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Smart Drip Irrigation System

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ABSTRACT

Water is an essential thing for crops and plants in agriculture. In traditional agriculture systems are take large amount of time to watering the crops lands and also have a lots of water wastes. Avoiding these problems drip irrigation systems are introduced. Drip irrigation technique is the best and efficient technique to supply the water to plants/crops in effective manner. In our IoT based smart and automatic drip irrigation system is solve the problems in existing systems and also provide the many features to farmers. This system is using Wemos D1 ESP 8266 which controls all sensors and send and receive the sensing values through the internet. In this paper explains the over view installation, system design and working of system.

Keywords: *Wemos D1 ESP 8266, IoT, OTA*

I. INTRODUCTION

Agriculture is backbone of India. India is one of the largest fruits and vegetables producer of the world. In traditional Indian agriculture techniques are not supported for today's world. Because the manual irrigations system facing large water wastage, workers salary, and etc. In a modern world we try to introduce and use the new water management techniques to manage and save the water effectively. Israel is the one of the country to teach the water management and water usage in around the world. Drip irrigation system is a replacement of traditional irrigation systems. Drip irrigation is mainly used irrigation techniques. It will supports small plants, trees, poly houses, showcase agriculture, green house farming and etc. In drip irrigation the water is sending into each plant/ crop equally and parallel. And also it will reduces the watering time and water usage. In this type of irrigation is suitable for large and small land farmers, desert agriculture farmers, and monsoons based agricultural lands and etc.

In drip irrigation the water is sending with a pressure to pumping the water into all drips. In today's technologies fertilizers mixed with water and send into plants. It will reduces the time and work and also access parallel. In this method water is drop by drop send into directly root structure. Mulching sheets technology reduces the water wastage via water evaporation. It Drip irrigations installation cost high but it will be used again and again for our land. To balancing the food crops for a growth of population drip irrigation suitable and profitable way for farming.

In a computer era robots and heavy machines can replaces the humans. In this scenario we must develop our irrigation technologies to manage and maintain the system using IOT/ WOT and any other technologies. In many systems are developed already in irrigation in our system adding new features to easily use and maintain end users. Fig. 1 shows drip irrigation system model. Fig. 2 shows smart / automated drip irrigation system controlled via the end user devices.

Fig. 1. Drip irrigation

Fig. 2. Smart drip irrigation

II. OVER VIEW

In this smart drip irrigation system is highly optimized and high performance drip irrigation system using the internet of things to access, monitor and maintain our data's. At first we are measure the water levels in resources like river, well, or bore well. After select the crop for the season and the soil type. Choose the crops based on season and soil types and also consider the water level in resource and analyse it will enough or not for the particular crop cultivation. After analysing these parameters and also analyse the root structure of the crop because it will tells watering time duration and next watering time. Once you can enter the watering time and duration and next watering time do not change in particular crop cultivation period. The farmer having large land and apply all for drip irrigation using gate values sensor to separate the watering time and other details.

This system allows multiple crops cultivation in same land and same time. Next install the drip irrigation system, once the drip irrigation systems are installed then install our smart devices. The device is a small box that contains many sensors and it all controlled/ connected one WEMOS D1 ESP 82266 module. This WEMOS D1 ESP 8266 module send and receive the data's using internet. It also needs the internet in case of access from anywhere otherwise does not need. We are using sensors like temperature sensor it measures the temperature in in crop land. High temperature makes easy to dry land. Humidity sensor measures the soil humidity level. Soil moisture sensor plays major role in this project. It will measures the soil moisture level in will fall in minimum level it will indicates to on the motor. The rain sensor is used to measure the rain level. Air sensor measure the barometric pressure in field and also measure the speed of air. Air also makes moisture soil into dry soil easily. This device the farmers or any end user will install the device in the any part the cultivation land. These all sensors connected to WEMOS D1 ESP 8266 and these all are installed the device will started it will requires some manual works. After these works the system will displays the temperature, humidity, moisture, rain level, water level, air levels, PH level, soil nutrients level, and etc in LCD screen in every 30 minutes.

These data's are also saved and lively monitored in any part of the world using smart phones/ tablets/ laptops via internet. Similarly change anything from these way. This system simplifies our work and time. It uses less current and less water usability and high crop cultivation rate. The monitored data's are analyse and maintain for E agriculture based Business intelligence analysis.

III. PROPOSED SYSTEM

1. SYSTEM DESIGN

The full system design is shown in Fig. 3. In this Fig. the left part is semi-automated system. Once installed the system it will working entire life cycle on it functionalities. The both left and right part combining system is fully automated and easily access/ modify/ update any changes Over The Air (OTA).

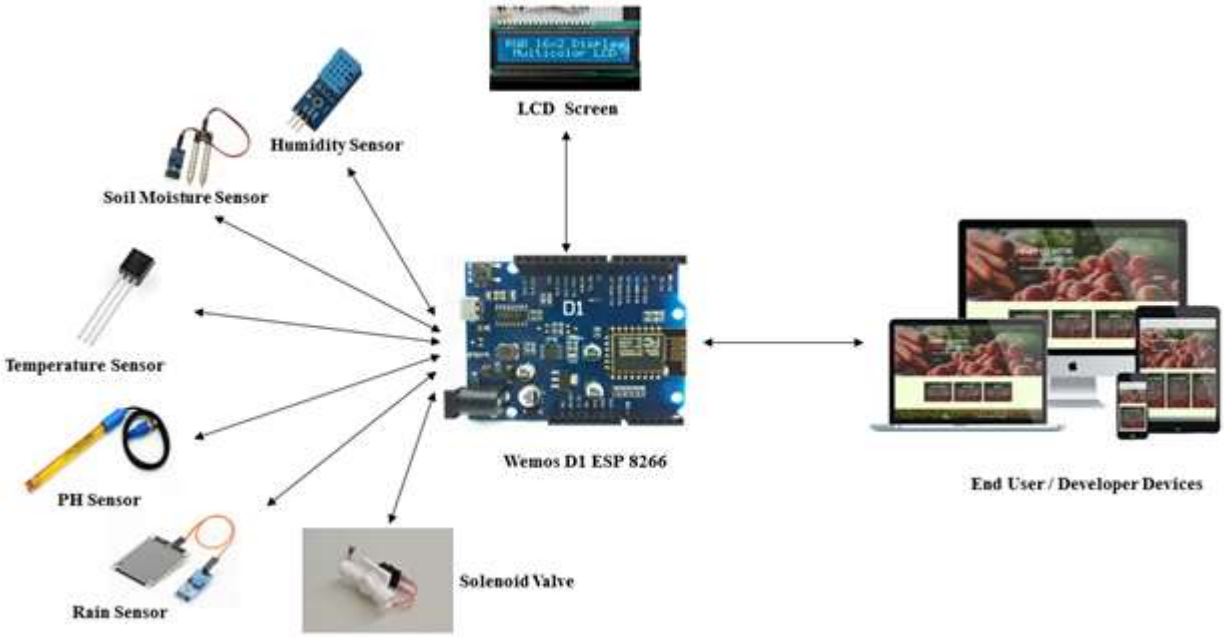

Fig. 3. Smart Drip Irrigation System

2. COMPONENTS

This system is configured by following components.

A. Micro Controller

Fig. 4. Wemos D1 ESP 8266

Wemos D1 is an ESP 8266 Wi-Fi based board it's using Arduino layout and having a large flash memory. In our system it will act as a master of all other components. The connections are very easy and using simple instructions to connect system the internet (OTA). It will send and receive the data's over the internet. Fig. 4 shows Wemos D1 ESP 8266.

B. Soil Moisture Sensor

The soil moisture sensor measures the moisture level in the soil. It plays major role of this system. In this system moisture sensor will placed in randomly in the land for measures the moisture level. The moisture level is goes below 30 % the motor will automatically turns on for particular time then it will turn off. The watering date, time, amount of water used, watering duration and other details will be maintained for future uses. Fig. 5 shows soil moisture sensor.

Fig. 5. Soil Moisture Sensor

C. Humidity Sensor

A Humidity sensor measures relative humidity in the air. It measures both temperature and air moisture in same time. It is also called as hygrometer. Fig. 6 shows humidity sensor.

Fig. 6. Humidity Sensor

D. Temperature Sensor

Fig. 7. Temperature Sensor

Temperature sensor measures the temperature in the agricultural field it will sense the temperature and displays Celsius in display. Fig. 7 shows temperature sensor.

E. Ph Sensor

Ph sensor will measures the ph level of soil. Various crops having different levels of ph value in soil. It is mostly used in nurseries and lawn care company's. Fig. 8 shows Ph sensor.

Fig. 8. Ph Sensor

F. Rain Sensor

Rain sensor used to switching the devices activated by rain level in land. If high amount of rain fall does not need the watering to the plant. And also it will increases the water levels in water resources like bond, lake and wells. Fig. 9 shows rain sensor.

Fig. 9. Rain Sensor

G. Solenoid Valve

Solenoid value is operated in electromechanically and it is also controlled by an electricity. It is used to minimize the Manual work to separately turn on/ off the gate valves. The two port valve is used for ON/OFF process. The multiple port valve having one input and any outlet valves. Fig. 10 shows Solenoid valve.

Fig. 10. Solenoid Valve

H. LCD Display

It is a single backlight LCD display for displaying the datas in end user side. It will notify temperature, humidity, soil moisture, motor in ON/ OFF status, rain fall, ph level etc to display the LCD screen with their symbols to easily identify all persons. Fig. 11 shows LCD Display.

Fig. 11. LCD Display

I. Water Pump

Submersible water pump is used in our system. It is totally dipped in water tank and main drip wire is connected into this pump. Fig. 12 shows Water pump.

Fig. 12. Water Pump

J. Soil Nutrient Sensor

Soil Nutrient Sensor using electro chemical sensor to measures the different soil nutrient in the amount of sample is taken. This system adding the new feature to monitor the micro and macro nutrients in the soil. It mainly measures NPK in soil

IV. ADVANTAGES

1. Easy to access.
2. Monitoring fields automatically.
3. Low cost.
4. Less water usage, electricity.
5. High yielding.
6. Parallel watering of each crops.
7. Supports poly house and green house.

V. RESULT AND ANALYSIS

This result is useful to analyse the water, current, rain level, ph values, humidity, and temperature for a particular crop. It is very useful to new farmers and research scholars. In a series of crop circulation method we have to analyse the entire thing which need or need not to crops. And also predict the weather using previous historical data's. Fig. 13 shows result of the system.

VI. CONCLUSION

Smart drip irrigation is reduces the manual work. And it will reduces the 70% of the water wastage. So it will greatly saving water and energy. The aim of the project is to develop the awareness for drip or any other irrigation system to develop the agriculture.

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