge farming creation utilizing IoT sensors. This structure was in like way a bound together framework that sponsorships the strategies sowing seeds through pitching developing things to buyers. [7,8] Proposed animal monitoring applications, both creature location and their developed forecast are significant assignments and focused on three applications of wildlife monitoring: location tracking, behavior recognition and

in figure 3 as shown the feature model has the sensor node where it is dipped into the soil to detect the soil moisture of the soil. Agriculture is the main source of income for India's biggest population and a prime contributor to the Indian economy. However, fight technology and its use should be promoted and developed for the economic-Indian vicinity. However, the government of India has also taken numerous tasks to provide farmers with on line and cellular services for agricultural associated inquiries and information about farmers' agricultural livelihoods. From the survey, it is able to be seen that agriculture gives 27% of GDP and offers employment to 70% of India's population. The Internet of Things is converting the sector of agriculture and allowing farmers to address the biggest challenges they face. Agriculture have to triumph over the shortage of water, the confined availability of land, even as assembly the wishes of the arena's developing customer population. New ideas for the development of IoT are recently addressing these issues and improving agricultural production in terms of convenience, volume, sustainability and financial performance. For information, agriculture uses 85% of the world's fresh water, and a percentage of that will continue to control water use due to population growth and the need for food. Business and production strategies, including technological, agronomic, managerial and local improvements, are urgently needed to increase sustainable water use. According to the electricity production in agricultural irrigation, internet is done according to the law of water consumption of plants. Using the Internet and community electronics, we can control water loss and maximize water strategy research. The person can view the records using a portable device along with a mobile telephone or pill. In the country, water shortage is a critical problem for agriculture. This mission allows farmers efficiently irrigate their fields with an automated soil moisture based irrigation device.

CHAPTER 2

LITERATURE SURVEY

TITLE: IoT Based Smart Plant Irrigation System with Enhanced learning

AUTHOR:: Kemal CagriSerdaroglu, CemOnel, SebnemBaydere

YEAR: 2022

In this look at, we propose an smart IoT planting irrigation device that autonomously adapts to a specific irrigation conduct. Automated crop irrigation structures generally make decisions based totally on static models primarily based on plant characteristics. On the opposite hand, in the proposed solution, irrigation decisions are dynamically adjusted according to converting environmental situations.

Title : Mobile includedirrigation sensible control and massive machine the use of IoT

Author: Vaishali S., Suraj S., Vignesh G., Dhivya S. Udhayakumar S.

YEAR: 2023

Agriculture has been the most important practice considering that the beginning of civilization. Traditional irrigation techniques including sprinkler and flood irrigation aren't very effective. They cause big losses of water and can also make a contribution to sicknesses along with fungus because of excessive soil moisture. An automated irrigation device is necessary to conserve water and circuitously the viability of the farm, as the alternate is crucial.

TITLE :IoT-primarily ased computerized irrigation system technique

AUTHOR: Dvipayan Mishra, Arzina Khan, Rajeev Tiwari, Shuchi Upadhyay

YEAR: 2022

Agriculture is the main supply of profits for Indians and agriculture has had a first-rate impact on the Indian economy. It may be very important to boom crops so as to growth the high-quality of culmination and merchandise. Thus, suitable situations and suitable humidity inside the beds will have an effect on manufacturing..

TITLE: Smart irrigation gadget the use of machine learning and the Internet of Things

AUTHOR: Revant Kondaveti, Akash Reddy, Supreet Palabtla

YEAR: 2023.

In urban regions such as evolved cities, residents have all of the primary amenities along with strength deliver with minimum strength outages, meals deliver, pretty proper roads and constructing infrastructure, and so forth. But this is not the case in rural areas where most of the villages are affected by poverty. Energy, agricultural troubles, flawed water deliver and

distribution for diverse uses, and so forth. Thus, for our cause, there are actually many elements which can affect the formation of a sharp village. This one computerized irrigation system follows the best rainfall forecasting set of rules that can help us choose which crops to develop in a specific place. Likewise, we will store water and strength, which is generally spent on irrigating crops, for other wishes of the villagers.

CHAPTER 3

METHODOLOGY

3.1 PROPOSED SYSTEM

The proposed Agriculture Bed Formation System using IoT aims to revolutionize traditional bed formation practices in agriculture by leveraging advanced technology for improved efficiency and productivity. This system will integrate IoT sensors deployed across agricultural fields to continuously monitor key parameters such as soil moisture levels, temperature, and nutrient content in real time. These sensors will transmit data wirelessly to a central control unit, where sophisticated algorithms will analyze the information and dynamically adjust bed formation parameters accordingly. By utilizing this data-driven approach, the system will optimize bed dimensions, spacing, and orientation to suit the specific requirements of different crops and prevailing environmental conditions. Moreover, the system will be equipped with actuators capable of autonomously adjusting bed formation equipment in response to the control unit's instructions. This integration of IoT technology will not only streamline the bed formation process but also enable precise resource management, leading to increased yields, reduced input costs, and enhanced sustainability in agriculture.

3.2 EXISTING SYSTEM

In traditional agriculture, bed formation is typically a manual or semi-manual process, relying on human labor and subjective judgment. Farmers often rely on experience and visual assessment to determine bed dimensions and soil conditions, leading to inefficiencies and inconsistencies in bed quality across fields. Existing mechanized systems offer some level of automation but often lack real-time data feedback and adaptability. These systems are typically programmed based on predefined parameters and do not dynamically adjust to changing environmental conditions. As a result, there is a need for an advanced bed formation system that integrates IoT technology to provide real-time monitoring and control, optimizing bed structures based on precise data analysis. Such a system would address the limitations of existing approaches and enhance overall efficiency and productivity in agricultural bed formation processes.

3.3 ADVANTAGES

1. Precision Agriculture: Enables precise and tailored bed formation based on real-time data, optimizing growing conditions for different crops.
2. Increased Efficiency: Reduces manual labor and time required for bed formation through automation and dynamic adjustments.
3. Enhanced Productivity: Improves crop yields by providing optimal bed structures and resource management, leading to increased productivity.

4. **Resource Optimization:** Minimizes resource wastage by adjusting bed formation parameters based on soil moisture, temperature, and nutrient levels, leading to efficient resource usage.
5. **Cost Savings:** Reduces labor costs and input expenses through automation, ultimately increasing profitability for farmers.
6. **Environmental Sustainability:** Promotes sustainable agricultural practices by minimizing environmental impact through efficient resource usage and reduced chemical runoff.
7. **Scalability:** Adaptable to various farm sizes and crop types, making it suitable for both small-scale and large-scale agricultural operations.
8. **Data-Driven Decision Making:** Facilitates informed decision-making by providing real-time insights into soil conditions and crop requirements, improving overall farm management.

3.4 DISADVANTAGES

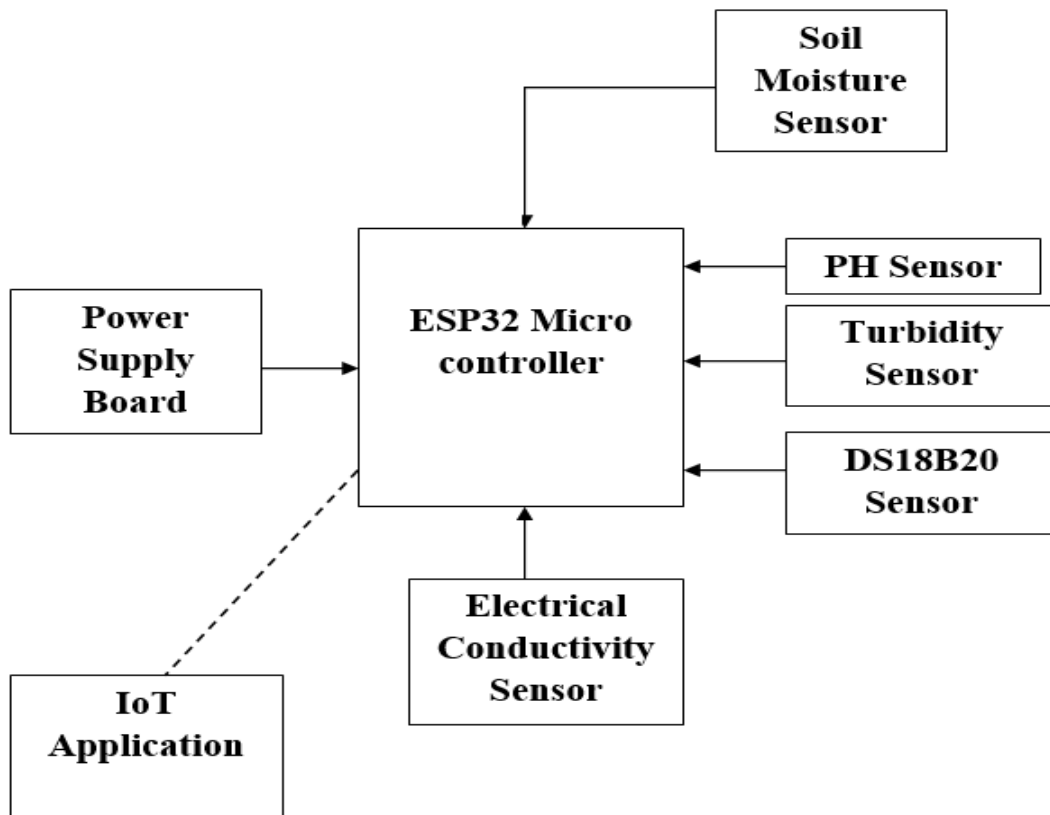
1. **Initial Cost:** The upfront investment for implementing IoT technology, including sensors, actuators, and control systems, can be substantial, especially for small-scale farmers with limited financial resources.
2. **Complexity:** The integration of IoT components and automation systems may introduce complexity to farm operations, requiring specialized knowledge and technical expertise for installation, maintenance, and troubleshooting.
3. **Reliability:** Dependence on technology and connectivity may lead to reliability issues, such as sensor malfunctions, connectivity disruptions, or software glitches, which could impact system performance and reliability.
4. **Data Security and Privacy:** IoT systems generate and transmit sensitive data about farm operations, raising concerns about data security and privacy breaches. Unauthorized access or manipulation of this data could pose risks to farmers' privacy and business operations.
5. **Training Requirements:** Farmers and agricultural workers may require training to effectively utilize and manage IoT-enabled systems, including understanding data interpretation, system operation, and troubleshooting procedures.
6. **Dependency on External Factors:** The performance of IoT systems relies on external factors such as network connectivity, weather conditions, and availability of power sources. Any disruptions in these factors could affect system functionality and performance.
7. **Maintenance Challenges:** Regular maintenance and updates are necessary to ensure the proper functioning of IoT components, which may require additional time, effort, and resources from farmers.

8. **Compatibility Issues:** Integration of IoT systems with existing farm equipment and infrastructure may pose compatibility challenges, requiring additional investments or modifications to ensure seamless operation.
9. **Environmental Impact:** The manufacturing and disposal of IoT devices may have environmental implications, including resource depletion, electronic waste generation, and energy consumption.
10. **Overreliance on Technology:** Overreliance on IoT technology may lead to a reduction in traditional farming skills and practices, potentially diminishing farmers' ability to adapt to unforeseen challenges or disruptions.

CHAPTER 4

SYSTEM DESIGN

4.1 BLOCK DIAGRAM



4.2 DESCRIPTION

4.2.1 ESP32 Micro controller

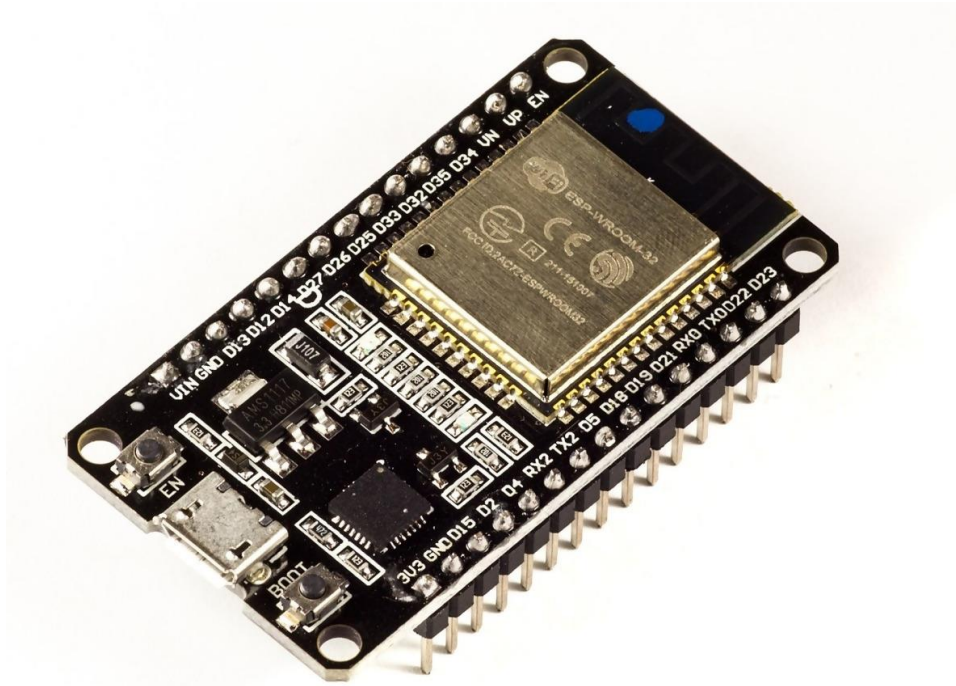


Fig 4.2.1 ESP32 Micro controller

The ESP32 is a powerful 32 bit microcontroller with integrated Wi-Fi, full TCP/IP stack for internet connection and Bluetooth 4.2. Due to the low cost combined with great power and the opportunity to connect the ESP32 to many other electronic devices, the microcontroller is well suited for IoT projects.

Technical specifications of the ESP32

- TTensilicaXtensa 32-bit LX6 microprocessor with 2 cores
- Power supply: 2.3V – 3.6V
- Current consumption: 20 μ A – 240mA. In DeepSleep-Mode only 5 μ A
- Operating temperature range: -40°C – 125°C
- External flash memory: up to 16 MB is supported
- Interfaces
 - UART/SDIO/SPI/I2C/I2S/IR Remote Control
 - 36 programmable I/O pins max 20mA
 - 2 analog input 0V to 1V with 12 bit resolution
 - all inputs tolerate maximum 3.6V
- Network

- WiFi
 - WiFi 802.11 b/g/n 2.4 GHz with WPA/WPA2 PSK
 - ipv4 and ipv6 from Arduino Core 2.5.0
 - UDP and TCP with 5 simultaneous connections as maximum
 - Bandwidth: 150 to 300 kByte/s
 - Latency: < 10ms
- Bluetooth: v4.2 BR/EDR and Bluetooth Low Energy (BLE)

If you want a full comparison of the technical specifications of the ESP32 against the ESP8266 boards and different Arduino boards, you will find this comparison in [this article](#).

Applications

- Prototyping of IoT devices
- Low power battery operated applications
- Network projects
- Easy to use for beginner level DIYers and makers.
- Projects requiring Multiple I/O interfaces with Wi-Fi and Bluetooth functionalities.

4.2.2 PH Sensor Module:



Fig 4.2.2 PH Sensor module

pH is the unit of measure for the acidity of a solution. this kit will helps to measures the hydrogen-ion concentration (or pH) in a solution, indicating its acidity or alkalinity. This kit will provide analog / digital out put with respect to temperature analog output. This kit also enabled with xbee footprint for wireless communication.

This PH Sensor Module with Probe is specially designed for Arduino based controllers but can also me used with other MCU circuits. Very stable and excellent reading tested in lab. It has an LED which works as the Power Indicator, a BNC connector and PH electrode sensor interface. A simple board to check the ph value of a liquid. The pH stands for the power of hydrogen, which is a measurement of the hydrogen ion concentration in the body. This is used in Water quality testing and Aquaculture. The total pH scale ranges from 1 to 14, with 7 considered to be neutral. A pH less than 7 is said to be acidic and solutions with a pH greater than 7 are basic or alkaline. The PH electrode has a single cylinder that allows direct connection to the input terminal of a pH meter, controller, or any pH device which has a BNC input terminal. The pH electrode probe is accurate and reliable that can give almost instantaneous readings.

This board can be easily connected to any MCU or Arduino boards. The serial interface system is integrated to simply connect with most of the devices. It is small size, low power, enabling a variety of applications.

Features:

- Operating voltage: 5V DC
- The detection concentration range: PH0-14
- The detection range of temperature: 0-80 centigrade
- The output: analog voltage signal output and TTL Output.
- Xbee foot print for RF/WiFi communication.
- High quality PCB FR4 Grade with FPT Certified.

Specifications:

- Operating Voltage is 5V DC.
- The best environment temperature is about 25 degree.
- The PH Probe is connected to the BNC connector on the PH Sensor Module and then use the connection lines, PH Sensor Module is connected to the analog port of the controller.
- When the controller gets power, you will see the blue/red LED on board is on.
- Put the PH Probe into the standard solution. Open the serial monitor of the Arduino IDE, you can see the pH value printed on it or connect to any MCU as desired.

Module Interface Description:

- To : The output of the temperature sensor for temperature compensation. At a temperature of 25°C is the voltage of about 3.6 V with increasing temperature the voltage decreases (with a delay). At 100°C is the voltage of about 0.85 In.
- Do : digital output (5V / 0V) responsive to the set threshold value ph. The threshold is set by the potentiometer closer to the output pins.

- Po : the output of the ph sensor (-0.4 V to 0.4 V) amplified 2x. The mean value of the voltage of the ph sensor 0V (PH7) is shifted in the range of about 1V to 2.5 V using the potentiometer closer to the connector for the ph probe.
- G : GND (ground)
- G : GND (ground)
- V+ : 5V

Step to Use the pH Meter:

- 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.

Cautions:

- Please use an external switching power supply, and the voltage as close as possible to the +5.00V. More accurate the voltage, higher the accuracy!
- Before the electrode in continuous use every time, you need to calibrate it by the standard solution, in order to obtain more accurate results. The best environment temperature is about 25 °C, and the pH value is known and reliable, close to the measured value. If you measure the acidic sample, the pH value of the standard solution should be 4.00. If you measure the alkaline sample, the pH value of the standard solution should be 9.18. Subsection calibration, just in order to get better accuracy.
- Before the pH electrode measured different solutions, we need to use water to wash it. We recommend using de-ionized water.

Applications

- Water quality testing
- Aquaculture

4.2.3 DS18B20 SENSOR



Fig 4.2.3 DS18B20 SENSOR

The DS18B20 is a digital temperature sensor manufactured by Maxim Integrated. It is widely used in various applications due to its accuracy, simplicity, and digital interface. Here's an overview of the DS18B20 sensor:

Digital Interface: The DS18B20 sensor communicates over a one-wire bus interface, which means it requires only a single data line for communication. This simplifies the wiring and makes it suitable for applications where multiple sensors need to be connected to a single microcontroller or other digital device.

Temperature Measurement: The DS18B20 sensor measures temperature with a resolution of 9 to 12 bits, depending on the configuration. It can accurately measure temperatures ranging from -55°C to +125°C (-67°F to +257°F), making it suitable for a wide range of temperature monitoring applications.

Unique Serial Number: Each DS18B20 sensor has a unique 64-bit serial number burned into its ROM during manufacturing. This allows multiple sensors to be connected to the same one-wire bus without the need for external addressing, simplifying the system design.

Power Supply: The DS18B20 sensor can be powered from the same data line used for communication (parasitically powered) or from an external power supply. It operates over a wide voltage range, typically 3V to 5.5V, making it compatible with a variety of digital systems.

Accuracy and Calibration: The DS18B20 sensor offers high accuracy ($\pm 0.5^{\circ}\text{C}$) over its operating temperature range. Additionally, it supports user-programmable temperature alarm functionality, allowing the sensor to trigger an alarm when the temperature exceeds a predefined threshold.

Applications: The DS18B20 sensor finds applications in various industries, including HVAC (Heating, Ventilation, and Air Conditioning), industrial automation, automotive, environmental monitoring, and consumer electronics. It is commonly used for temperature monitoring and control in systems where accuracy and reliability are critical.

Integration: Maxim Integrated provides software libraries and application notes to facilitate the integration of the DS18B20 sensor into different microcontroller platforms and programming languages, making it easy for developers to incorporate temperature sensing capabilities into their projects.

4.2.4 TURBIDITY SENSOR

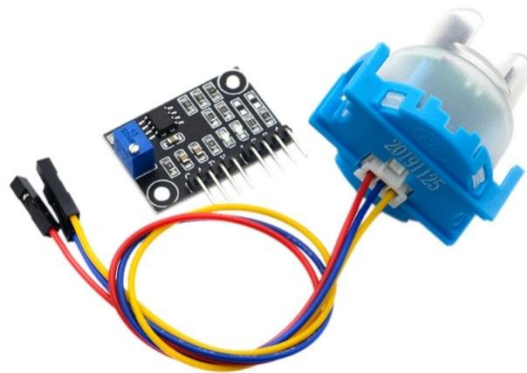


Fig 4.2.4 Turbidity sensor

A turbidity sensor is a device used to measure the clarity or cloudiness of a liquid by quantifying the amount of suspended particles or solids present in the liquid. Turbidity sensors find extensive use in various industries and applications where monitoring and controlling the level of suspended solids are important. Here's an overview of turbidity sensors:

Principle of Operation: Turbidity sensors operate based on the principle of light scattering or absorption. When light passes through a liquid containing suspended particles, it gets scattered or absorbed by the particles, leading to a reduction in the intensity of the transmitted light. The turbidity sensor measures this reduction in light intensity to determine the turbidity of the liquid.

Detection Methods: There are different methods used in turbidity sensors to detect the level of turbidity in a liquid:

Light Scattering: This method involves measuring the amount of light scattered by suspended particles in the liquid. The sensor emits light into the liquid, and a photodetector measures the intensity of the scattered light at a specific angle.

Light Absorption: In this method, the sensor measures the amount of light absorbed by suspended particles in the liquid. The sensor emits light of a specific wavelength, and a photodetector measures the intensity of the transmitted light after it passes through the liquid.

Calibration and Measurement Units: Turbidity sensors are calibrated using standardized turbidity solutions to establish a correlation between the sensor output and turbidity levels. Turbidity is typically measured in nephelometric turbidity units (NTU), formazin turbidity units (FTU), or other standardized units depending on the calibration method used.

Sensor Design: Turbidity sensors come in various designs, including inline sensors that are immersed directly into the liquid stream, submersible sensors for measuring turbidity in open bodies of water, and handheld or portable sensors for field measurements.

Applications: Turbidity sensors find applications in a wide range of industries and processes, including:

Water Treatment: Monitoring the quality of drinking water and wastewater to ensure compliance with regulatory standards.

Environmental Monitoring: Assessing the turbidity of natural water bodies such as rivers, lakes, and oceans to monitor environmental health.

Industrial Processes: Controlling the level of suspended solids in industrial processes such as food and beverage production, pharmaceutical manufacturing, and chemical processing.

Research and Development: Studying the behavior of colloidal suspensions and particulate matter in various liquids for scientific research purposes.

4.2.5 SOIL MOISTURE SENSOR

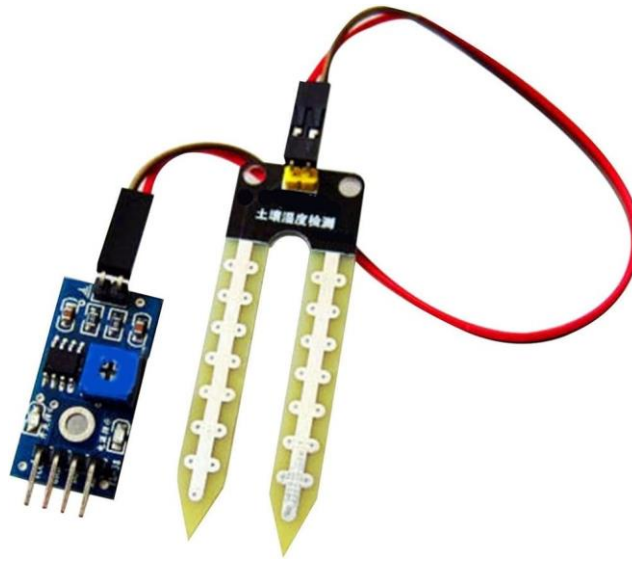


Fig 4.2.5: Soil Moisture sensor

Soil moisture sensor measures amount of water content present in the soil and gives gravimetric values directly. Sensor produces the soil resistance value in between a source and detector probe. This sensor play a vital role in field of agrology and more helps to farmers manage their irrigation system into efficient manner. It activates a modern system into the optimized water usage and increase growth of crops. It used some other applications such as horticulture and environmental or weather research.

- Measure the loss of moisture over time due to evaporation and plant uptake.
- Evaluate optimum soil moisture contents for various species of plants.
- Monitor soil moisture content to control irrigation in greenhouses.
- Enhance your Bottle Biology experiments.

The Soil Moisture Sensor uses capacitance to measure the water content of soil (by measuring the dielectric permittivity of the soil, which is a function of the water content). Simply insert this rugged sensor into the soil to be tested, and the volumetric water content of the soil is reported in percent.

4.2.5.1 Specifications

- Range: 0 to 45% volumetric water content in soil (capable of 0 to 100% VWC with alternate calibration)
- Accuracy: $\pm 4\%$ typical

- Typical Resolution: 0.1%
- Power: 3 mA @ 5VDC
- Operating temperature: -40°C to $+60^{\circ}\text{C}$
- Dimensions: 8.9 cm $\times$ 1.8 cm $\times$ 0.7 cm (active sensor length 5 cm)

4.2.6 Power Supply

In this project we have power supplies with +5V & -5V option normally +5V is enough for total circuit. Another (-5V) supply is used in case of OP amp circuit. Transformer primary side has 230/50HZ AC voltage whereas at the secondary winding the voltage is step downed to 12/50hz and this voltage is rectified using two full wave rectifiers. The rectified output is given to a filter circuit to filter the unwanted ac in the signal After that the output is again applied to a regulator LM7805(to provide +5v) regulator. Whereas LM7905 is for providing -5V regulation. (+12V circuit is used for stepper motors, Fan and Relay by using LM7812 regulator same process like above supplies).

4.2.6.1 Transformer

Transformers are used to convert electricity from one voltage to another with minimal loss of power. They only work with AC (alternating current) because they require a changing magnetic field to be created in their core. Transformers can increase voltage (step-up) as well as reduce voltage (step-down).

Alternating current flowing in the primary (input) coil creates a continually changing magnetic field in the iron core. This field also passes through the secondary (output) coil and the changing strength of the magnetic field induces an alternating voltage in the secondary coil. If the secondary coil is connected to a load the induced voltage will make an induced current flow. The correct term for the induced voltage is 'induced electromotive force' which is usually abbreviated to induced e.m.f.

4.2.6.2 Rectifiers

The purpose of a rectifier is to convert an AC waveform into a DC waveform (OR) Rectifier converts AC current or voltages into DC current or voltage. There are two different rectification circuits, known as 'half-wave' and 'full-wave' rectifiers. Both use components called diodes to convert AC into DC.

4.2.6.3 Filters

A filter circuit is a device which removes the ac component of rectifier output but allows the dc component to the load. The most commonly used filter circuits are capacitor filter, choke input filter and capacitor input filter or pi-filter. We used capacitor filter here.

The capacitor filter circuit is extremely popular because of its low cost, small size, little weight and good characteristics. For small load currents this type of filter is preferred. It is commonly used in transistor radio battery eliminators.

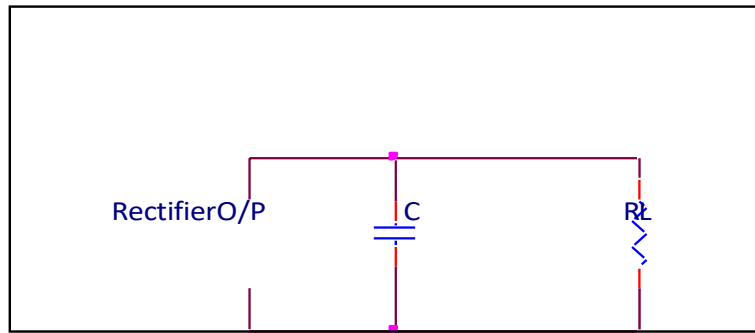


Fig 4.2.6.3: Block Diagram of Capacitive Filter

4.2.7 Jumper wire:



Fig 4.2.7 Jumper Wire

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. Fairly simple. In fact, it doesn't get much more basic than jumper wires.

Though jumper wires come in a variety of colors, the colors don't actually mean anything. This means that a red jumper wire is technically the same as a black one. But the colors can be used to your advantage in order to differentiate between types of connections, such as ground or power.

Make Your Own Jumper Wires

While jumper wires are easy and inexpensive to purchase, it can also be a fun task to challenge students to make their own. Doing so requires insulated wire and wire strippers. However, beware that it is important not to nick the wire when stripping off the insulation.

4.2.7.1 Types of Jumper Wires

Jumper wires typically come in three versions: male-to-male, male-to-female and female-to-female. The difference between each is in the end point of the wire. Male ends have a pin protruding and can plug into things, while female ends do not and are used to plug things into. Male-to-male jumper wires are the most common and what you likely will use most often. When connecting two ports on a breadboard, a male-to-male wire is what you'll need.

Alligator Clips

Alligator clips, which consist of two spring metal clips connected by wire, are actually just fancy jumper wires! Their unique connection point (they can be clipped on instead of inserted into) allow alligator clips to be used in a variety of situations that would get a little awkward with a traditional jumper wire. One of the most common uses for alligator clips in education is with the MakeyMakey, though they can also be used to connect the ports on a LilyPad board as well as for a number of other applications.

CHAPTER 5

RESULT AND DISCUSSION

The implementation of the Agriculture Bed Formation System utilizing IoT technology yielded promising results, significantly enhancing the efficiency and effectiveness of bed formation processes in agriculture. Through real-time monitoring of soil conditions and environmental parameters, the system enabled dynamic adjustments to bed dimensions and configurations, tailored to the specific requirements of different crops and field conditions. This capability resulted in improved uniformity and consistency in bed structures across fields, minimizing variations that could impact crop growth and yield.

Furthermore, the data-driven approach facilitated by IoT sensors allowed for precise resource management, optimizing the use of water, fertilizers, and other inputs. By adjusting bed formation parameters based on real-time soil moisture levels and nutrient content, the system promoted more efficient utilization of resources, reducing wastage and environmental impact while maximizing crop productivity.

The integration of actuators for autonomous adjustment of bed formation equipment enhanced operational efficiency, reducing the need for manual intervention and labor-intensive tasks. This automation not only saved time and labor costs but also improved overall workflow management, enabling farmers to focus on other critical aspects of farm operations.

Overall, the Agriculture Bed Formation System utilizing IoT technology represents a significant advancement in modern agriculture, offering a scalable and sustainable solution for optimizing bed formation processes. Further research and development efforts can explore additional functionalities and refinements to enhance the system's performance and applicability in diverse agricultural settings.

CHAPTER 6

CODING

6.1 SAMPLE CODING

```
#define PH_OFFSET -1.00 //if there have offset

#include <OneWire.h>

#include <DallasTemperature.h>

#include <WiFi.h>;

#include <WiFiClient.h>;

#include <ThingSpeak.h>;

#define SensorPin A0          // the pH meter Analog output is connected with the Arduino's
Analog

unsigned long int avgValue; //Store the average value of the sensor feedback

float b;

int buf[10],temp;


const char* ssid = "HASHAN"; // your network SSID (name)

const char* password = "hashanprojects"; // your network password


WiFiClient client;


unsigned long myChannelNumber = 2476494; //Your Channel Number (Without Brackets)

const char * myWriteAPIKey = "JGTBZW6YAGGH4CVV"; //Your Write API Key


// GPIO where the DS18B20 is connected to

const int oneWireBus = 2;
```

```

// Setup a oneWire instance to communicate with any OneWire devices
OneWire oneWire(oneWireBus);

// Pass our oneWire reference to Dallas Temperature sensor
DallasTemperature sensors(&oneWire);

void setup()
{
  pinMode(13,OUTPUT);
  Serial.begin(115200);
  //Serial.begin(9600);
  // Connect to WiFi network
  WiFi.begin(ssid, password);
  ThingSpeak.begin(client);
  sensors.begin();
  Serial.println("Ready"); //Test the serial monitor
}

void loop()
{
  sensors.requestTemperatures();
  float temperatureC = sensors.getTempCByIndex(0);
  float temperatureF = sensors.getTempFByIndex(0);
  Serial.print("temp:");
  Serial.print(temperatureC);
  Serial.println("'C");
  // Serial.print(temperatureF);
  // Serial.println("'F");
  // delay(1000);

```

```

int tur_sensorValue = analogRead(35);
int moister_sensor = analogRead(32);
Serial.print("moister value:");
Serial.println(moister_sensor);
float tur_voltage = tur_sensorValue * (3.3 / 4095.0);
Serial.print("tur:");
Serial.println(tur_voltage);
for(int i=0;i<10;i++)    //Get 10 sample value from the sensor for smooth the value
{
    buf[i]=analogRead(SensorPin);
    delay(10);
}
for(int i=0;i<9;i++)    //sort the analog from small to large
{
    for(int j=i+1;j<10;j++)
    {
        if(buf[i]>buf[j])
        {
            temp=buf[i];
            buf[i]=buf[j];
            buf[j]=temp; else:
                cv2.putText(image, text, (5, 25), cv2.FONT_HERSHEY_SIMPLEX,0.7,
(0, 255, 0), 2)
                # engine.say(text1)
                # engine.runAndWait()
                cv2.imshow("Image1",img)
                #print(text1)

```

```

        k = cv2.waitKey(30) & 0xff
        if k == 27:
            break
cap.release()
cv2.destroyAllWindows()

#####
"""call using an open ADO connection --> list of table names"""
from . import adodbapi

def names(connection_object):
    ado = connection_object.adoConn
    schema = ado.OpenSchema(20) # constant = adSchemaTables

    tables = []
    while not schema.EOF:
        name = adodbapi.getIndexValue(schema.Fields, "TABLE_NAME").Value
        tables.append(name)
        schema.MoveNext()
    del schema
    return tables

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    ado = connection_object.adoConn
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```

```

tables = []
while not schema.EOF:
    name = adodbapi.getIndexedValue(schema.Fields, "TABLE_NAME").Value
tables.append(name)
schema.MoveNext()
del schema
return tables

```

```

"""adodbapi - A python DB API 2.0 (PEP 249) interface to Microsoft ADO

```

```

Copyright (C) 2002 Henrik Ekelund, version 2.1 by Vernon Cole

```

```

* http://sourceforge.net/projects/adodbapi

```

```

"""

```

```

import sys

```

```

import time

```

```

from .apibase import apilevel, threadsafety, paramstyle

```

```

from .apibase import (

```

```

    Warning,

```

```

    Error,

```

```

    InterfaceError,

```

```

    DatabaseError,

```

```

    DataError,

```

```

    OperationalError,

```

```

    IntegrityError,

```

```

)

```

```

from .apibase import (

```

```

    InternalError,

```

```

    ProgrammingError,

```

```

    NotSupportedError,

```

```

FetchFailedError,
)
from .apibase import NUMBER, STRING, BINARY, DATETIME, ROWID

from .adodbapi import connect, Connection, __version__, dateconverter, Cursor

def Binary(aString):
    """This function constructs an object capable of holding a binary (long) string value."""
    return bytes(aString)

def Date(year, month, day):
    "This function constructs an object holding a date value."
    return dateconverter.Date(year, month, day)

def Time(hour, minute, second):
    "This function constructs an object holding a time value."
    return dateconverter.Time(hour, minute, second)

def Timestamp(year, month, day, hour, minute, second):
    "This function constructs an object holding a time stamp value."
    return dateconverter.Timestamp(year, month, day, hour, minute, second)

def DateFromTicks(ticks):
    """This function constructs an object holding a date value from the given ticks value
    (number of seconds since the epoch; see the documentation of the standard Python time
    module for details)."""

```

```
return Date(*time.gmtime(ticks)[:3])
```

```
def TimeFromTicks(ticks):
```

```
    """This function constructs an object holding a time value from the given ticks value
    (number of seconds since the epoch; see the documentation of the standard Python time
    module for details)."""
```

```
    return Time(*time.gmtime(ticks)[3:6])
```

```
def TimestampFromTicks(ticks):
```

```
    """This function constructs an object holding a time stamp value from the given
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```
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```
version = "adodbapi v" + __version__
```

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Copyright (C) 2002 Henrik Ekelund, version 2.1 by Vernon Cole
```

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    OperationalError,
    IntegrityError,
)
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    InternalError,
    ProgrammingError,

```

```

NotSupportedError,
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    "This function constructs an object holding a time value."
    return dateconverter.Time(hour, minute, second)
def Timestamp(year, month, day, hour, minute, second):
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    return dateconverter.Timestamp(year, month, day, hour, minute, second)
def DateFromTicks(ticks):
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    (number of seconds since the epoch; see the documentation of the standard Python time
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    return Date(*time.gmtime(ticks)[:3])
def TimeFromTicks(ticks):
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    module for details)."""
    return Time(*time.gmtime(ticks)[3:6])
def TimestampFromTicks(ticks):
    """This function constructs an object holding a time stamp value from the given
    ticks value (number of seconds since the epoch;
    see the documentation of the standard Python time module for details)."""

```

```

    return Timestamp(*time.gmtime(ticks)[:6])
version = "adodbapi v" + __version__
import unittest
from caffe2.python import core, test_util, workspace
from caffe2.python.control_ops_grad import disambiguate_grad_if_op_output
from caffe2.python.model_helper import ModelHelper
import numpy as np
class TestControl(test_util.TestCase):
    def test_disambiguate_grad_if_op_output(self):
workspace.FeedBlob("cond", np.array(True))
workspace.FeedBlob("then_grad", np.array(1))
workspace.FeedBlob("else_grad", np.array(2))

then_model = ModelHelper(name="then_test_model")
then_model.net.Copy("then_grad", "input_grad")

else_model = ModelHelper(name="else_test_model")
else_model.net.Copy("else_grad", "else_temp_grad")
else_model.net.Copy("else_temp", "input_grad")

    # to BuildGradientGenerators, in forward pass, we need else temp
    # as one of the output. Which later on results in a grad op like this:
grad_op = core.CreateOperator

    }

    }

    }

avgValue=0;
for(int i=2;i<8;i++)          //take the average value of 6 center sample
    avgValue+=buf[i];

float pHValue=(float)avgValue*3.3/4095/6; //convert the analog into millivolt

```

```
phValue=3.3*phValue;           //convert the millivolt into pH value
```

```
phValue = phValue + PH_OFFSET;
```

```
Serial.print("pH:");
```

```
Serial.print(phValue,2);
```

```
Serial.println(" ");
```

```
digitalWrite(13, HIGH);
```

```
delay(800);
```

```
digitalWrite(13, LOW);
```

```
ThingSpeak.writeField(myChannelNumber, 1,phValue, myWriteAPIKey);
```

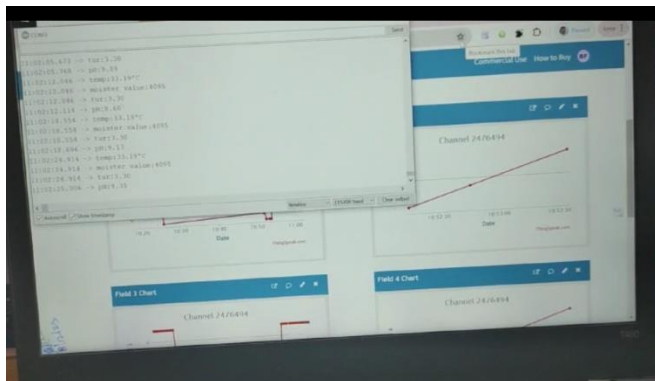
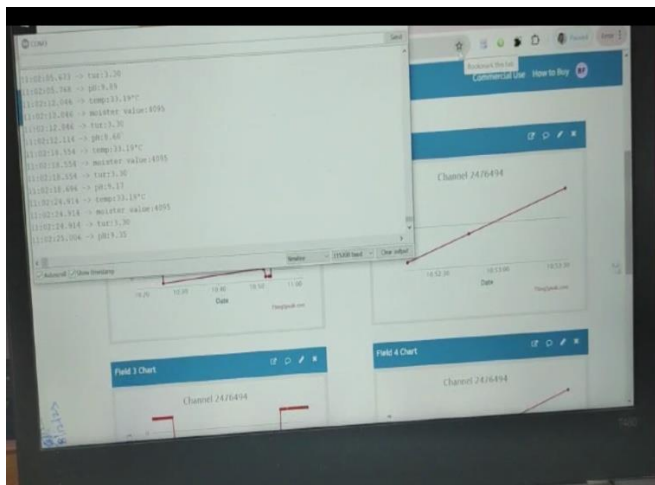
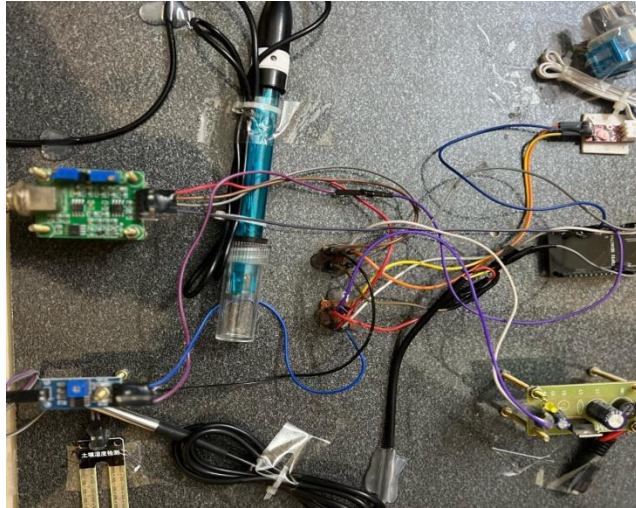
```
ThingSpeak.writeField(myChannelNumber, 2,tur_voltage, myWriteAPIKey);
```

```
ThingSpeak.writeField(myChannelNumber, 3,temperatureC, myWriteAPIKey);
```

```
ThingSpeak.writeField(myChannelNumber, 4,moister_sensor, myWriteAPIKey);
```

```
}
```

6.2 SAMPLE SCREENSHOTS



CHAPTER 7

CONCLUSION

In conclusion, the Agriculture Bed Formation System utilizing IoT technology represents a transformative solution for improving bed formation processes in agriculture. By integrating real-time data monitoring, dynamic adjustments, and autonomous control capabilities, this system offers significant benefits in terms of efficiency, productivity, and resource optimization.

Through precise monitoring of soil conditions and environmental parameters, the system enables tailored bed formations that meet the specific requirements of different crops and field conditions. This leads to improved uniformity and consistency across fields, enhancing crop growth and yield potential.

Moreover, the data-driven approach facilitated by IoT sensors promotes efficient resource management, minimizing wastage and environmental impact while maximizing resource utilization. The autonomous adjustment capabilities further streamline operations, reducing the need for manual intervention and labor-intensive tasks.

Overall, the Agriculture Bed Formation System using IoT technology holds great promise for modern agriculture, offering a scalable and sustainable solution to optimize bed formation processes. Continued research and development efforts in this field will further refine and enhance the system's performance, driving innovation and advancement in agricultural practices.

CHAPTER 8

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