IOT BASED PLANT MONITORING SYSTEM USING TELEGRAM BOT

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Abstract : More and more it has become necessary to use technologies in the agriculture field. Agriculture is the backbone of our country; most of the people depend on agriculture. The main issue in agriculture is water scarcity. The water resource is not used in an effective manner, so the water is wasted. In order to overcome this irrigation process can be automated. The use of Internet of things in this field will be helpful to reduce the wastage of water. The use of sensors for IoT and actuators that make everything in the field more efficient and modern. We can do work easily and efficiently. The work can also be done within a very short period. By developing this intelligent system aimed at monitoring and controlling soil moisture in plants and plantations, it not only speeds up the work but also reduces the wastage of water by supplying required amount of water to the plant. It sends Telegram message which contains the details of the water content in the plant and can be viewed whenever we want.

I.   INTRODUCTION

1.1 PROJECT OVERVIEW:

More and more it has become necessary to use technologies in the agriculture field. The use of sensors for IoT and actuators that make everything in the field more efficient and modern. We can do work easily and efficiently. The work can also be done within a very short period. By developing this intelligent system aimed at monitoring and controlling soil moisture in plants and plantations, it not only speeds up the work but also reduces the wastage of water. by supplying required amount of water to the plant. It sends Telegram message which contains the details of the water content in the plant and can be viewed whenever we want. The circuit starts sensing the soil moisture using Soil Moisture Sensor and sends to the ESP32 in quick intervals.
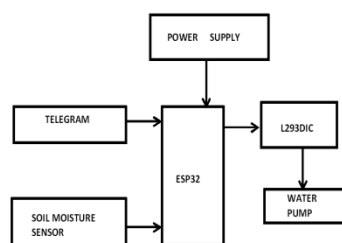
1.2 BLOCK DIAGRAM:

Figure 1:Block Diagram of IoT Based Plant Monitoring System with Telegram Bot

1.3 BLOCK DIAGRAM DESCRIPTION:

1.3.1   Power Supply:

Here we used +5V dc power supply from a computer USB/9v battery. The main function of this block is to provide the required amount of voltage to essential circuits. +5V is given to Soil Moisture Sensor, ESP32. +9V is given to the water pump.

1.3.2   ESP32:

ESP32 is a single 2.4 GHz Wi-Fi-and-Bluetooth combo chip designed with the TSMC lowpower 40 nm technology. It is designed to achieve the best power and RF performance, showing robustness, versatility and reliability in a wide variety of applications and power scenarios. This microprocessor supports RTOS and operates at 80MHz to 240 MHz adjustable clock frequency. ESP32 has 520 KB RAM and 4MB of Flash memory to store data and programs. ESP32 can be powered using a Micro USB jack and VIN pin (External Supply Pin). It supports UART, SPI, and I2C interface.
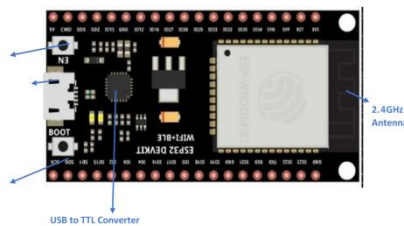

Figure.2 ESP32 Board

1.3.3   Soil Moisture Sensor:

A soil moisture sensor measures the volumetric water content of soil. A resistive soil moisture sensor works by using the relationship between electrical resistance and water content to gauge the moisture levels of the soil. These sensors possess two exposed probes that are inserted directly into the soil sampleA electrical current is sent from one probe to the other, which allows the sensor to measure the resistance of the soil between them. When the water content in the soil is high, it has a higher electrical conductivity (water is a good conductor of electricity!). Hence, a lower resistance reading is obtained which indicates high soil moisture. When the water content in the soil is low, it has poorer electrical conductivity. Hence, a higher resistance reading is obtained, which indicates low soil moisture.
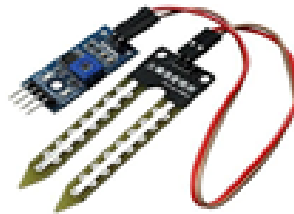

Fig .3 Soil Moisture Sensor

1.3.4   L293D:

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. The l293d can drive small and quiet big motors as well. VCC is the voltage that it needs for its own internal operation 5v; L293D will not use this voltage for driving the motor. For driving the motors, it has a separate provision to provide motor supply VSS (V supply). L293d will use this to drive the motor. It means if you want to operate a motor at 9V then you need to provide a Supply of 9V across VSS Motor supply. The maximum voltage for VSS motor supply is 36V. It can supply a max current of 600mA per channel. Since it can drive motors Up to 36v hence we can drive pretty big motors with this L293d.

1.3.5   Water Pump:

This is a low-cost mini submersible type water pump that works on 3-6V DC. It is extremely simple and easy to use. Just immerse the pump in water, connect a suitable pipe to the outlet and This motor is small, compact and light. It can be controlled from a micro controller/Arduino using our DC Motor Drivers or one of our Relay Boards. You may use our

5V SMPS Power Supply Adapter to run this pump. You may also use our 6V Solar Panel to run the pump with appropriate a 6V voltage regulator. Its flow rate is 1.6L/min

Figure.4: Water Pump

II.   LITERATURE SURVEY

Water management is paramount in countries with water scarcity. This also affects agriculture, as a large amount of water is dedicated to that use. The possible consequences of global warming lead to the consideration of creating water adaptation measures to ensure the availability of water for food production and consumption. Thus, studies aimed at saving water usage in the irrigation process have increased over the years. Typical commercial sensors for agriculture irrigation systems are very expensive, making it impossible for smaller farmers to implement this type of system. However, manufacturers are currently offering low-cost sensors that can be connected to nodes to implement affordable systems for irrigation management and agriculture monitoring. Due to the recent advances in IoT and WSN technologies that can be applied in the development of these systems, we present a survey aimed at summarizing the current state of the art regarding smart irrigation systems. We determine the parameters that are monitored in irrigation systems regarding water quantity and quality, soil characteristics and weather conditions. We provide an overview of the most utilized nodes and wireless technologies. Lastly, we will discuss the challenges and the best practices for the implementation of sensor-based irrigation systems.

2.2 SMART IRRIGATION USING LOW-COST MOISTURE SENSORS AND XBEE-BASED COMMUNICATION

In this paper the author talked about soil moisture sensor and its type. Capacitive sensors have a very big advantage over resistive because they don't corrode. Capacitive sensors are instantaneous but they are costly and need to calibrated often with varying temperatures. Neutron probe-based moisture sensors are very accurate but present radiation hazards, calibration difficulty and are costly. Gypsum blocks are however less expensive but they dissolve in water and change their response with passage of time. Thermal imaging is an effective method but is prohibitively expensive. Due to the above reasons, an alternative, low-cost sensor must be produced enabling the use of smart irrigation systems in the third world countries. XBee is a low-cost and low-power wireless technology. XBee wireless technology was first introduced with XBee alliance being formed between Philips, Motorola, Honeywell, Invensys and Mitsubishi Electric in October 2002 under IEEE 802.15.4 WPAN standard. XBee operates in the 2.4 GHz band with a data transfer rate of 250kbps and it supports peer to peer, point to point and point to multipoint networking methods with current consumption ranging between 30 to 40mA for data transmission.

2.2 SOLAR-POWERED AUTOMATED IOT-BASED DRIP IRRIGATION SYSTEM

In this paper the author talked about the usage of solar power in irrigation system. In most of the cases, conventional electricity or diesel-generated electricity is used by the farmers to run the motors and pumps manually, resulting in over irrigation and wastage of water. The use of conventional energy resources like petrol, diesel, coal is expensive and also creates air pollution and noise. Hence nowadays maximum research works are focusing on utilization of renewable energy resources, which is widely available, like solar energy. Solar-powered irrigation system is not only ecofriendly but also economically a cheap process. This process minimizes the operation and maintenance cost, which is 2–4 times higher than a solar photovoltaic (PV) pump. In most of the developing countries, agriculture is solely dependent on rain water and thus poorly affected in the season of summer. In India there are also some of the places where water availability is very low

which has detrimental effects on crop production. Hence nowadays wireless sensors were used to analyze the moisture level of the field and to automate the irrigation process. An automated irrigation system refers a system, with a minimum of manual requirement. All types of irrigation process like drip irrigation, sprinkler irrigation or surface irrigation can be automated by using timers, sensors or computers or mechanical appliances.

III.   TECHNICAL DESCRIPTION:

A soil moisture sensor measures the volumetric water content of soil. A resistive soil moisture sensor works by using the relationship between electrical resistance and water content to gauge the moisture levels of the soil. These data is then send to the ESP32 microcontroller. The microcontroller is fed with the analog values. The details fed to the microcontroller are processed and depending upon the threshold value a high signal is sent by ESP32 to the L293D IC. When L293D gets high signal, it switches on the water pump. Soil Moisture Sensor continuously shares the signal to ESP32. We can communicate with the plant using Telegram Bot created in Telegram app,

3.2 WORKING:

1. When POWER SUPPLY is given to ESP32, Soil Moisture sensor gets activated.
2. Wi-Fi connects to ESP32.
3. If the water level is less than the threshold value the system automatically waters the plant.
4. We can communicate with the plant using telegram bot by sending "/Plant Condition".

3.3 PROCEDURE:

1. Take all the components required.
2. Connect 5V pin of Soil moisture sensor to the bread board having 5V supply, GND to the GND pin and A0 to the 32nd pin of ESP32.
3. Connect 1st pin of L293D to 5V supply and 4th pin to Ground.
4. Connect 2nd pin of L293D to 27th pin of ESP32.
5. Connect positive terminal of Water Pump to 3rd pin of L293D and negative terminal to Ground.
6. Connect 9V battery to 8th pin of L293D.
7. Install the Telegram application in android phone.
8. Accept all the permissions required.
9. Create Telegram bot using Bot Father in Telegram and note down the token access code and chat_id.
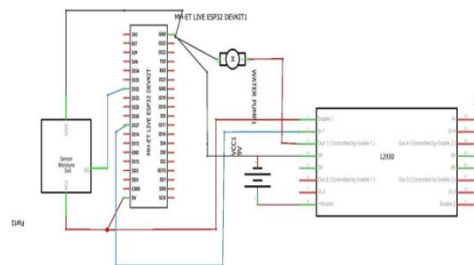
3.4 SCHEMATIC DIAGRAM

Figure .5 Schematic Diagram of IoT based Plant Monitoring System with Telegram Bot

IV.   SYSTEM ANALYSIS

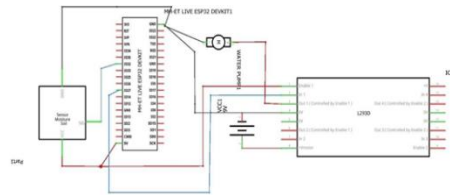### 4.1 EXISTING MODEL
4.1.1 Schematic Diagram

Figure .6 Schematic Diagram

Circuit Connections of this Plant Monitoring System with Telegram Bot is simple and is shown in the image above. Here the VCC pin of soil moisture sensor is connected to the VCC of ESP32 and GND of the soil moisture sensor is connected to the GND of ESP32. SIG pin is connected to the EDP32 32nd pin. The L293D 1st pin is connected with the 5V supply and 4th pin is connected to the GND. 2nd pin of L293D IC is connected with the 32nd pin of ESP32. The output pin of L293D i.e., 3rd pin is connected with the positive terminal of water pump and negative terminal of water pump is grounded. The 8th pin of L293D is powered by 9V battery.

4.1.2 Working

In this project, ESP32 is used for controlling whole the process with a Soil Moisture Sensor and L293D IC. Soil Moisture Sesnor is used for detecting the water content in the soil, L293D IC is used to control the water pump.

4.1.3 Advantages :

- Provides right amount of water to the plant
- Reduces water wastage

Disadvantages :

- The resistive type soil moisture sensor may corrode with time.

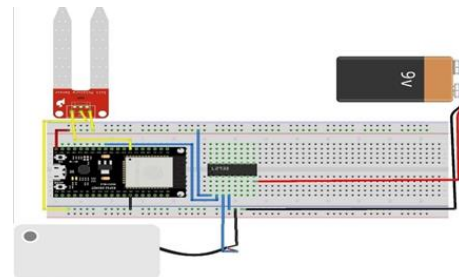### 4.2 PROPOSED MODEL

4.2.1 Circuit Diagram

Figure 7. Circuit Diagram of Plant Monitoring System with Telegram Bot

Circuit Connections of this Plant Monitoring System with Telegram Bot is simple and is shown in th e image above. Here the VCC pin of soil moisture sensor is connected to the VCC of ESP32 and GND of the soil moisture sensor is connected to the GND of ESP32. SIG pin is connected to the EDP32 32nd pin. The L293D 1st pin is connected with the 5V supply and 4th pin is connected to the GND. 2nd pin of L293D IC is connected with the 32nd pin of ESP32. The output pin of L293D i.e., 3rd pin

is connected with the positive terminal of water pump and negative terminal of water pump is grounded. The 8th pin of L293D is powered by 9V battery.

4.2.2 WORKING:

1. When POWER SUPPLY is given to ESP32, Soil Moisture sensor gets activated.
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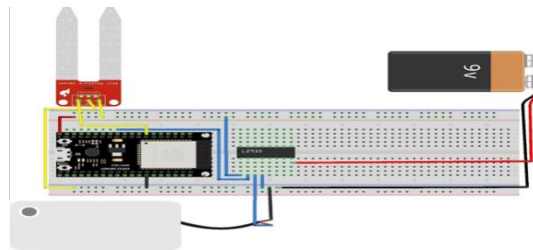
V.   RESULTS

5.1 CIRCUIT DIAGRAM

Figure 8.Shows Circuit Diagram of Pant Monitoring System with Telegram Bot

5.2 RESULT

Figure 9. Circuit ON state

The pictures above are to represent the result of this work. In this model, the system waters the plant and shares the water content in the plant.

5.3 ADVANTAGES

➤ Low cost.
➤ Easy to use.

- ➢ Can be implemented to any fields.
- ➢ Can be used to control the waste age of water.
- ➢ It uses separate battery power, so this device turns off/ on manually.

5.4 DISADVANTAGES

- ➢ Device efficiency may decrease with time.
- ➢ Probes of Soil Moisture Sensor may corrode.

5.5 APPLICATIONS

- ➢ For Agriculture Purpose.
- ➢ Controlled water supply for a plant.
- ➢ The System can be implemented in house hold gardening to monitor the plant condition.
- ➢ The System is very useful in drought effected areas so that water can be used minimally but also most effectively.

VI.   CONCLUSION & FUTURE SCOPE

6.1 CONCLUSION

Planet Earth may be called as a Blue Planet but only 3% of the whole water available on the planet can be used for all the domestic purposes. Implementation of Plant Water Monitoring System in farming leads to a great decrease in wastage of water and helps a farmer use water efficiently with minimal cost. This system also gives the feasibility to diagnose the plants condition from a distance. By adjusting the threshold value of the soil moisture, we can also provide the required amount of water according to the plant needs.

6.2 FUTURE SCOPE

- This system can not only be used to monitor moisture content in soil but also, we can integrate a camera to monitor plants health condition.
- By updating the commands in telegram bot, we can also control the water pump.

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