Smartphone based Automatic Irrigation System

Varsha P M, Varsha A, Shubha H V, Parneeth charanthimath,
Department of Computer Science and Engineering
Alva's Institute of Engineering and Technology, Mijar, Moodbidri

***Abstract*: One of the most important factors for successful agricultural production is the irrigation system in place. This paper propounds a design for automatic water supplying system in farmland using raspberry pi 3, Arduino microcontrollers, relay boards and couple of sensors. System helps in water conservation by automatically providing water to the plants depending on their water requirements. It can prove to be efficient in agricultural fields, since pumping motor will be controlled from the remote place through the android application. Soil moisture sensor is inserted into the soil to measure the moisture level. The moisture level will be received by the raspberry board. After receiving the value, it is compared to the predetermined threshold value. If the moisture level is greater then the threshold value the motor will be turned ON of if it is lesser than the threshold value the motor can be turned OFF by the user. The farmer can control the motor from the remote place depending on the moisture value. The system is best suited for places where water is scares and has to be used in limited quantity.**

INTRODUCTION

Agriculture is considered as the basis of life for the human species as it is the main source of food grains and other raw materials. It plays vital role in the growth of country's economy. It also provides large ample employment opportunities to the people. Growth in agricultural sector is necessary for the development of economic condition of the country. Unfortunately, many farmers still use the traditional methods of farming which results in low yielding of crops and fruits. But wherever automation had been implemented and human beings had been replaced by automatic machineries, the yield has been improved. Hence there is need to implement modern science and technology in the agriculture sector for increasing the yield. This paper sheds light on an implementation of an automatic water supplying system. Without water, they can't survive, whereas the inaccurate supply of water can also lead to many complications. For instance, water accumulated for a long time around the roots of a sapling may damage the roots and can also cause mineral loss in the soil. Moreover, the amount of water to be supplied to the trees depends upon the soil humidity and sunlight availability. Any error in this regard will cause harm to their upbringing. Therefore, measuring the correct condition of the soil and environment is critical in determining the proper quantity of water needed for the plants. With the help of Arduino sensors controlled by Raspberry Pi 3 microcomputer, automatic water control system is designed by detecting soil moisture and temperature. Each type of crops needs different soil moisture for smooth growth. Hence the soil moisture is a key variable that can be used to determine the quantity of water needed. Besides, the availability of the amount of temperature is also very crucial for crops. Wrong timing of watering can cause more harm rather than benefit.

Moisture sensor was installed near the roots and temperature sensor is installed further away to clearly detect the sunbeam. These sensors send their data to the raspberry pi to analyze. If a predetermined condition is found, then the Raspberry Pi would command a microcontroller to open the gate of water supply until the moisture value becomes greater than the threshold value. If there is a problem in the main water supply, then the computer will notify the administrator. Besides, the administrator can control the system's functionality using the same protocol sending a particular keyword command. This scientific method of water supply can be expanded to use in any agricultural sector.

LITRATURE SURVEY

The new scenario of decreasing water , drying up of rivers and tanks, unpredictable environment, present an urgent need of proper utilization of water. To cope up with this use of temperature and moisture, sensors are placed at suitable locations for monitoring the crops. After research in the agricultural field, researchers found that the yield of agriculture is decreasing day by day. However, use of technology in the field of agriculture plays an important role in increasing the production as well as in reducing the man power . Some of the research attempts are done for betterment of farmers that provide systems which usetechnologies helpful for increasing the agricultural yield. The cloud computing devices create a whole computing system from sensors to tools that observe data from agricultura l field and accurately feed the data into the repositories .This idea proposes a novel methodology for smart farming by linking a smart sensing system and smart irrigaton system through wireless communication technology. It proposes a low cost and efficient wireless sensor network technique to acquire the soil moisture ,humidity , temperature from various locations of field and as per the need of crop water motor is enabled .It proposes an idea about how automated irrigation system was developed to optimize water use for agricultural purposes.

PROPOSED SYSTEM

The block diagram of the proposed system as shown consists of different types of sensing unit such as Soil Moisture Sensor to measure water content of the soil,

Temperature Sensor detects the temperature, Humidity Sensor to measure the presence of water in the air.

Raspberry Pi:
The Raspberry Pi is a low cost, credit-card sized computer. Its capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, making spreadsheets, and playing games. There are different models of Raspberry Pi from Raspberry Pi 0 to RaspberryPi 3.

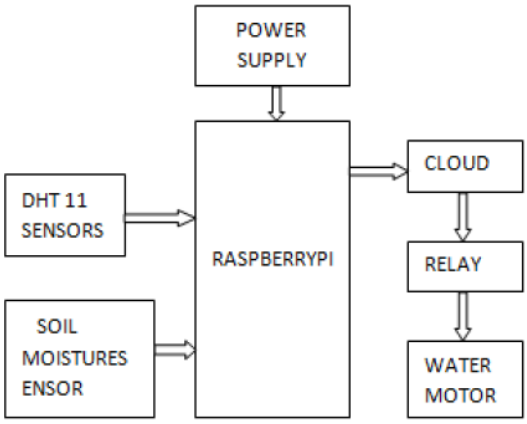

Figure 1. Block diagram of system.

Figure 2. Raspberry Pi.

Motor:
A Motor is a device which converts electrical power into mechanical rotation using the principle of electromagnetism. Electro-magnetism: A wire wound on a ferrite core carrying electric current generates a magnetic field; this principle is called Electro-magnetism

DC motor:

Figure 3. DC motor

DC motor in simple words is a device that converts direct current (electrical energy) into mechanical energy.

Relay:
The relay module is an electrically operated switch that allows you to turn on or off a circuit using voltage and/or current much higher than a microcontroller could handle.

Figure 4 .Relay

Analog-to-Digital Converter (ADC):

Figure 5. Analog-to-Digital Converter

The 12-bit Analog-to-Digital Converter (ADC) combines high performance and low power consumption in a small package, making it ideal for embedded control applications.

Soil moisture Sensor:

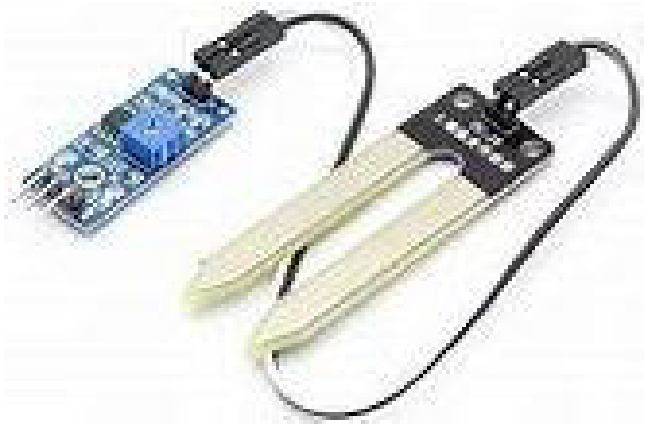

Figure 6. Soil moisture Sensor

The **Moisture sensor** is used to measure the water content(moisture) of soil.when the soil is having water shortage,the module output is at high level, else the output is at low level.This sensor reminds the user to water their plants and also monitors the moisture content of soil.It has been widely used in agriculture,land irrigation and botanical gardening.

Specifications for soil moisture sensors

- Working Voltage:**5V**
- Working Current:**<20mA**
- Interface type:**Analog**
- Working Temperature:**10°C~30°C**

Temperature Sensor(DHT11):
The DHT11 is a basic, low-cost digital temperature and humidity sensor. It gives out digital value and hence we can give its output directly to data pin instead of ADC. It has a capacitive sensor for measuring humidity. The only real shortcoming of this sensor is that one can only get new data from it only after every 2 seconds.

Figure 7. Temperature Sensor

METHODOLOGY

Raspberry Pi is the heart of the overall existing system. The Raspberry Pi 3 incorporates a number of enhancements and new features. Improved power consumption, enlarged connectivity and greater IO are among the improvements to this powerful, small and lightweight GPIO(General Purpose Input Output) pins. The Raspberry Pi cannot directly drive the relay. It has only zero volts or 3.3 V. We need 12V to drive electromechanical relay. In that case we need a driver circuit .The driver circuit takes the low level input and gives the 12V amplitude to drive the relay which operates at 12V .We are using here 2 relay to switch on Water motor . Soil moisture sensor, humidity sensor, temperature detection sensor are connected to Raspberry Pi board through arduino. If the soil moisture value is low the moisture level and humidity is low at the given value and also if the temperature is high then the water motor will be on, whereas if the moisture level, humidity is high and temperature is low the motor will be off through the relay. The application will have a GUI which will show all the data to user. The modes as specified can be selected by the user on the app itself.

APPLICATIONS

- Irrigation in fields
- Irrigation in Gardens , Parks.
- Very efficient for paddy and rice fields.
- Picsiculture.

CONCLUSION

The sensors are successfully interfaced with raspberry pi and wireless communication is achieved.
All observations and experimental tests prove that this project is a complete solution to the field activities irrigation problems. Implementation of such a system in the field can definitely help to improve the yield of the crops and aids to manage the water resources effectively reducing the wastage.

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