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Water consumption by self-watering

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Abstract – *This paper proposes a design for smart irrigation system using raspberry pi. It is cost effective, simple and easy to use to farmers. This system consists of the temperature sensor, humidity sensor, LDR and soil moisture sensor which displays result on screen by using python language to raspberry pi and motor will on by clicking button on web page.at the time of night the bulb will glow automatically with the help of LDR .Automation allows us to control the appliances automatically. This system will be a substitute to traditional farming method.*

Key Words: Raspberry Pi, Temperature sensor, humidity sensor and soil moisture sensor, relay, LDR, Web page etc.

1. INTRODUCTION

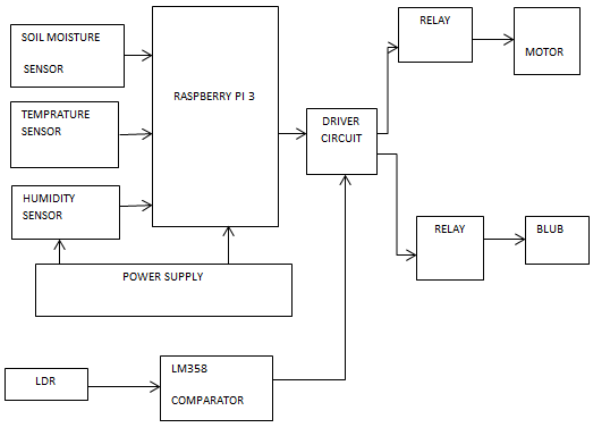
India is largest country in the world, but only 58 million hectors of land was actually irrigated in India. Because of farmers faces many problems, one of the big problem is scarcity of water because of that farmers unable to manage their crop cycle. For this problem we done this project it is useful for farmers to manage the water and it is less cost.

Agriculture is the worldwide prime occupation of human being, 64% of total available land is occupied by the agriculture, and it contains 85% freshwater. This figure of water consumption increases every year due to globalization and population of growth.

This paper presents the smart irrigation system for garden or small area irrigation with the use of devices like raspberry pi 3+ model b, python programming language and also creates a web page for automation purpose. 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 analyse. 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.

2. BLOCK DIAGRAM



The block diagram of the project consist of Raspberry pi3 model, Temperature sensor, Humidity sensor, Soil moisture sensor, LDR, Driver circuit, Relay, Motor. The temperature sensor [DTH11] detects the temperature in environment; moisture sensor measure the content of water in soil and humidity sensor detects the presence of water in air. All this information is send to the Raspberry Pi model. According to the information the Raspberry Pi model turns ON OR OFF the water motor and LDR.

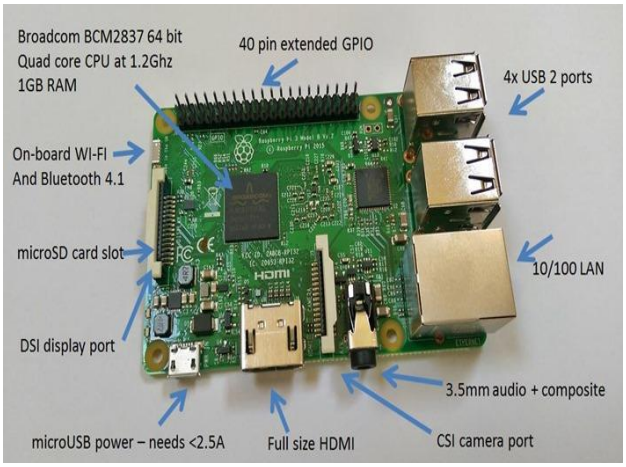
3. IMPLEMENTED METHODLOGY

3.1 Hardware Description

A. RASPBERRY PI 3

Raspberry pi 3+ model b is the new version of raspberry pi 3 model b was launched in 2018. It has faster 1.4 GHz processor and a three- times faster gigabit Ethernet. It has also on board WI-FI, Bluetooth and USB boot capability. 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 Raspberry Pi 3.



B SENSORS

Sensors are the device which converts physical parameter into the electric signal. The system consists of soil moisture sensor, temperature sensor, humidity sensor.

B.1 Temperature sensor

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.

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B.2 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.

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

Figure 6. Soil moisture Sensor

C. A to D converter

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

D. 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.

D.1 DC Motor

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

E. 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.

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3.2 Web Server

In our project we are displaying the condition of farm related to the parameters like the moisture level, temperature level and humidity in soil in a website. By using the specific IP address anybody can operate their farm anywhere in the world by using the laptops, tablets and smartphone.

3.3 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. 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.

3.3 Proposed System

The proposed system consists of a one central raspberry pi model, different types of sensor, motor, relays. The sensors are placed in various positions on land. This sensors and their data is provided to the raspberry pi model. After receiving the data from the various sensors the raspberry pi sends it to the specific IP address.
With all the received data, the raspberry pi computer makes the decision whether to supply the water or not. If the conditions are met, the raspberry pi commands the relay module to activate the water pump for specific duration after which the computer commands the relay to stop the water pump. Water is pumped to specific area not to whole farm area. The sensors provide all the data from which quantity of water and which pumps to activate can be inferred

4. RESULT AND OBERVATION

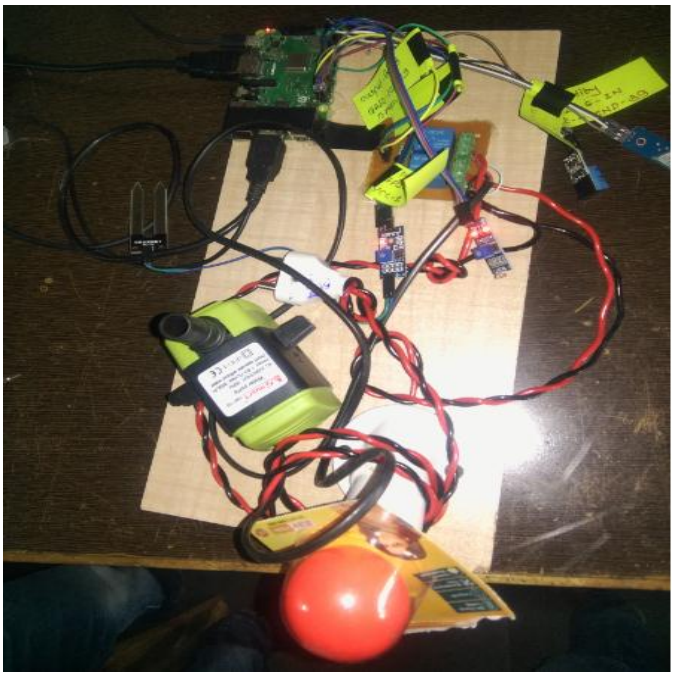

Fig 1: Hardware implementation

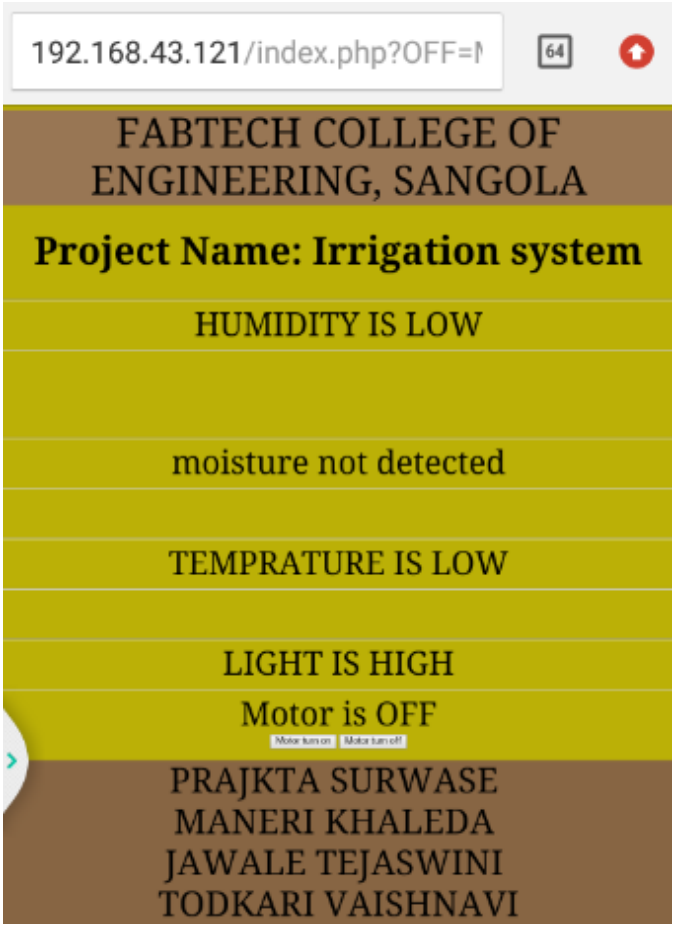

Fig 2: Result on Display

5. CONCLUSIONS

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