International Journal of Aquatic Science
ISSN: 2008-8019
Vol 12, Issue 01, 2021

Automatic Plant Watering System Using Raspberry Pi

Anil Kumar Gona[1], L Praveen Kumar[2], A Madhusudan[3], Nayab Rasool[4]

[1]*Assistant Professor, Dept. of ECE, Anurag Group of Institutions*
[2]*Assistant Professor, Dept. of ECE, Anurag Group of Institutions*
[3]*Assistant Professor, Dept. of ECE, Anurag Group of Institutions*
[4]*Assistant Professor, Dept. of ECE, Anurag Group of Institutions*

Abstract: Currently the automation is one of the important role in the human life. It not only provide comfort but also reduce energy ,efficiency and time saving .This project on automatic plant watering system soil moisture is intended to create automated irrigation mechanism to turn the motor ON and OFF. Now the industries are use automation and control machine which is high in cost and not suitable for using in a farm field. Raspberry pi is the main heart of the whole system. Automation allows us to control appliances automatically. The objective of this paper were to control the water motor automatically.

Keywords: Raspberry pi, moisture sensor, MQTT.

1. INTRODUCTION

India is the largest freshwater user in the world, and thecountry's total water use is greater than anyother continent.The agricultural sector is the biggest user of water, followedby the domestic sector and the industrial sector.Groundwater contributes to around 65% of the country'stotal water demand, and plays an important role in shapingthe nation's economic and social development. The requirement of building an automation system for an officeor home is increasing day-by-day. Automation makes an efficient use of the electricity and water and reduces muchof the wastage. smart irrigation system makes the efficientuse of water.

This paper presents an automatic plant wateringsystem for agriculture farm with the use of devices likeraspberry pi. Python programming language is used forautomation purpose. This paper contributes an efficient and fairlycheap automation irrigation system. System once installed has less maintenance cost and is easy to use.Thispaper focuses on online monitoring of agriculture field withthe help of wi-fi on android mobiles and parameters such as temperature and soil moisture. It is more advantageousthan the traditional agriculture techniques.

Drip irrigation is artificial method of supplying waterto the roots of the plant. It is also called micro irrigation.In past few years there is a rapid growth in this system.The user communicates with the centralized unit through internet.Thecentralized unit communicates withthesystem through SMS which will be received by the IOT with the help of the smart phone. The starter coil is indirectly activated by means of a transistorized relay circuit. When the motor is started, a constant monitoring on soil moisture and water level is done & once the soil moisture is reached to sufficient level the motor is automatically turned off & a massage is send to subscriber that the motor is turned off. "Things," in the IoT sense, can refer to a wide variety of devices such as heart monitoring implants, biochip transponders on farm animals, electric clams in coastal waters, automobiles with built-in sensors, DNA analysis devices for environmental/food/pathogen monitoring orfield operation devices that

assist firefighters in search andrescue operations. Legal scholars suggest to look at "Things" as an "inextricable mixture of hardware, software, data and service". These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices. Current market examples include smart thermostat systems and washer/dryers that use Wi-Fi for remote monitoring.

As well as the expansion of Internet-connected automation into a plethora of new application areas, IoT is also expected to generate large amounts of data from diverse locations, with the consequent necessity for quickaggregation of the data, and an increase in the need toindex, store, and process such data more effectively. IoT is one of the platforms of today's Smart City, and Smart Energy Management Systems.

System Overview

The block diagram of the proposed system as shown inFig.1 consists of sensing unit such as Soil Moisture Sensorto measure water content of soil.

Raspberry PI 3 is interfaced with either PC or Mobile Phone By Using Web Protocol. The soil moisture sensor output is send to the raspberrypi.if moisture sensoroutput is then motor will turn on otherwise it is off. whenthe motor turns on by using water pump the plant wateringis done automatically.

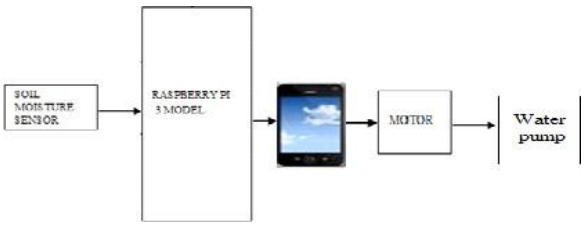


Figure: 1.1 System Overall Block Diagram

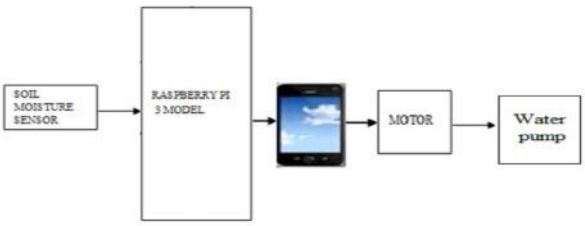


Figure: 1.1 System Overall Block Diagram

A. RASPBERRY PI

The The Raspberry Pi is a small, powerful and lightweight ARM based computer which can do many of the things a desktop PC can do. The Raspberry Pi 3 is a wonderfulplatform that can be used to buildhome automation system. Raspberry Pi is a small sized single board computer which is capable of doing the entire job that an average desktop computer does like spread sheets, word processing, Internet, Programming, Games etc. It consist of 1GBRAM, ARM V8 Processor,2 USB and an Ethernet port,HDMI & RCA ports for display,3.5mm Audio jack, SD card slot (bootable), General purpose I/O pins, runs on

5v. Raspberry pi 3 model B

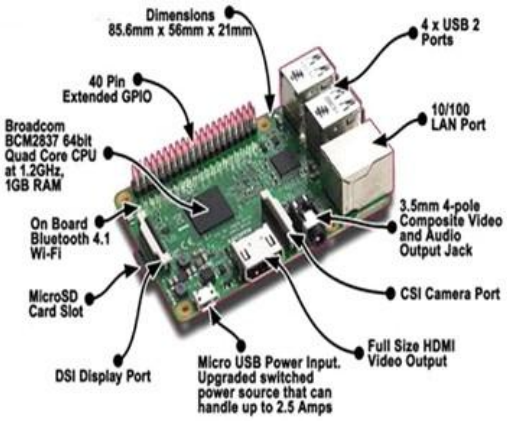
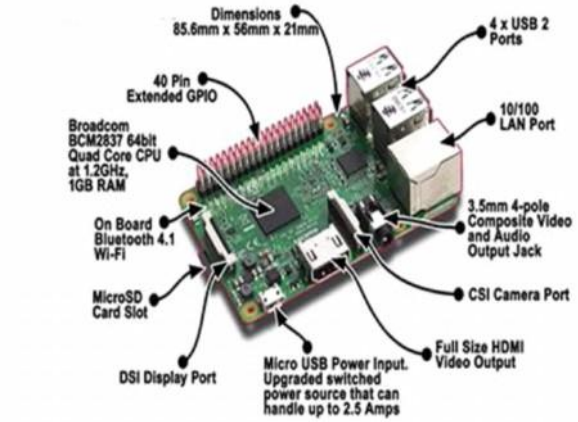


Figure 1.2 : Raspberry pi 3 front view

v. Raspberry pi 3 model B



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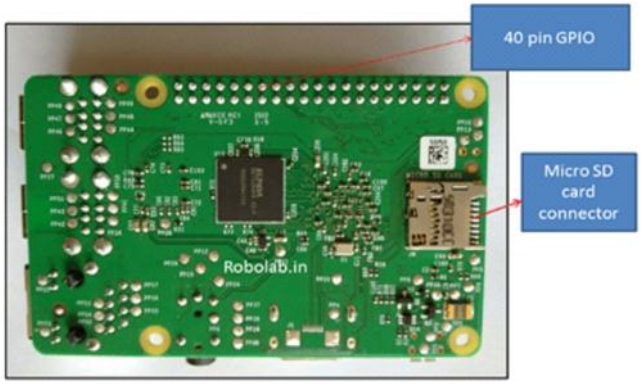

Figure 1.3: Raspberry pi bottom view

The powerful graphics capabilities and HDMI videooutput make it ideal for multimedia applications such asmedia centers and narrowcasting solutions. The RaspberryPi is based on a Broadcom BCM2835 chip. It does not feature a built-in hard disk or solid-state drive, instead relying on an SD card for booting and long-term storage.

In November 2015, the Foundation launched the Raspberry Pi Zero. The Foundation provides Debian and Arch Linux ARM distributions for download, andpromotes Python asthe mainprogramming language, with support for BBC BASIC (via the RISC OS image or theBrandy Basic clone for Linux), C,C++,JAVA, PERL,RUBY,SQUEAK Smalltalk and more also available.

The Raspberry Pi hardware has evolved throughseveral versions that feature variations in memorycapacityand peripheral-device support.

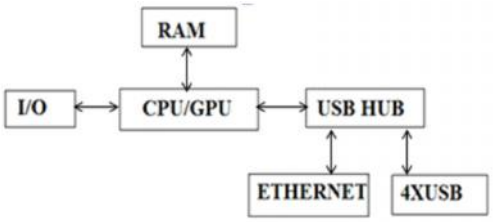

Figure 1.4: Raspberry Pi Hardware

Applications

Pi in the sky: This board is a GPS receiver, radio transmitter designed for tracking high altitude balloon flights.

Livebots: Livebots is scheme that allows users to controlmany robots based on Raspberry Pi over the internet.

Lap pi: The scheme features a laptop assembled from scratch which is based on the Raspberry pi board.

Components Description

Power Supply: One of themost exciting updates/upgradesof the new Model B+ is a fancy new power supply. Thepower supply is what takes the micro USB port voltageand creates the 5V USB, 3.3V, 2.5V and 1.8V core voltages. The 3.3/2.5/1.8 are for the processor and Ethernet.

Sensor: Sensors are the device which converts the physical parameter into the electric signal. The system consists of soil moisture sensor. The output of sensor is analog signal, the signal is converted into digital signal andthen fed to the processor. The moisture sensor is used tomeasure the moisture content of the soil. Copper electrodes are used to sense the moisture content of soil.The conductivity between the electrodes helps to measurethe moisture content level.

Figure 2.1: Moisture sensor

ɔntent level.

Working Principle

Raspberry Pi is the heart of the system. The Raspberry Pi Model B+ incorporates a number of

enhancements andnew features. Enhanced features are improved powerconsumption, increased connectivityand greater IO whichmade this powerful, small and lightweight ARM basedcomputer. The Raspberry Pi cannot directlydrive the relay.It has only zero volts or 3.3V. It needs 12V to drive electromechanical relay. In that case it uses a driver circuitwhich provides 12V amplitude to drive the relay.

Sensors connected to the Raspberry Pi board givea resistance variation at the output. This signal is appliedto the comparator and signal conditioning circuit whichhas potentiometer to decide the moisture level abovewhich the output of comparator goes high. This outputsignal is given to the Raspberry Pi board.

If the soil moisture value is above the moisture levelthen the message send to the former via way2 sms whichindicates moisture is high. The 3phase induction motorwill be OFF, whereas if the moisture level is low themessage sent to former via way2sms which indicatesmoisture level is low. then by using MQTT app the farmerautomatically turns on motor .

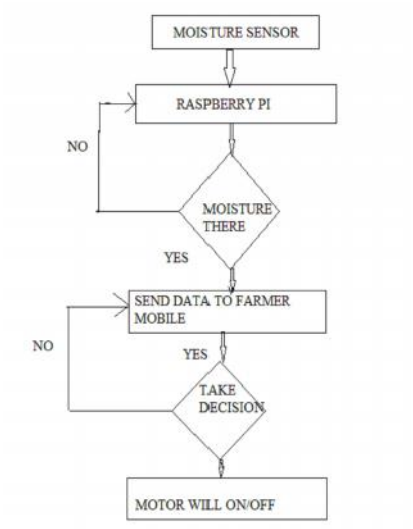

Figure 2.2: Implementation setup

Figure 2.3: Moisture Sensor, motor, water pumpinterfaced to raspberry pi

Figure 2.4: Moisture sensor placed in wet soil

Figure 2.5: Moisture sensor placed in dry soil

Figure 2.6: SMS sent to mobile

Web Protocol

They are different types of IOT (internet of things) protocols. In this web protocols we choose MQTT (Message Queue Telemetry Transport) protocol. Forimplementing MQTT protocol we use mosquito brokeror Node.js.So in this project we used Node.js. Targets device data collectionAs its name states, its main purposeis telemetry, or remote monitoring. Its goal is to collectdata from many devices and transport that data to the ITinfrastructure. It targets large networks of small devices that need to be monitored or controlled from the cloud.MQTT makes little attempt to enable device-to-device transfer, nor to "fan out" the data to many recipients. Sinceit has a clear, compelling single application, MQTT issimple, offering few control options. It also doesn't needto be particularly fast.

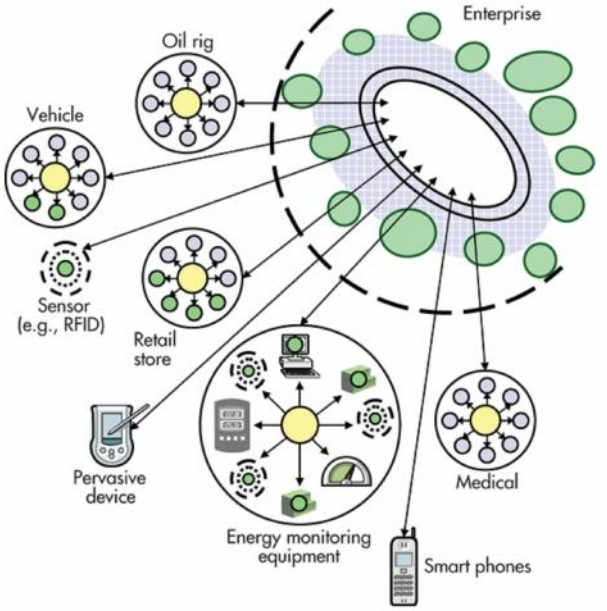

Figure 5: MQTT implements a hub-and-spoke system

MQTT enables applications like monitoring a hugeoil pipeline for leaks or vandalism. Those thousands ofsensors must be concentrated into a single location for analysis. When the system finds a problem, it can takeaction to correct that problem. Other applications forMQTT include power usage monitoring, lighting control,and even intelligent gardening. They share a need forcollecting data from manysources and making it availableto the IT infrastructure.

1. CONCLUSION

Irrigation has been the backbone ofhuman civilization since man has started agriculture. As the generation evolved, man developed manymethods of irrigation to supplywaterto the land. In this proposed system have presented thenew innovative irrigation system. This system comprisesthe live streaming of crops using android phones andautomatic motor on/off system, The entire system ismonitored and controlled by the power full credit cardsized microcomputer called Raspberry Pi.

Acknowledgement
I would like to take this opportunity to express our profound sense of gratitude to my colleague **Mr.R. ASHOK KUMAR (TASK HEAD),** Sphoorthy
EngineeringCollege, forhisconstantguidance, supervision,motivation and encouragement all the way during theproject, his annotations and criticisms are the key behindsuccessful completion of this project work.

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