

Design And Implementation Of Raspberry Pi 3 Based Embedded System For Analysis Of Soil Parameters

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ABSTRACT

Agriculture has a big role in the socio- economic development of India. From last ten years, few existing Systems working for reducing the agriculture water use. But these systems have some limitations. So Modern technology is necessary to resolve this problem and support better crop-watering method. In this Paper, Raspberry Pi 3 is used as an embedded Linux board which is designed based on ARM Cortex 53.It is attached to the sensors in the field to observe the changes. The temperature, humidity and soil moisture sensors extend the data to the Raspberry Pi for estimation of water demand of plants.

KEYWORDS: Raspberry Pi 3 b, Soil Moisture Sensor,AM 2302 DHT 22.

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I. INTRODUCTION

In India, farming is of central importance to the national and regional economics adding 14.6 percent of GDP over 55 percent of employment. Along with food security, farming also provides jobs for most of the people. But only about 102 million hectares of land is cultivated. In many areas due to not enough rain falls the production of the agriculture products has been declined.

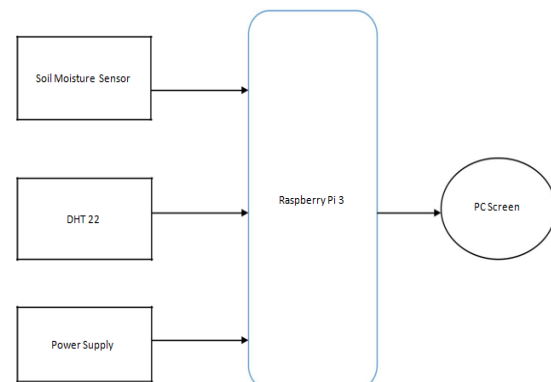
Andhra Pradesh is mostly an agriculture state. Nearly two-third of labor force in the state depends on agriculture. In Andhra Pradesh, red and sandy soil occupies 65 percent of the land area. Only 25 percent of the area is black soil, while the remaining 10 percent area is under alluvial soil. so the fertility as well as productivity in Andhra Pradesh are usually below the all India averages. The average once a year rain fall of the state is only 925 mm. as against the national average of 1150 mm. This paper presents smart crop-watering system for agriculture related farm with use of devices like Raspberry Pi. Python language is used for automation purpose. This paper contributes an efficient and cheap automation irrigation system. If system once installed, it has less maintenance cost and easy to use. This paper focuses on supervising of farm-related field parameters such as temperature, humidity and soil moisture.

HARDWARE

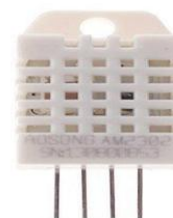
The block diagram of the proposed system as shown in Fig. The main components of this diagram are

1. AM 2302 DHT 22,

2. Raspberry Pi 3 Module,
3. YL 69 Soil Moisture Sensor.



1. AM 2302 DHT 22



It is a basic temperature and humidity sensor. For measuring, it uses the humidity sensing part which contains two electrodes with moisture holding substrate between them. So, when the humidity changes, the conductivity of the substrate changes. If the resistance changes, the IC which makes it ready to be read by a micro-controller. The temperature is measured by NTC (Negative Temperature Coefficient) temperature sensor.

2. RASPBERRY PI 3 B



The raspberry pi is a wonderful flat supporting surface that can be used to build home automation system. Raspberry pi is a small sized single board computer which can do whole job than can an average computer can do like spread sheets, word processing, internet programming, games etc. It consists of 1GB Ram, ARM Cortex A53Processor, 4 USB Ports, and Ethernet port, HDMI, and RCA ports for display, 3.5mm audio jack, SD card slot, General purpose I/O pins, runs on 5v.

WORKING PRINCIPLE

Raspberry Pi is the heart of the system. The Raspberry Pi incorporates many improvements and new features. Improved features are improved power use, increased connectivity and greater I/O which has made more powerful, small, and light weight ARM based computer. Sensor are connected to the Raspberry Pi board gives the resistance difference at the output. The signal is applied to comparator and signal conditioning circuit which contains potentiometer decides the moisture level above, if the output of comparator goes high. The output signal is given to the Raspberry Pi board.

APPLICATIONS

The raspberry pi boards are used in many applications like Media streamer, Arcade machine, Tablet computer, Home automation, Internet radio, controlling robots etc.

3. YL 69 SOIL MOISTURE SENSOR



The YL 69 Soil Moisture Sensor is used to measure the water content of soil.

Uses

- i. It measures the loss of moisture over time due to evaporation and plant uptake.
- ii. It monitors soil moisture content to control irrigation in greenhouses.

SOFTWARE

Python is a object-oriented programming language, created by Guido van Rossum. It has a design which emphasizes code readability and syntax which allows the programmer in fewer lines of code It enables to write the program on both small and large scale.

APPLICATIONS OF PYTHON

You can create smaller Web Apps using solid basic structure on which bigger things can be built and CMS (Content Management System) are built on Python. Some of the popular or creating Web Apps are: Django, Flask, Pyramid,

Creating software prototypes

Python is slow compared to compiled languages like C++ and java.

However, Python is a great language for creating games. For example: You can use Py game library for creating games.

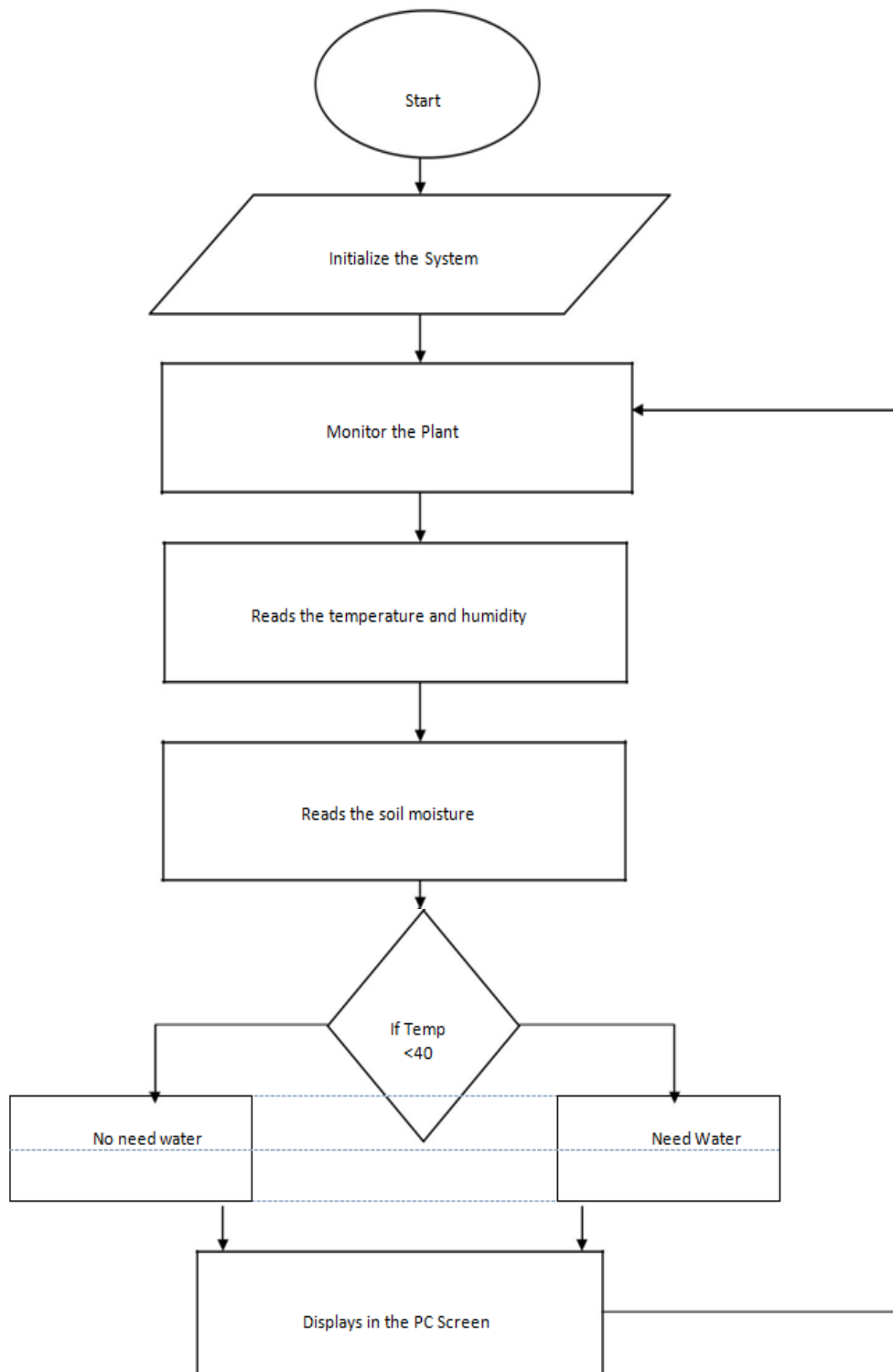
ALGORITHM

- Step 1. Start
- Step 2. Initialize the system on Raspberry Pi.
- Step 3. The Soil Moisture sensor constantly checks for the water level of the point
- Step 4. The DHT 22 sensor constantly senses the temperature and humidity of the field.

Step 5. If the water reduces the allowed level, the Soil Moisture sensor which is connected to the Raspberry Pi will detect and the output “Need Water” is displayed on the PC Screen.

Step 6. In the same way if the soil becomes wet, it displays “Cool No need water “in the PC Screen.

FLOW CHART

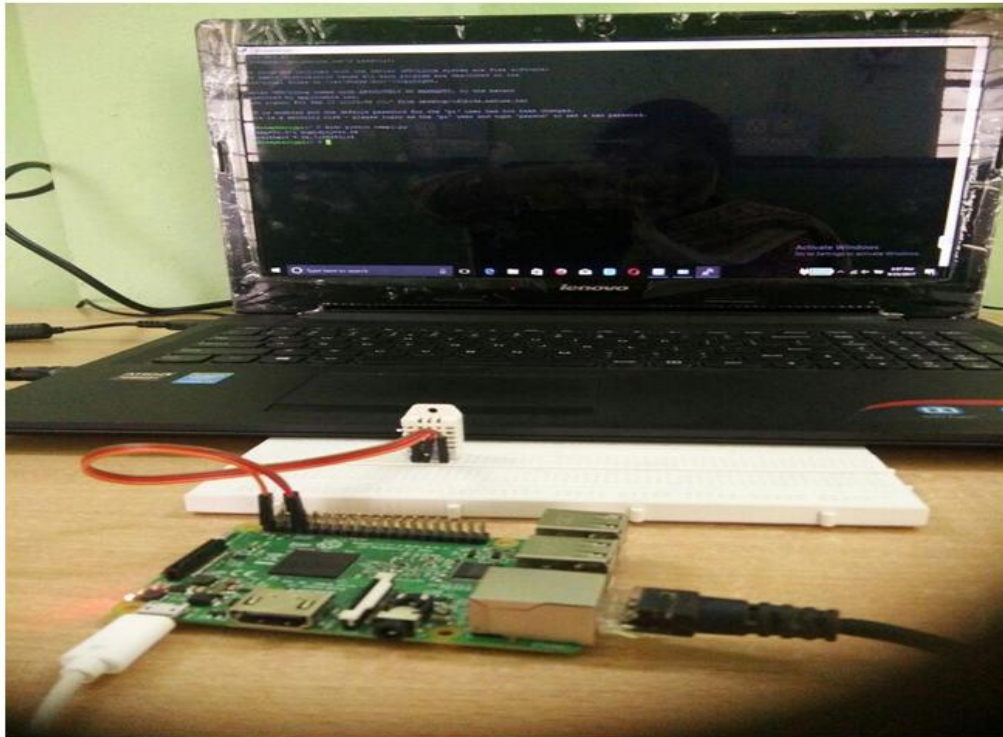


II. EXPERIMENTAL RESULTS

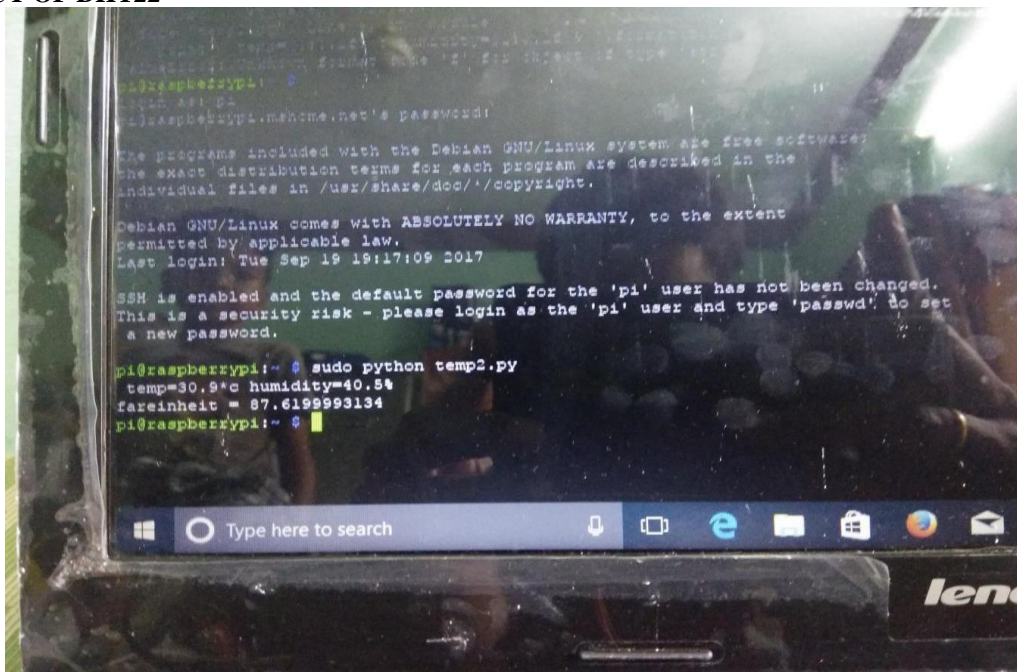
In this project, Soil Moisture Sensor and DHT 22 Sensor are connected to Raspberry Pi. The readings from the sensors are collected and send to micro controller. It stores collected data in the database and analyze the stored data. The readings are displayed on PC irrigation system which controls

the flow as per the requirement along with automation. With the use of low cost sensors and the simple circuitry makes these instruments a low-cost product, which can be bought even by a poor farmer. This work is best suited for places where water is scarce.

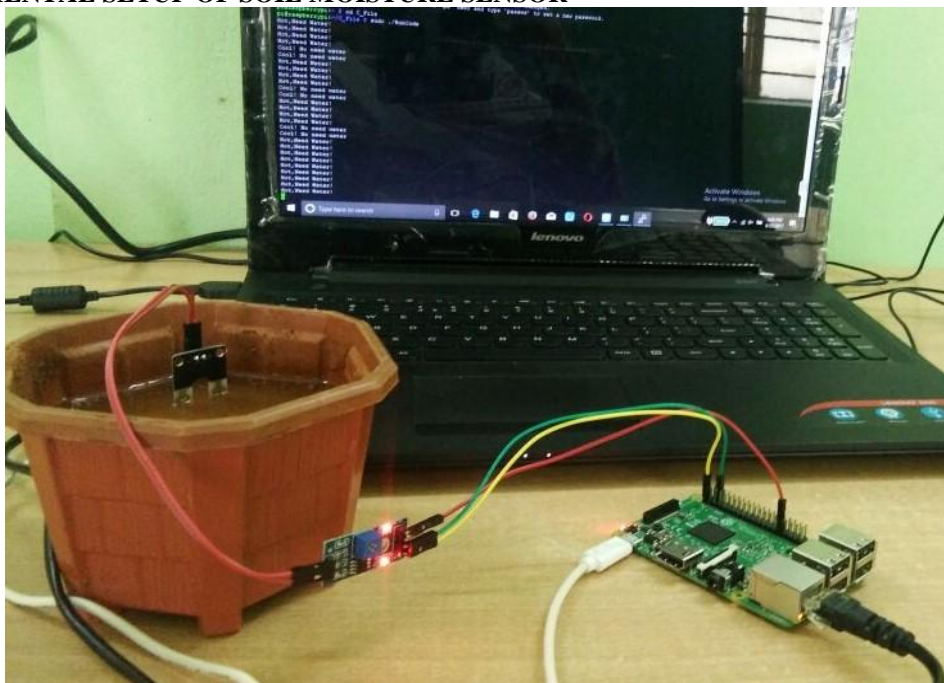
EXPERIMENTAL SETUP OF DHT22



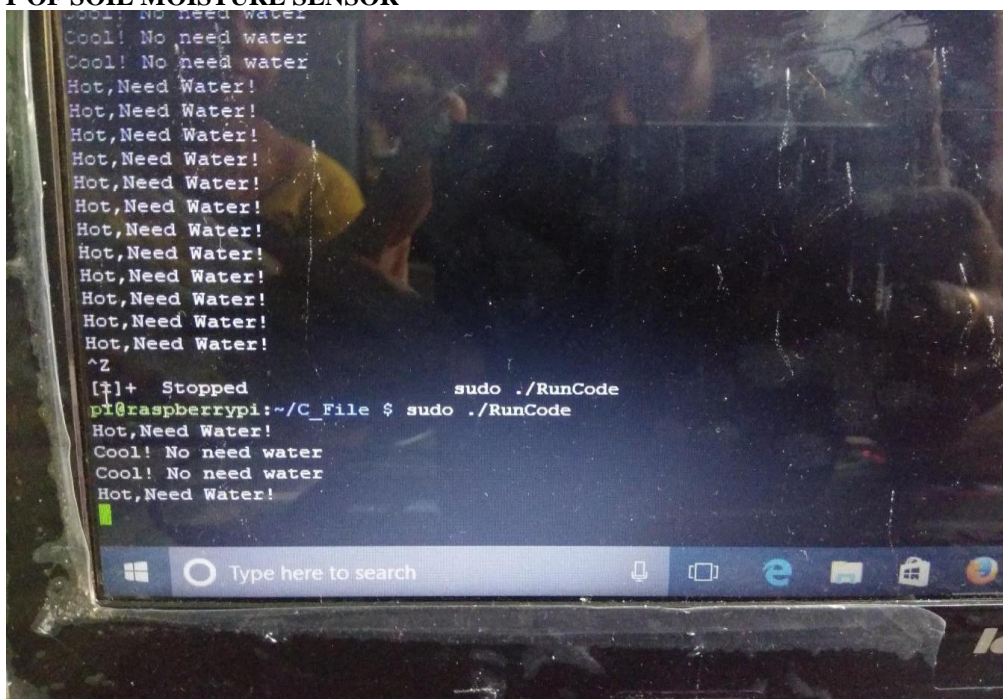
OUTPUT OF DHT22



EXPERIMENTAL SETUP OF SOIL MOISTURE SENSOR



OUTPUT OF SOIL MOISTURE SENSOR



III. CONCLUSION & FUTURE ENHANCEMENT

Thus, the irrigation system is feasible and less cost for optimizing water resources for agricultural production. The system would provide feedback control system which will monitor and control all the activities of growth of the plant.

1. PH and Soil Nutrient can be added to measure the PH Level and Nutrient of the Soil
2. Air Flow Sensors can be added to measure Soil Air Permeability. Measurements can be made at singular locations or dynamically while in motion. The desired output is the required to push a predetermine amount of air into the ground at prescribed depth.

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