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Smart Home Gardening Automation System Using IoT

T. Prabhu[1], B. Ragunath[2],P.Rubika[3], S.Varun kumar[4],K.Vasanthi[5]

Assistant Professor, Dept. of EEE, K.S. Rangasamy College of Technology, Tiruchengode, Tamilnadu, India[1]

UG Student, Dept. of EEE, K.S. Rangasamy College of Technology, Tiruchengode, Tamilnadu, India[2]

UG Student, Dept. of EEE, K.S. Rangasamy College of Technology, Tiruchengode, Tamilnadu, India[3]

UG Student, Dept. of EEE, K.S. Rangasamy College of Technology, Tiruchengode, Tamilnadu, India[4]

UG Student, Dept. of EEE, K.S. Rangasamy College of Technology, Tiruchengode, Tamilnadu, India[5]

ABSTRACT:Garden automation is an automatic system used to irrigate the plants, whenever needs and reduces the workload of people. An idea of automatic irrigation is done by analyzing both the temperature and moisture of the soil and detects the human presence in the garden. These parameters are sensed and monitored using sensors and processed by Raspberry -pi to store the data in the IoT server. By analyzing the sensor values, water is supplied by the solenoid valve through the pipeline and sprinkled for a given amount of time. Finally, energy usage and cost be reduced by turning ON and OFF the light, depending upon the motion of the people using IR sensor.

KEYWORDS: Irrigation System; Raspberry-pi 3;Soil Moisture Sensor;Temperature Sensor; IR sensor, Solenoid Valve; Internet Of Things

I.INTRODUCTION

In India most of the irrigation system are manually operated. Garden automation is a technique used to monitor the garden as well as to control the irrigation system automatically via mobile devices would significantly enhance quality of life. Many people lose their interest in gardening, because it needs a lot of efforts for proper maintenance of the seedlings. Nowadays, it is a challenge to improve the irrigation system of garden to enhance the plant growth. The plants are irrigated and monitored manually by the people and this monitoring may cause wastage of water, if the gardener is unavailable. Most of the people are not able to maintain their gardens due to their workload.After the extensive agricultural research, many researchers found that the crop productivity is less due to the inadequate maintenance. Bin the field of agriculture we can increase the production as well as reduce manual efforts. A system proposed on smart drip irrigation system using raspberry pi and Arduino. Experimental set-upis also tested and explained for an automatic drip irrigation system to water 50pots [1].During the night time, wastage of electricity increases when there is nobody available. So, the energy usage is increased with increase in electricity cost. An optimized garden watering system has become a necessity due to the lack of world water resource**.**

In current scenario**,** the Arduino microcontroller is used to monitor and irrigate the plant automatically. The moisture sensors measure the moisture level of the different plants. If the soil moisture level is below the threshold level, the moisture sensor sends the signal to the Arduino board which enables the water pump to turn ON and supply the water to the plant using the Rotating Sprinkler. When the desired moisture level is reached, the water pump is turned OFF.Bharathi presented a paper on Automatic Irrigation System for Smart City Using PLC AND SCADA. SCADA is the automation system with the integration of Fuzzy control to reduce the level of water wastage and maintaining the clean water supply[2]. Zigbee system is used for wireless irrigation for home gardens and it can be integrate with existing smart home control system [3].

This paper aims on automatic irrigation of plants using both the temperature and moisture of the soil are monitored using sensors and processed by Raspberry-pi to store the data in the IoT server.By analysing these parameters, water is

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supplied through the pipeline and sprinkled for a given amount of time and to detect the motion of the human using IR sensor.

II. INTERNET OF THINGS

Internet of Things is the network which interconnects the devices such as home appliances, vehicles to exchange data. In this proposed system IoT plays a major role in sharing data to the cloud and that data are accessed and viewed by the user by anytime at anywhere with the help of networks. Here "Thing speak" platform is used to view the status of the garden.

III.SYSTEM SETUP

The setup requires Raspberry-pi 3 B model board connected with sensors like temperature, soil moisture and Infrared which sends the sensed data to the server through the Wi-Fi module which is built in itself. Each sensor get interfaced with the raspberry-pi which sends the sensor values for the irrigation purposes.

A.BLOCK DIAGRAM

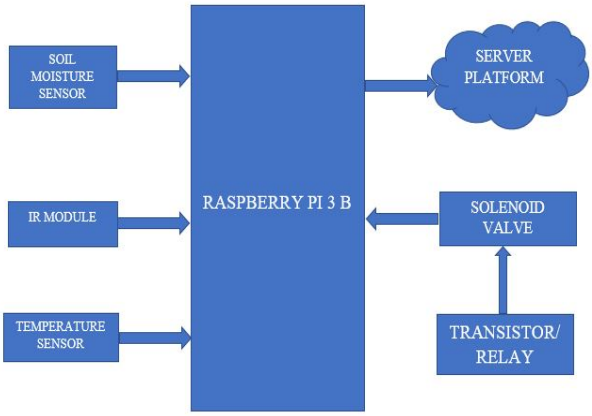

Fig.1 Block Diagram

Fig.1 shows the block diagram. The block diagram consists of Raspberry-pi, temperature sensor, soil moisture sensor, IR sensor, transistor or relay and solenoid valve.In this proposed system, we are discussed the methodology of project and components like Raspberry pi 3 model B, soil moisture sensor, temperature sensor, IR sensor, transistor, solenoid valve and explains the block diagram. Sometimes, people forgot to maintain their garden due to workload. This leads to improper growth of the plant which ultimately upsets theowner.The system tracks, temperature and soil moisture, motion, and then uploads this information to the database on Cloud. Soil Moisture Sensor can be used to detect the moisture content of the soil and temperature sensor senses the environment temperature, based on that value solenoid valve is turned ON and OFF.IR sensor senses the object or human presence by emitting the infrared radiation, then stores the data in the server. The system continuously monitors the conditions and alerts the user to the changes that require immediate action.The proposed system using both the light intensity of sun, moisture of the soil and these values sensed by the sensors connected to the Raspberry-pi will store the data in the cloud platforms. By analyzing these parameters, water is supplied through the pipeline and sprinkled for a given amount of time. Finally, the energy usage and cost be reduced by changing the light usage, depends upon the motion of the people. Saving energy, time and resources, so that it can be utilized in proper way and amount.

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B. CIRCUIT DIAGRAM

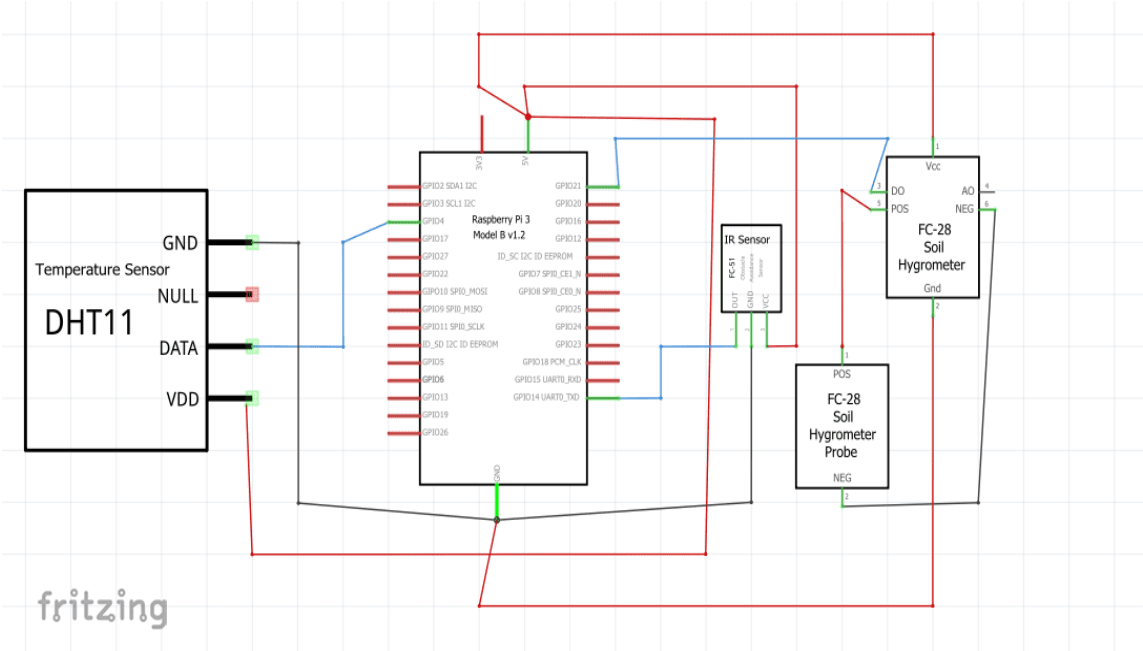

Fig 2 Circuit Diagram

Fig.2 shows the circuit diagram. The circuit diagram consists of Raspberry-pi, Temperature sensor, Soil moisture sensor andIR sensor. TheRaspberry-pi is powered by a 5.1V,2A source and eachsensors are powered from the Raspberry-pi.

IV.MODULES WITH WORKING PRINCIPLES

A. POWER SUPPLY

An electrical device which supplies electric power to an electric load. Its primary function is to convert electric current from source to correct voltage,current, and frequency to the power load. Here obtained the power supply from the transformer,and we take 5V power supply for the input.

B.RASPBERRY PI 3 MODEL B

A Single-board computer with wireless LAN and Bluetooth connectivity, 40pin extended GPIO, 1.4GHz 64-bit quad-core processor, dual-band wireless LAN, Bluetooth 4.2/BLE, faster Ethernet, and Power-over-Ethernet support. A micro SD card with NOOBS and 2.5A of high quality micro USB power supply.Its consist of1GB RAM so that it will run bigger and more powerful applications. Raspbian OS is used in the Raspberry-pi and python coding is used in it.

C.SOIL MOISTURE SENSOR

A soil moisture sensor is used to sense the presence of moisture content in the soil which also measures the quantity of water contained it. By calibrating the sensor, accurate measurement is obtained. The soil moisture sensor has two probes which are used to measure the volumetric content of water. current is passed through the soil through the probes and then the resistance value gets changed. Based on the resistance value, moisture value also gets changed. Its operating range is -40°C (-40°F) to 85°C (185°F).

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D. TEMPERATURE SENSOR

Temperature sensor is a device used to measure the temperature through an electrical signal.The thermocouple is prepared by two dissimilar metals which generate the electrical voltage indirectly proportional to change the temperature. The RTD is a variable resistor, it will change the electrical resistance indirectly proportional to changes in the temperature in a precise, and nearly linear manner. The working base of the sensors is the voltage as that it read across the diode. There is a voltage drop between the transistor terminals, when voltage and temperature increases.

E.IR MODULE SENSOR

An infrared sensor detects the changes occur in the surrounding. It is used as an obstacle detector which transmits an infrared signal from the transmitter and this signal reflects back to the receiver when obstacle detects. This sensor measures the heat being emitted by an object and detecting motion.

F. SOLENOID VALVE

It is an electromechanical device which opens and closes, when electric current generating the magnetic field which regulates the fluid flow. Here 24V supply is used for the solenoid valve.

V.RESULT AND CONCLUSION

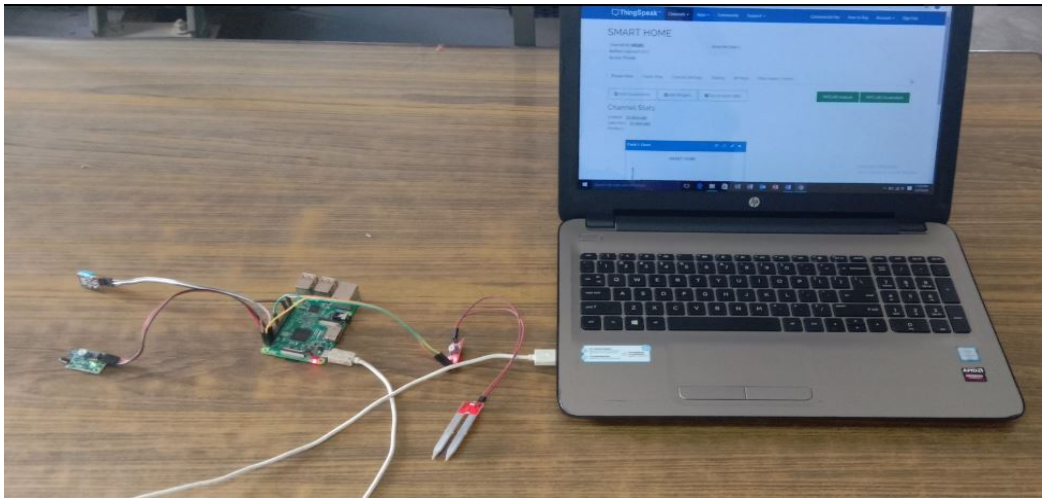

Fig 3 Implemented Prototype

The proposed IoT prototype is tested and implemented successfully.In this proposed system, we are accomplished that the automatic irrigation for plant by Soil moisture sensor and temperature sensor is calibrated and clubbed to connect with Raspberry pi to check the humidity, temperature of the soil for automatic irrigation purpose. The smart home irrigation system manages to maintain the soil humidity at the same level. It dissipates less water and it provides irrigation scheme that is adaptable to specific watering needs of each plant. The most important feature is the fact that by constantly monitoring the humidity levels, it basically adapts to the current environmental conditions. Whether there are high temperature or sunlight variations or not, the system will adjust the irrigation process so as to maintain the same level of soil humidity.fig.3 shows temperature, soil moisture and IR sensors are interfaced with the Raspberry pi to sense the parameters of the garden.

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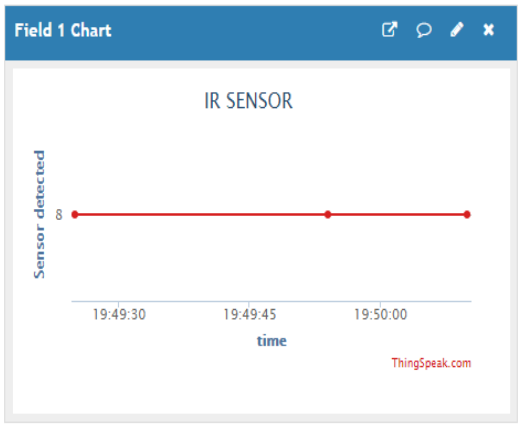

Fig.4 Time vs sensor detected

Fig.4 shows the graph between time and sensor detected for the IR sensor.

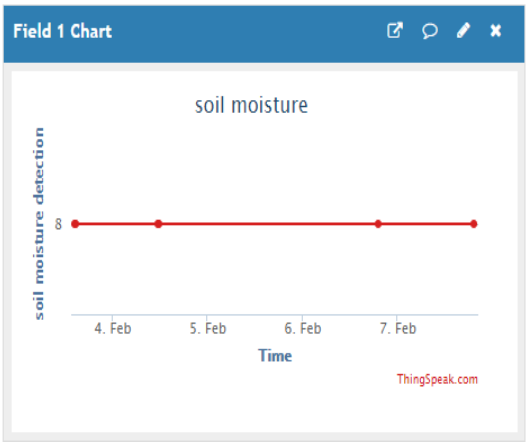

Fig.5 Time vs Soil moisture

Fig.5 shows graph between time and soil moisture detection for the soil moisture sensor

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