IOT BASED AUTOMATIC PLANT MONETORING AND PREDECTION SYSTEM

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Abstract – ***Plant Health Management is the process of researching and overcoming the issues that limit a plant's ability to reach its full genetic potential, such as crop, adornment, timber, and other uses. Crop management is one of the most critical aspects of any agricultural setting. The plant health monitoring system and the numerous elements that affect plant growth will be discussed in this study. Temperature, humidity, soil moisture, light, and other variables are detected by several sensors, which send the data to the Arduino Uno board, which then delivers it to the user's smartphone. An alarm message is sent to the user's smartphone if any variation in the data is discovered. The user can examine the data and take appropriate measures to save the plant, such as adequate watering, ample sunlight, and so on.***

Keywords**:** *Arduino Uno, Ubidot IoT cloud platform, Environmental factors, sensor, IoT, Wi-Fi***.**

I. INTRODUCTION

IoT has been defined by several organisations. The International Telecommunication Union defines IoT as "the global infrastructure of the Information Society, enabling advanced services by combining based (physical and virtual) products based on, current and adaptable, information and communication technology."

"It is defined as a network of connected devices, sensors, or any other electronic equipment," says the simplest definition. These interconnected devices can gather and share information." As a result, the Internet of Things allows us to manipulate the electrical qualities of current network equipment from afar. If it can connect to the internet, it can be turned into an IoT device. More electronics are linked to our environment than individuals. The Internet of Things (IoT) will transform how businesses, governments, and individuals interact with each other and the rest of the world.

In countries like India, agricultural development has become a major problem, we must use new technologies to solve the problems. A new approach of visual parameter monitoring, cloud compilation, warning generating, and future value prediction has been implemented. For data gathering, these sensors are embedded in the agricultural sector, and data is stored in the cloud using the Ubidot IoT cloud platform.

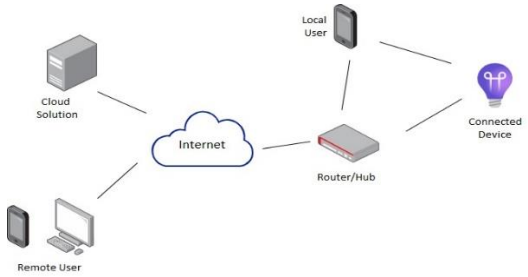


Fig. 1. Components of IoT Applications

II. LITERATURE SURVEY

Author [1] has used an ADCON-based system for telemonitoring purposes in grape areas in this research. This system can be used by a single vineyard owner, an employee, or a group of people who own several vineyards. They can direct these systems to execute a variety of activities, such as increasing productivity and crop management efficiency. The Adcon station has an anemometer sensor for data collection, which is transferred to the cloud through MQTT and then returned to the farmers after a specified algorithm to optimise the agricultural process.

In this paper, author [2] employed a DHTII sensor to measure temperature and humidity. These data will be captured and delivered to an Arduino dev board, which will then use the Arduino Rest API to send data from Arduino to another device. YL-38+ YL-69 soil moisture sensor TEMT6000 light intensity sensor to determine how much light the plant receives While the variable id and token are being produced, the ubidot will be configured so that the Arduino client can send data. An authentication token will connect the cloud. Sensor values and other data are then stored in the cloud. It is straightforward to carry out. To check that the water pump is properly controlled, use a raspberry pie.

This author[3] has employed game-based learning for plant monitoring, in which users will enjoy plant care and guidance, which will be monitored on plants via cellphones. Author has also used IOT technology, which will send and receive data from the Raspberry Pi to the gaming application, and lastly, plant care, in which plant development will be based on temperature, water, and moisture, with data collected from the light intensity sensor using the Raspberry Pi. If there isn't enough Raspberry Pie, it will send a signal to the cloud server, which will notify the game programme, and the player will be able to switch on the light. Another option is to water the plant when the deficit is severe. Raspberry pie to control the water pump in order to ensure that the plant has an appropriate environment for care.

In this paper author[4] tries to improve the agriculture field needs a lot of care so that over the economic condition of the user Author has used Raspberry pie, Temperature, moisture, light, IR, motor, and server with a database Power supply. So first you have to start the system by logging in with your id & password and then in the code path link give your IP address after that your IP address opens a web page where you will see a list of sensors like temperature, humidity, light intensity. If the moisture sensor reads 1, the land is wet and the motor is turned off; otherwise, the land is dry and the engine is turned on. If the IR sensor reads 1, the intruder detected Buzzer on, otherwise Buzzer off. As a result, the device can be used in or stored in a garden, and it can also be installed in an agriculture region to monitor crop health.

III. SYSTEM ARCHITECTURE

The Architecture for Plant Health Monitoring System consist of various hardware and software components which can be interconnected via Arduino Uno board. The components used are DHT11, TEMP6000 sensors which are connected to the Arduino Uno board which is then connected to the internet using Ubidot. From there the user can access the data. The idea is depicted in the figure below.

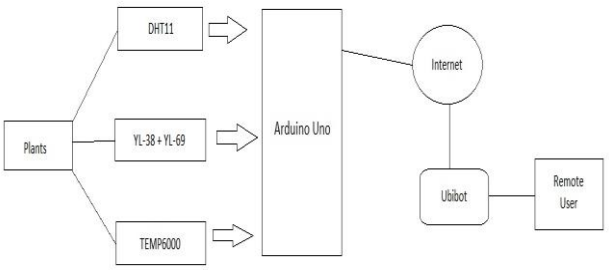


Fig. 2. Block diagram of the proposed architecture

The Architecture includes various sensors which are interconnected via the Arduino Uno board to facilitate the sharing of the information from the

sensors to the user's smartphone. The details of the sensors used in the architecture is discussed below.

A. DHT11

The DHT11 could be a cheap digital temperature and humidness sensing element. This sensing element could merely be connected to any microcontroller, like associate degree Arduino or a Raspberry Pi, to live humidness and temperature in period. A electrical phenomenon humidness police investigation component and a semiconductor device for temperature detection form up the DHT11 sensing element. The IC measures, processes, and converts the resistance values into digital type. DHT11 includes a temperature vary of zero to fifty degrees stargazer with a 2-degree accuracy. This sensor's humidness vary is twenty to eighty p.c, with a five-hitter accuracy. This sensor's rate is 1Hz. It delivers one reading each second, in alternative words. The DHT11 could be a little semiconductor with a three to 5-volt operating voltage. whereas mensuration, the utmost current used is two.5mA.

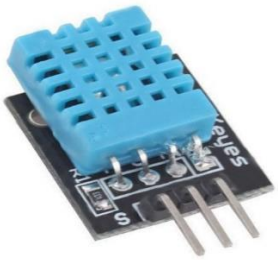


Fig. 3. DHT11 Sensor

B. YL-38 + YL-69

A soil moisture sensor, commonly known as a hygrometer, is used to measure soil moisture. The YL-38 + YL-69 is a hygrometer (soil moisture sensor) that detects moisture in the soil. Assisting with plant soil moisture monitoring or the design of an automatic plant watering system. The sensor is made up of two parts: an electrical board and a two-pad probe that measures groundwater levels. When the soil is moist, the output voltage drops, and when the soil is dry, it rises. The output can be a low or high digital signal depending on the water content. The modules have a reduced effect when the soil moisture level exceeds a specified threshold; otherwise, they have a stronger effect.

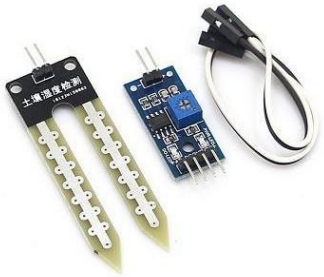


Fig. 4. YL-38 and YL-69 Sensor

C. TEMT6000

The TEMT6000 is a light intensity sensor that allows us to determine how much light a plant receives. The sensor functions as a transistor that is larger than the incoming light, with the voltage at the signal pin as the height. It detects the amount of light present and sends an analogue voltage signal to the Arduino controller. It's modelled after the human eye, which can detect infrared and ultraviolet light. The TEMT6000 has a 3.3V to 5.5V supply voltage range, a 40 to 85 C working temperature range, and a brightness range of 1 to 1000 Lux.

Fig. 5. TEMP6000 Sensor

D. Arduino Uno

Arduino is Associate in Nursing ASCII text file platform that will be wont to produce electronic creations. Arduino is formed from a hardware programmable card (also referred to as a microcontroller) and code, referred to as Associate in Nursing IDE (Integrated Development Environment), that runs on your pc and is employed to make and transfer coding system to the physical board. The Arduino Uno dev board is a microcontroller during this system, and it may be programmed in C or C++. It comes with Associate in Nursing integrated development setting (IDE) to form the event method easier. Associate in Nursing local area network defend or a Wi-Fi defend may be wont to send Associate in Nursingd receive information on an Arduino Uno. it should be controlled from a distance.

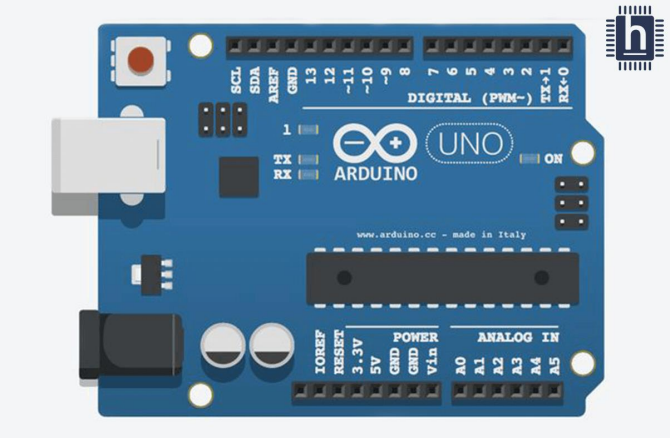


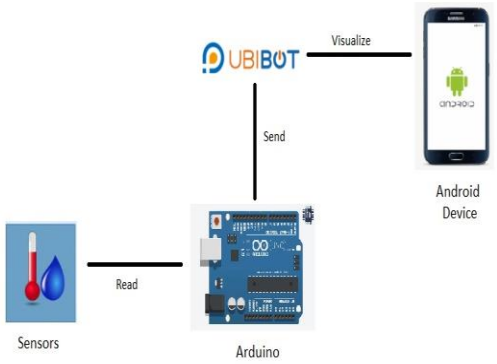
Fig. 6. Arduino Uno microcontroller

E. Ubidot IoT Cloud platform

Ubidot are crucial components of a plant health monitoring system. The dev board provides data to a cloud platform when you build a sensor-based IoT system. These forums keep track of information and utilize it to produce graphs. The Ubidot IoT cloud platform is similar to PaaS (Platform as a Service), which provides IoT providers using these services. Connecting Arduino to a distant service will cost money. These forums put in a lot of effort. They employ a set of custom rules that are based on events received from Arduino sensors. These occurrences trigger an external action, such as sending a text message. Most of these platforms include a free account that can be used to start an IoT project.

IV. EXPERIMENTAL SETUP

To exchange data between components in the IoT ecosystem, a variety of protocols are used. Some of these protocols, such as HTTP, are widely used in other sectors and are also employed in the IoT ecosystem. It's really beneficial if we want to connect IoT components all across the world. To host HTTP connections, the Arduino Uno includes an HTTP web server.



Data is transferred from Arduino to other systems using the Arduino Rest API. The Arduino Rest API is used to read and write data to the Arduino board. The sensor values will be returned. When a client submits an Arduino application, the Ubidot IoT cloud platform employs the Arduino Rest API method, which responds with other data. The HTTP protocol is used by the Arduino Rest API, which plays a crucial role in the client-server context in which Arduino serves as a server. The Relaxation library is used by the Arduino Rest API. Restless board dedicated services are supported by this library. It's free to use and open source.

V. RESULT

During the seeding to harvesting process, the platform system measures air temperature and humidity, leaf wetness, soil temperature, and moisture.

The importance of understanding soil-plant-atmosphere interactions in agricultural output

optimization is highlighted by these data transmission networks. One of the system's advantages is that it runs on solar energy and has specialised sensors. We'd like to conduct some further system testing for denial of service (DoS) attacks. We'll concentrate on using DoS attacks to limit data transmission between ADCON and the server and prevent legitimate users, such as farmers, from accessing server data.

5. Conclusion

Sensors and little controls area unit with success connected to the cloud. information is hold on with success and might be accessed remotely. All thought of once
test setup proves that this can be the proper resolution for observation plant health. The user could have access to the information and should not bear in mind of any deviations in temperature, humidity, soil wetness, and light-weight intensity. victimisation this program can permit users like farmers to watch and improve crop yields and overall production.

VI. FUTURE WORK

Though we can detect plant health by various devices sometimes it's impossible to detect a plant that is inside the clay pot due to which user is unable to determine whether the plant is root bounded or not. Therefore we will implement this method in the further project of detecting root bound so that the life of the plant will be saved and the plant will take the space it requires to get rid of the root-bound. In the following figure its shows that how densely root bound has effected the plants due to which plant life has been reduced and its also shows that the plant does got the enough space its required.

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