IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

APP BASED AUTOMATIC IRRIGATION SYSTEM

[1]M. Sushma Sri, [2]V. Nikita, [3]S. Bhargavi,[4] Md. Muneeruddin,[5] K. Pragthi,[6] T. Kranthi

[1]Faculty, [2]Student, [3]Student,[4]Student,[5]Student,[6]Student
Government Institute of Electronics, Hyderabad, India

Abstract: Farming is the most important factor for yielding the crops. India is the agriculture-based country and many people are completely depended on agriculture harvesting because it is a major source of employment. For this reason, we proposed automatic irrigation system and soil moisture controlled by Wi-Fi module. Here we developed an automated watering system which can help farmers in water level management for controlling the motor and tests the soil moisture. In this project we also proposed a solar system for power consumption and providing a security for protecting the crop fields from animals. The main aim of this project is to help farmers by reducing water use, increasing soil fertility and saving time.

Index Terms **– Node MCU, Soil Moisture Sensor, Motor Driver**

I. INTRODUCTION

The objective of this project is to outline a manageable, facile to install technique to detect and specify the level of soil moisture that is endlessly managed with a view to attain pinnacle plant growth and concomitantly augment the obtainable irrigation resources. In this project we also proposed a water level management system through an app for switching the motor ON / OFF. Soil monitoring, providing a series of assessments showing how soil conditions and their properties change over time. The use of simple obtainable components decreases the manufacturing and maintenance costs. This makes this system more economical, appropriate and a low maintenance solution for applications, mainly in rural areas and for small scale agriculturists [1]. Thus, App Based Automatic Irrigation System reduces the wastage of water in the fields and tests the soil moisture for exact crop. This system can be programmed to discharge the exact amount of water required by the plant in the fields and in the home. Thus, saving the time as well as the water for the farmer.

1.1Block Diagram:

In our project firstly we sense the moisture level of the soil using soil moisture sensor which irrigates the soil accordingly. As shown in the above fig 1 block diagram the soil moisture sensor sends the information to NodeMCU and sends to the firebase server. After deciding the mode whether automatic or manual, the motor is functioned accordingly.

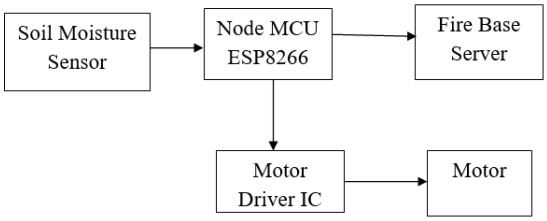

Fig. 1 Block Diagram

1.2 Overall description:

The device provides an application to check the moisture level and water the plants with dual mode operation (Manual and Automatic). If the user selects the automatic mode, then the device will check the moisture level and ON/OFF the water pump automatically. In manual mode the user needs to ON/OFF the water pump based on the moisture level as he desires. The flow chart is explained in below fig.2.

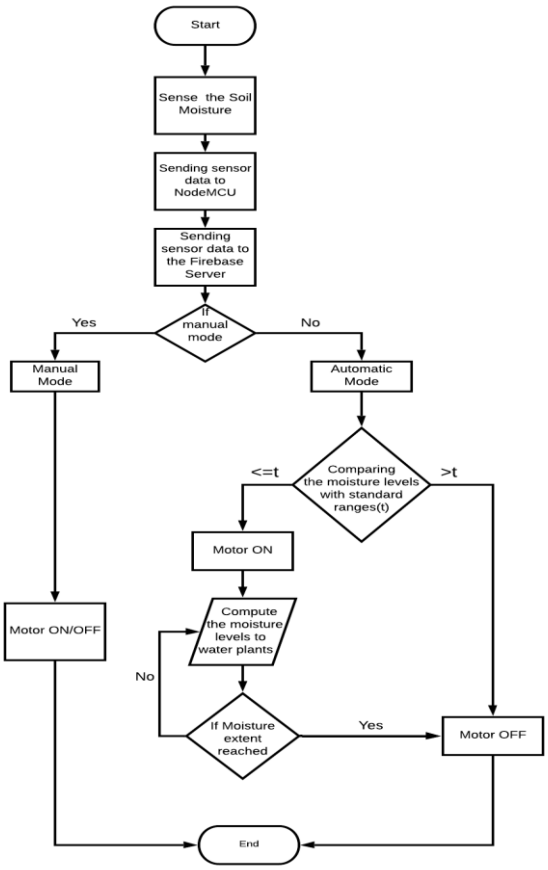

Fig 2: Flow Chart

1.3. Objective of the Project:

The automatic watering system on sensing soil moisture is intended for the development of a watering system that switches motor pump on or off using NodeMCU, to perform this action on sensing the moisture content of the soil, soil moisture sensor collects the data from the soil to the NodeMCU for transferring the moisture conditions of the soil for wetness, dryness, etc. Once the microcontroller gets the data from the sensing material, it compares the data to standard values (according to the threshold value), which generates output signals and activates the motor driver for operating the motor pump.

II. IMPLEMENTATION

There are four components in our project namely:

2.1 NODEMCU ESP8266:

NodeMCU is an open-source development board and firmware based which is widely used ESP8266 Wi-Fi module as shown in fig.3. With just a few lines of code you can establish a Wi-Fi connection and define input/output pins accordingly based on our needs exactly like Arduino. It is the Wi-Fi equivalent to Ethernet module. It combines features of Wi-Fi access point and Arduino. These features make the NodeMCU extremely powerful tool for Wi-Fi networking. It can be used as access point and station, host a web server or to connect on the internet to fetch or upload data.

Fig 3: NodeMCU

2.1.1Description

Arduino NodeMCU ESP8266

- Working temperature: -40℃~+125℃;
- AD0: one-way ADC;
- Power input: 4.5V~9V(10VMAX), support USB powered and USB debug;
- Working current ~70mA (200mA MAX, continue), standby <200uA;
- Support update firmware remotely (OTA);
- Support UART/GPIO data communication interface.

2.1.2 Features

- Open-source
- Interactive
- Programmable
- Low cost
- Simple

2.1.3 Specifications

The Development Kit based on ESP8266, integrates GPIO, PWM, IIC, 1-Wire and ADC all in one board. Power your development in the fastest way combining with Node MCU Firmware.

2.2 Soil Moisture Sensor:

The soil moisture sensor consists of two probes which are used to measure the volumetric content of water as shown in fig.4. The two probes allow the current to pass through the soil and then it gets the resistance value to measure the moisture value. When there is more water, the soil will conduct more electricity which means that there will be less resistance. Therefore, the moisture level will be higher. Dry soil conducts electricity poorly, so when there will be less water, then the soil will conduct less electricity which means that there will be more resistance. Therefore, the moisture level will be lower. This sensor can be connected in two modes; Analog mode and digital mode.

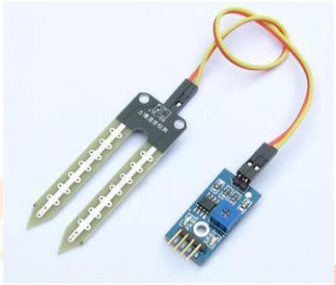

Fig 4: Soil Moisture

2.2.1 Need for Soil Moisture Content Measurement

Volumetric water content is an important part of the soil, influencing the many biological, physical, and chemical processes [6]. For the growing of crop three factors are most important first the soil nutrients and soil properties; second, the properties of the seeds and most important is the soil moisture level [2]. Objectives of soil moisture measurements in agriculture are: Automatic irrigation, Water saving [7], [8], Increase product or yield [8], Soil salinity control and Soil erosion control.

2.3 Motor:

A dc motor is used as a water pump, shown in fig.5. The pump is turned on and off automatically with the help of the motor driver. The values of the moisture content are read by the NodeMCU and are compared with the threshold value and thereby motor driver circuit is activated.

Fig 5: Motor

2.4 Circuit Diagram:

The circuit diagram of our project is shown in below fig 7. With the basic components power socket, connecting wires, adapter and bread board. The output terminals of soil moisture are ground (GND), A0, D0, Vcc. The output of soil moisture sensor is analog here, as the ESP8266 has built in analog to digital converter (A0 pin of soil moisture sensor is connected to the A0 pin of ESp8266). Now the output of soil moisture content from ESP8266 is taken from D0, GND. This is given as input to the motor driver L298N IC (Pin IN1). The power socket positive terminal will be connected to the +5V terminal of L298N motor driver. The motor thus functions as programmed.

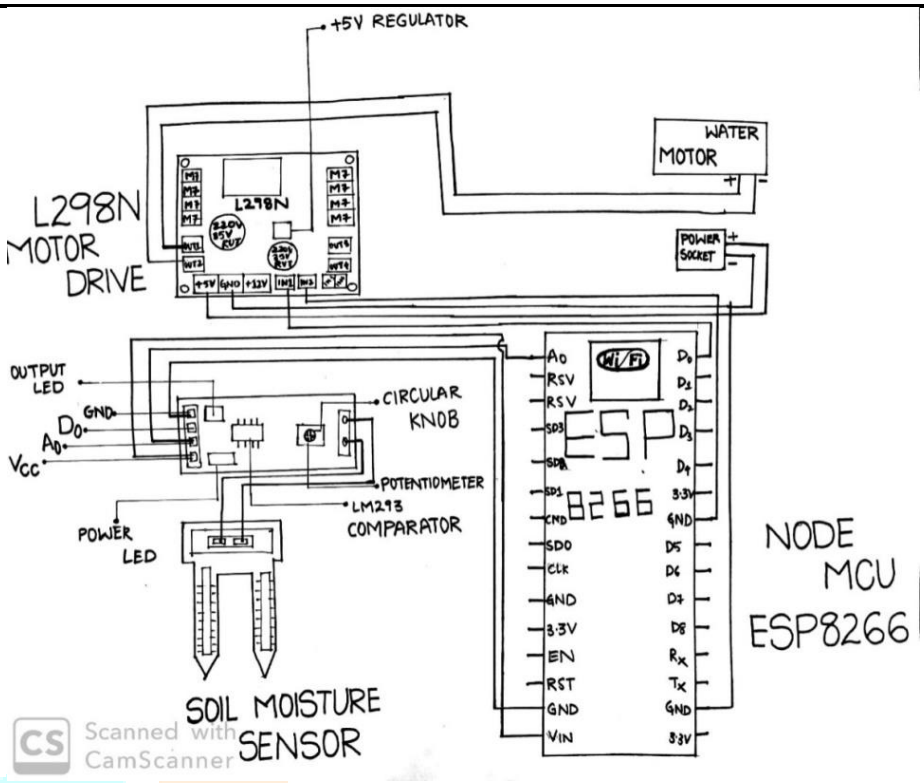

Fig 6: Circuit Diagram

III. ANALYSIS

3.1 Existing System:

Primarily, the system detects the moisture level using moisture sensors and displays the moisture level of the soil on the LCD screen with a timer which is set by user to water the plant at regular intervals. It waters the plant though the moisture level is high. It doesn't keep the user updated about the status of the moisture content in the soil when the user is far away. And so, the user cannot access the device when the user is not around.

3.2 Proposed System:

Along with the already existing device features, we have added a few more for making it more effective and easier for the user to access as shown in below fig 7. A mobile application has been designed which can be installed in the user's mobile to get the status of the moisture level and also the motor pump status. This makes the device easily accessible by anyone from anywhere. It also provides an additional feature of manual and automatic mode of operation depending upon user's convenience.

Fig 7: App based Automatic Irrigation System

IV. APPLICATION DESIGN

4.1Mobile Application Design:

In this mobile application design the user (farmer) can set in manual mode or automatic mode based on the requirement and also the farmer can know the moisture level of plants in the field crop.

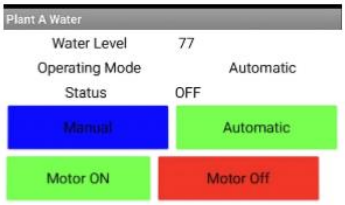

Fig 8: App Image

V. ADVANTAGES AND DISADVANTAGES

5.1 Advantages:

- Affordable.
- Saving farmer's time (no need to monitor always).
- Easy handling (light weight, easy installation and direct reading).
- For irrigating the field based on the required rate of moisture automatically.
- Minimizes water waste and improves plant growth.
- The circuit is designed to work automatically and hence, there is no need for human intervention.

5.2Disadvantages:

- Lack of Accuracy in sandy soil.

VI. APPLICATIONS

- The project is intended for small gardens and residential environment, by using advanced soil moisture sensor. The same circuit can be expanded to large agricultural fields.
- Implementing Automatic Irrigation System in large field.
- Irrigation in garden and parks.
- Very efficient for paddy fields.
- Can be used for cultivation.

VII. RESULTS & DISCUSSIONS

The below are the pictures of moisture levels of organic plants in which different plants has different moisture levels based on moisture level, the farmer will come to know how much of water is required for his field.

Marigold (33%)

Fig (109%)

Tomato (75%)


Brinjal (128%)


Banana (65%)


Mint (104%)

Table 9.1.1 Moisture Level-Leafy Vegetables

LEAFY VEGETABLES	MOISTURE LEVEL (%)
Spinach	59
Coriander	71
Fenugreek	27
Mint	104
Spring Onion	71
Curry Leaves	58
Betel Leaves	99

Table 9.1.2 Moisture Level-Vegetables

VEGETABLES	MOISTURE LEVEL (%)
Green Chillies	61
Sweet potato	74
Cucumber	99
Brinjal	128
Lemon	78
Tomato	75
Carrot	110
Beet root	118

Table 9.1.3 Moisture Level-Fruits

FRUITS	MOISTURE LEVEL (%)
Pineapple	113
Pomegranate	123
Banana	65
Guava	72
Fig	109
Papaya	75
Green Apple	97

Table 9.1.4 Moisture Level-Flowers

FLOWERS	MOISTURELEVEL (%)
Chrysanthemum	21
Firecracker	77
Marigold	33
Rose	39

7.2 Motor On/Off based on moisture level:

Table 9.2.1 Moisture Level-Motor ON/OFF

PLANTS	MOISTURE LEVEL (%)	MOTOR
Chrysanthemum	21	ON
Mint	104	OFF

The motor is ON/OFF based on the Moisture Levels of the plants. As programmed in the code, the motor is ON when the moisture level is less than 50% and is turned OFF when reaches the appropriate Moisture Level and OFF when the moisture level is greater than 50%.

VIII. CONCLUSION

Water is important resource for farming. Soil moisture can be known very easily, accurately. This helps farmers to choose exactly what crop should be grown in that particular soil that leads to water consumption and also increases the quality of the crop. We have implemented the system so as to sense the moisture level and automatically irrigate the field as required. This could reduce the manual work of the farmer and work automatically in the absence of the farmer.

REFERENCES

[1] Awasthi, A., & Reddy, S. R. N. (2013). Monitoring for Precision Agriculture using Wireless Sensor Network-A review. GJCST-E: Network, Web & Security.

[2] Bhadane, G., Sharma, S., &Nerkar, V. B. (2013). Early Pest Identification in Agricultural Crops using Image Processing Techniques. International Journal of Electrical, Electronics and Computer Engineering.

[3] Bhasha, S. J., &Hussain, S. M. Agricultural field monitoring and automation using PIC16F877A microcontroller and GSM.International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume.

[4] C.M. Devika, Karthika Bose, S. Vijayalekshmy, “Automatic plant irrigation system using Arduino”, Dec. 2017.

[5] S. DAS and E. AL, "Design and Fabrication of a Soil Moisture Meter Using Thermal Conductivity Properties of Soil," no. October 2016.

[6] X. Liu, "Evaluation of the heat-pulse technique for measuring soil water content with the thermo-TDR sensor," Procedia Environ.Sci., vol. 11, no.PART C, pp. 1234–1239, 2011.

[7] P. C. Dias, W. Roque, E. C. Ferreira, and J. A. S. Dias, “Proposal of a Novel Heat Dissipation Soil Moisture Sensor,” pp. 124–127.

[8] A. Valente, C. Couto, and J. H. Correia, “On-chip integrated silicon bulk-micromachined soil moisture sensor based on the DPHP method,” Transducers '01 Eurosensors Xv, Dig. Tech. Pap. Vols 1 2, vol. 1, no. iii, pp. 316–319, 2001.