CHAPTER 1

INTRODUCTION

INTRODUCTION

The automated greenhouse systems are designed to monitor the various parameters such as moisture, temperature and humidity and to control the excess values of these parameters for the growth of plants inside a greenhouse. The excel spreadsheet is used to display the conditions of the greenhouse to the owner of the greenhouse. The automated greenhouse system can be accessed from anywhere and it can be remotely monitored the greenhouse conditions and save the human expenses. An excel spreadsheet is used to store the readings of the sensors. To design and implement the temperature monitor and control system and soil moisture controlling which will predict and appropriately irrigate the crops and provides equal sunlight requirements for crops and control crop explosion The cost is very high to hire the people to always check, monitor and maintain the crops. Hence the greenhouse can be used as it is of less cost and easy to maintain and owner can access it from anywhere. In this greenhouse system the user will get the information regarding the conditions in the greenhouse. Hereafter getting the conditions in the greenhouse the user can also be able to control and adjust the values according to the requirement. Once the greenhouse is implemented the manpower required for the greenhouse will reduce and also be able to control the status of the greenhouse without moving into the greenhouse. It will also check the wastages like unnecessary watering of the plants.

CHAPTER 2
LITERATURE REVIEW

LITERATURE REVIEW

Since 1990's various kinds of greenhouses are implemented, but due to lack of awareness, cost and implementing factors, these systems were not in use. By introducing this system the environment of a greenhouse can be controlled.

The greenhouse system information is collected from different websites as well as some owner of the greenhouse.

For data collection and more information of greenhouse we visited a nearest greenhouse, There we collected more information about the plant growth in the greenhouse, and how they currently carryout their activities shall be noted down, analyzed and processed which shall later be used in the design and implementation of the proposed system. The data got from the farmers will be analyzed and processed to provide the requirements for the proposed system. "Automated Greenhouse" by Thangavel Bhuvaneshwari, Joshua Tan Yao Faculty of Engineering and Technology, Multimedia University, Jalan Ayer Keroh Lama, 75450 Melaka, Malasia , t.bhuvaneswari@mmu.edu.my. Cost effective optimization of greenhouse management using Raspberry Pi. A.J. Jadhav1, Mandar Ulape2, Sahil Khadikar3, Shubham Thanekar4, Niraj Salokhe5,1Computer Science & Engineering, DYPCET, aprjadhav@gmail.com, 2Computer Science & Engineering, DYPCET, m.ulape@gmail.com, 3Computer Science & Engineering, DYPCET, sahil.khadilkar@gmail.com, 4Computer Science & Engineering, DYPCET, shubhamthanekar94@gmail.com, 5Computer Science & Engineering, DYPCET, niraj.salokhe@gmail.com

CHAPTER 3
PROBLEM STATEMENT

PROBLEM STATEMENT

Design and Implementation of Environment monitoring system using Raspberry-Pi, which interfaced with various sensors (temperature, Humidity, CO2, Vibration).

CHAPTER 4
SCOPE OF THE PROJECT

SCOPE OF THE PROJECT

- Temperature, humidity and moisture sensor are used to monitor different parameter.
- The light sensor is used to monitor essential surrounding sunlight.
- Raspberry Pi used to interface the sensors.
- Output will be displayed in the excel spreadsheet.

CHAPTER 5
SYSTEM DESCRIPTION

SYSTEM DESCRIPTION

5.1. BLOCK DIAGRAM

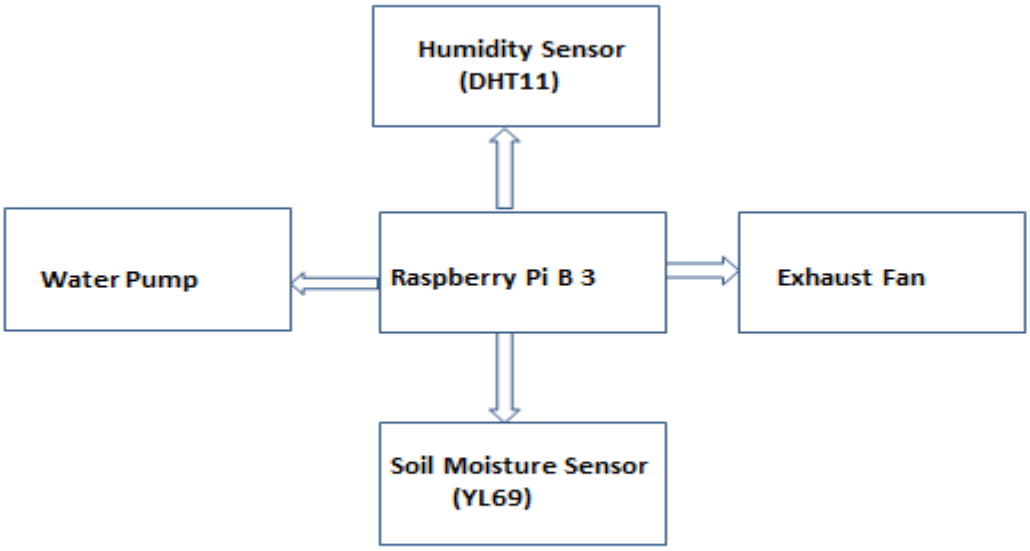

Fig.5.1. Block Diagram of Automated Greenhouse System

PROPOSED SYSTEM

The greenhouse consists of different types of sensors to help in the regulation of plant cycle and gives the user information to further growing process of the plants. The three sensors that are used in the greenhouse are DHT11 Humidity sensor, and YL-69 soil moisture sensor. After interfacing the sensors with the Raspberry Pi, the performance is tested. The greenhouse is turned on and it starts checking the temperature, humidity and soil moisture. These sensor results are compared with the standard required values and control the parameters as per requirement. Once the sensor output data is successfully read. The data will be presented in the excel spreadsheet to the user.

5.2. RASPBERRY PI B 3

The Raspberry Pi is a series of small single board computers developed in the United Kingdom by the Raspberry Pi. The foundation to promote the teaching of basic computer science in

schools and in countries. The original model became far more popular than anticipated, selling outside of its target market for uses such as Robotics. Peripherals are not included with the Raspberry Pi. Some accessories however have been included in several officials and unofficial bundles. The Raspberry Pi hardware has evolved through several versions that feature variations in memory capacity and peripherals-device support. This block diagram depicts Models B 3. Raspberry-PI 3 B is the beginning with Raspberry Pi to be open-source from the get-go, anticipate it to be the defect inserted Linux board in all the gatherings.

5.3. VNC VIEWER

Sometimes it is not convenient to work directly on the Raspberry Pi. Maybe you would like to work on it from another device by remote control.

VNC is a graphical desktop sharing system that allows you to remotely control the desktop interface of one computer (running VNC Server) from another computer or mobile device (running VNC Viewer). VNC Viewer transmits the keyboard and either mouse or touch events to VNC Server, and receives updates to the screen in return.

You will see the desktop of the Raspberry Pi inside a window on your computer or mobile device. You'll be able to control it as though you were working on the Raspberry Pi itself.

Fig.5.3.1 Setup on Mobile

VNC Connect from RealVNC is included with Raspbian. It consists of both VNC Server, which allows you to control your Raspberry Pi remotely, and VNC Viewer, which allows you to control desktop computers remotely from your Raspberry Pi should you want to.

You must enable VNC Server before you can use it: instructions for this are given below. By default, VNC Server gives you remote access to the graphical desktop that is running on your Raspberry Pi, as though you were sitting in front of it.

ENABLING VNC SERVER

On your Raspberry Pi, run the following commands to make sure you have the latest version of VNC Connect:

sudo apt-get update

sudo apt-get install realvnc-vnc-server realvnc-vnc-viewer

Now enable VNC Server. You can do this graphically or at the command line.

ENABLING VNC SERVER GRAPHICALLY

On your Raspberry Pi, boot into the graphical desktop.

Select **Menu > Preferences > Raspberry Pi Configuration > Interfaces**.

Ensure **VNC** is **Enabled**.

Enabling VNC Server at the command line

You can enable VNC Server at the command line using raspi-config

sudo raspi-config

Now, enable VNC Server by doing the following:

Navigate to **Interfacing Options**.

Scroll down and select **VNC > Yes**.

Connecting to your Raspberry Pi with VNC Viewer

There are two ways to connect to your Raspberry Pi. You can use either or both, depending on what works best for you.

ESTABLISHING A DIRECT CONNECTION

Direct connections are quick and simple providing you're joined to the same private local network as your Raspberry Pi. For example, this might be a wired or wireless network at home, at school, or in the office).

- On your Raspberry Pi (using a terminal window or via SSH) use these instructions or run `ifconfig` to discover your private IP address.
- On the device you'll use to take control, download VNC Viewer. For best results, use the compatible app from RealVNC.
- Enter your Raspberry Pi's private IP address into VNC Viewer.

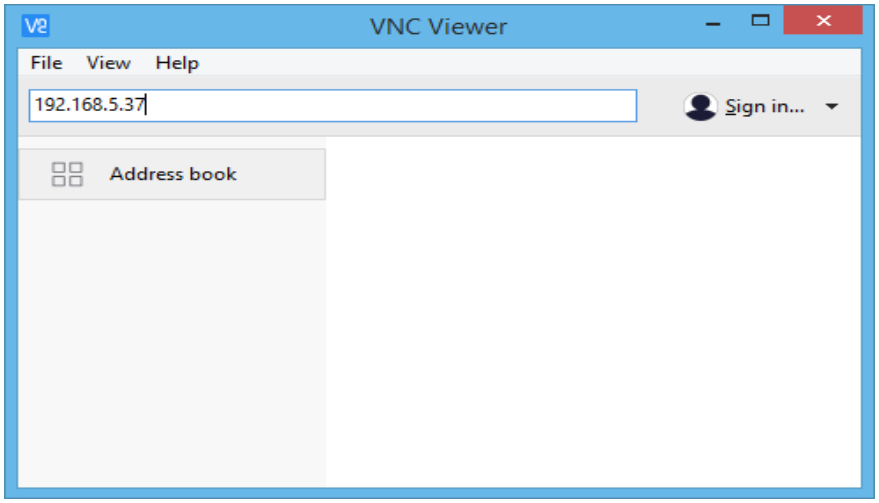

Fig.5.3.2 Direct Connection.

ESTABLISHING A CLOUD CONNECTION

You are entitled to use Real VNC's cloud service for free, provided that remote access is for educational or non-commercial purposes only.

Cloud connections are convenient and encrypted end-to-end. They are highly recommended for connecting to your Raspberry Pi over the internet. There's no firewall or router reconfiguration, and you don't need to know the IP address of your Raspberry Pi, or provide a static one.

Sign up for a Real VNC account here: it's free and it only takes a few seconds.

On your Raspberry Pi, sign in to VNC Server using your new Real VNC account credentials

- On the device you'll use to take control, download VNC Viewer. You **must** use the compatible app from Real VNC.
- Sign in to VNC Viewer using the same Real VNC account credentials, and then either tap or click to connect to your Raspberry Pi.

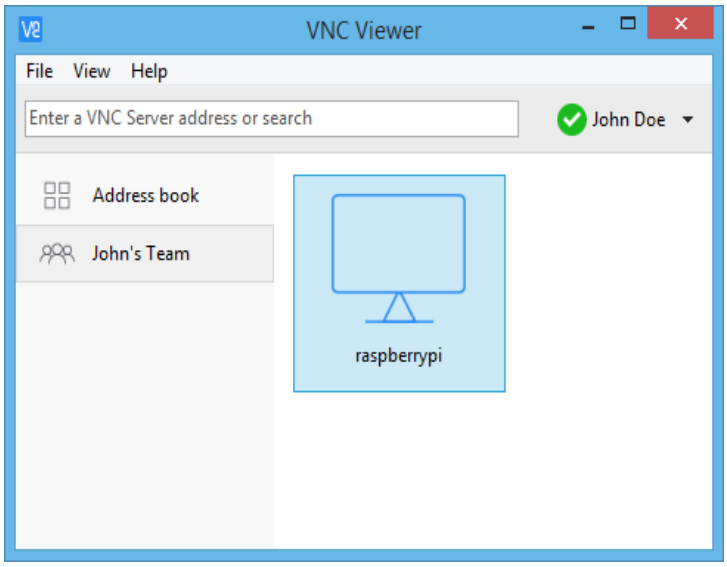

Fig.5.3.3 Cloud Connection

AUTHENTICATING TO VNC SERVER

To complete either a direct or cloud connection, you must authenticate to VNC Server. If you're connecting from the compatible VNC Viewer app from Real VNC, enter the user name and

password you normally use to log in to your user account on the Raspberry Pi. By default, these credentials are `pi` and `raspberry`.

- If you're connecting from a non-Real VNC Viewer app, you'll first need to downgrade VNC Server's authentication scheme, specify a password unique to VNC Server, and then enter that instead.
- If you are in front of your Raspberry Pi and can see its screen, open the VNC Server dialog on your Raspberry Pi, select **Menu > Options > Security**, and choose **VNC password** from the **Authentication** dropdown.
- **Or** if you're configuring your Raspberry Pi remotely from the command line, then to make the changes for Service Mode (the default configuration for the Raspberry Pi):
- Open the `/root/.vnc/config.d/vncserver-x11` config file.

- Replace `Authentication=SystemAuth` with `Authentication=VncAuth` and save the file.
- In the command line, run `sudo vncpasswd -service`. This will prompt you to set a password, and will insert it for you in the right config file for VNC Server running in Service Mode.
- Restart VNC Server.
-

PLAYIG MINECRAFT AND OTHER DIRECTLY RENDERED APPS REMOTELY

You can remotely access apps which use a directly rendered overlay, such as Minecraft, the text console, the Raspberry Pi Camera Module, and more.

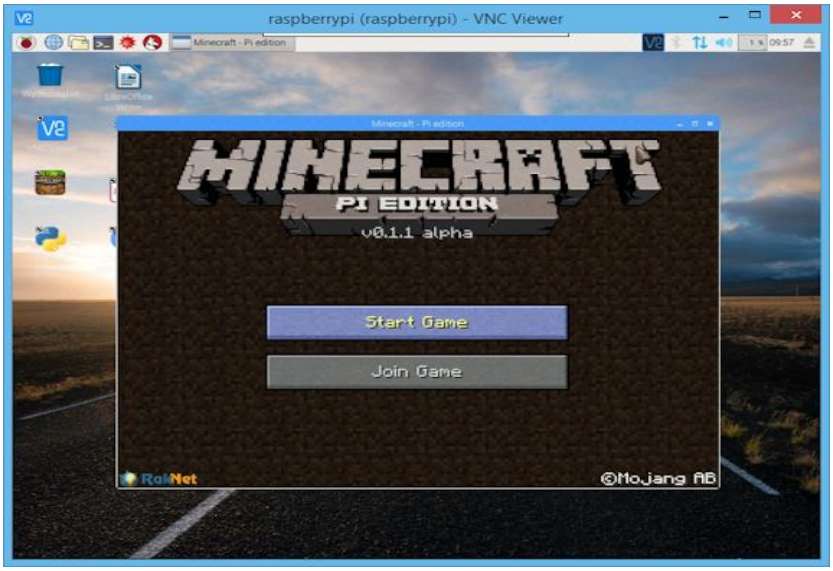

Fig.5.3.4 VNC Viewer

To turn this feature on:

- On your Raspberry Pi, open the VNC Server dialog.
- Navigate to **Menu > Options > Troubleshooting** and select **Enable experimental direct capture mode**.
- On the device you'll use to take control, run VNC Viewer and connect.
- **Note:** existing connections must be restarted in order for these changes to take effect.

Please note that direct screen capture is an experimental feature. If you're connecting from a desktop computer and mouse movements seem erratic, try pressing **F8** to open the VNC Viewer shortcut menu and selecting **Relative Pointer Motion**.

If performance seems impaired, try these troubleshooting steps, or let Real VNC know.

CREATING A VIRTUAL DESKTOP

If your Raspberry Pi is headless (i.e. not plugged into a monitor) or controlling a robot, it is unlikely to be running a graphical desktop.

VNC Server can create a **virtual desktop** for you, giving you graphical remote access on demand. This virtual desktop exists only in your Raspberry Pi's memory

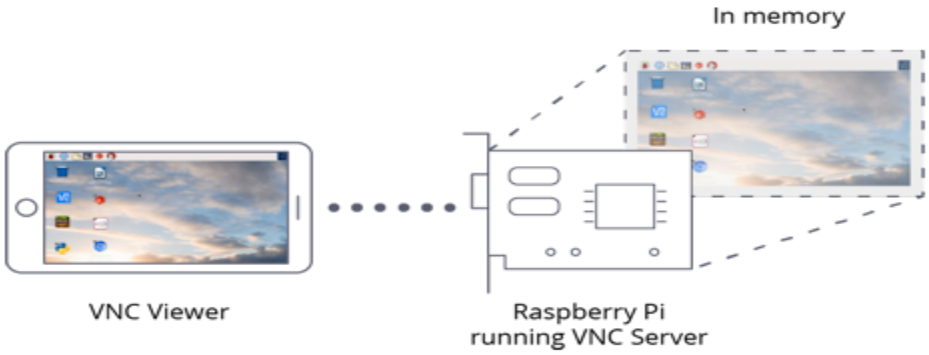

Fig.5.3.5 VNC Server

To create and connect to a virtual desktop:

- On your Raspberry Pi (using Terminal, or via SSH), run `vncserver`. Make note of the IP address/display number that VNC Server will print to your Terminal (e.g. `192.167.5.149:1`).
- On the device you'll use to take control, enter this information into VNC Viewer.
- To destroy a virtual desktop, run the following command:
- vncserver -kill :<display-number>
- This will also stop any existing connections to this virtual desktop.

CHAPTER 6
HARDWARE & SOFTWARE REQUIREMENT

HARDWARE REQUIREMENT

- Raspberry Pi
- 5V Supply
- Soil Moisture Sensor (YL69)
- Humidity Sensor (DHT11)
- Submersible Pump
- 5V DC Exhaust Fan
- Two Channel Relay Model

SOFTWARE REQUIREMENT

- Python

6.1. HARDWARE DESCRIPTION

RASPBERRY-PI 3:

Fig.6.1.1.Rasperry Pi 3 B

Raspberry Pi 3 Show B is the most recent form of the Raspberry Pi, a minor credit card estimate computer. The fair includes a console, mouse, show, control supply, smaller scale SD card with introducing Linux Dispersion and you'll have a fully-fledged computer that can run applications

from word processors and spreadsheets to diversions. As the Raspberry Pi 3 bolsters HD video, you can indeed make a media middle with it. The Raspberry Pi 3 Show B is the beginning with Raspberry Pi to be open-source from the get-go, anticipate it to be the defacto inserted Linux board in all the gatherings. [7] Technical Specification of raspberry pi:

1. Broadcom BCM2837 64bit ARMv7 Quad Center Processor powered single board machine running in 1. 2GHz.
2. 1GB RAM BCM43143.
3. Wi-Fi on board.
4. Bluetooth Low Energy (BLE) on board.
5. 40pin extended GPIO, 4 x USB 2 ports.

SD CARD

The SD card is a key part of the Raspberry Pi; it provides the initial storage for the Operating System and files. Storage can be extended through many types of USB connected peripherals.

When the Raspberry Pi is 'switched on', i.e. connected to a power supply, a special piece of code called the boot loader is executed, which reads more special code from the SD card that is used to start up the Raspberry Pi. If there is no SD card inserted, it will not start. Do NOT push in or pull out an SD card while the Raspberry Pi is connected to the power, as this is likely to corrupt the SD card data (you might get away with it, but it is best not to).

The SD card must be formatted, or written to, in a special way that means the Raspberry Pi can read the data it needs to start properly. If you are new to this check the instructions, or buy a pre-formatted SD card.

One advantage to using an SD card like this is that you can have several SD cards, each with a different operating system, or a different purpose. Simply power off, switch cards, and reconnect the power. You have a different computer to play with.

POWER SUPPLY

The Raspberry Pi 3 is powered by a +5.1V micro USB supply. Exactly how much current (mA) the Raspberry Pi requires is dependent on what you connect to it. We have found that purchasing

a 2.5A power supply from a reputable retailer will provide you with ample power to run your Raspberry Pi. You can purchase the official Raspberry Pi Power Supply from our website, and you can learn more about the differing power requirements of the various models of the Raspberry Pi on our FAQ page. Typically, the model B uses between 700-1000mA depending on what peripherals are connected; the model A can use as little as 500mA with no peripherals attached. The maximum power the Raspberry Pi can use is 1 Amp. If you need to connect a USB device that will take the power requirements above 1 Amp, then you must connect it to an externally-powered USB hub.The power requirements of the Raspberry Pi increase as you make use of the various interfaces on the Raspberry Pi. The GPIO pins can draw 50mA safely, distributed across all the pins; an individual GPIO pin can only safely draw 16mA. The HDMI port uses 50mA, the camera module requires 250mA, and keyboards and mice can take as little as 100mA or over 1000mA! Check the power rating of the devices you plan to connect to the Pi and purchase a power supply accordingly.

DHT11 (HUMIDITY SENSOR)

DHT11 humidity sensor feature a humidity sensor complex with a calibrated digital signal output. By using humidity sensing technology, it ensures high reliability and excellent long-term stability. This sensor incorporates a resistive measurement part that associate with execution of 8-bit microcontroller, putting forth fantastic quality, quick response, anti-interference capacity and cost effectiveness. The component is 4-pin signal row pin package. For measuring humidity, DHT11 has two electrodes with moisture holding substrate between them. So as the humidity changes, the conductivity of the substrate transforms alternately those safeties between these electrodes transforms. This change in resistance is measured and processed by the IC which makes it ready to be read by raspberry-pi's gpio pins.

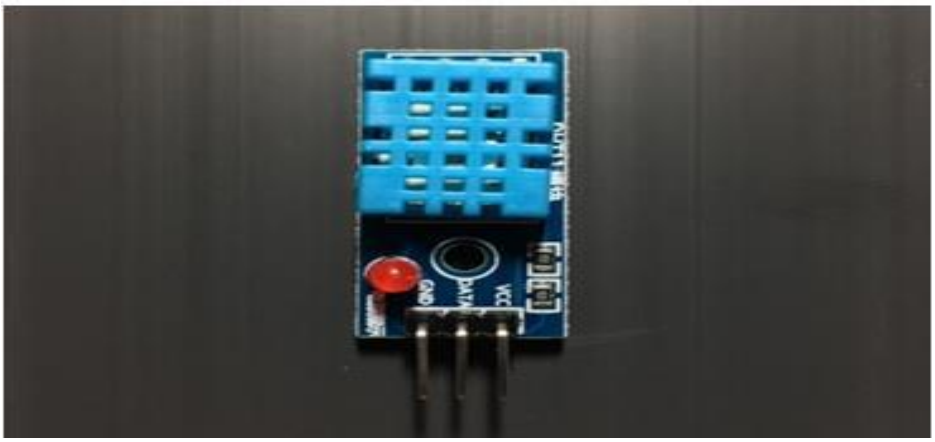

Fig.6.1.2.DHT11(Humidity Sensor)

SOIL MOISTURE SENSOR

A soil moisture sensor can read the amount of moisture present in the soil around it. It's a low tech sensor, perfect for monitoring a small garden, alternately your pet plant's water level. This is a must have tool for a connected garden.The Soil Moisture Sensor uses capacitance to measure dielectric constant of the surrounding medium. In soil, the dielectric constant is a function of the water content. The sensor creates a voltage proportional to the dielectric constant, and therefore the water content of the soil.

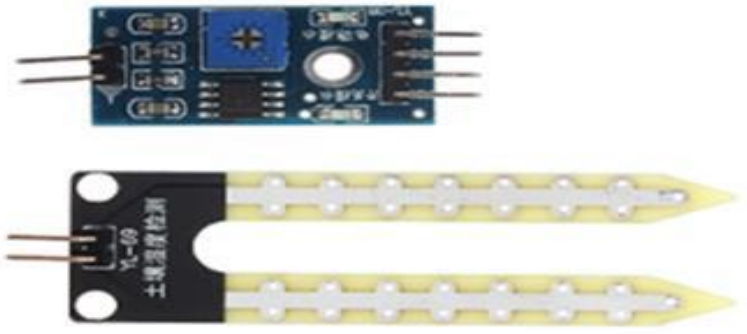

Fig.6.1.3.Soil Moisture Sensor (YL-69)

EXHAUST FAN

5V Mini Cooling Fan and prevent your hard-working Pi from overheating! Of course, it's also great for use with any small computer or FPGA or motor driver or anything that needs

cooling. Plug the fan directly into your Raspberry Pi's 5V+GND GPIO power pins, as shown, for instant cooling! Place in your case, or even better, on top of your Pi's CPU to give it extra air-flow. Compatible with any and all Raspberry Pi computers but only the Pi 3 runs hot enough to benefit from any cooling, when doing intense computations.

Specifications:

- Operating voltage: 5V
- Current: 0.2 A
- Brushless DC fan
- Fan dimensions: 30mm x 30mm x 8mm

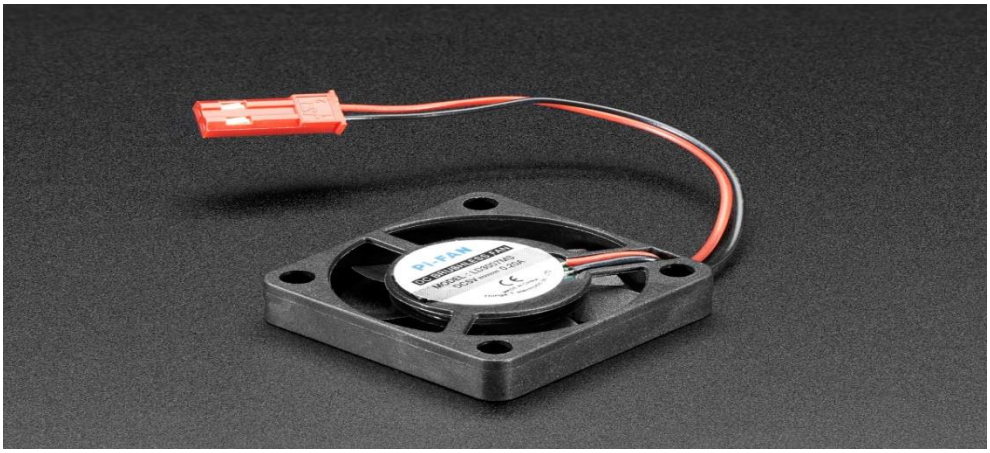

Fig.6.1.4.Exhaust Fan

TWO CHANNEL RELAY

This module contains two relays that are electrically isolated from the controlling input. The relays can be used to switch higher voltage and current loads than a microcontroller can traditionally accomplish.

Fig.6.1.5.Two channel relay

SOFTWARE DESCRITION

The software is divided into two parts, first consist of the temperature and humidity and the other is soil moisture Firstly the Raspberry Pi gets the sensor data and then this data is compared with the threshold values and according to that the hardware components will get turned on or turned off. Then this data is displayed in the excel spreadsheet. The input or outputs of the sensors are given by the Raspberry Pi using the GPIO pins and these pins are programmed using python language.

6.2. PYTHON

Python is a wonderful and powerful programming language that's easy to use (easy to read and write) and with Raspberry Pi lets you connect your project to the real world. Python syntax is very clean, with an emphasis on readability and uses standard English keywords. Start by opening IDLE from the desktop.

IDLE

The easiest introduction to Python is through IDLE, a Python development environment. Open IDLE from the Desktop or applications menu:

Fig.6.2.1. Python IDLE desktop menu.

IDLE gives you a REPL (Read-Evaluate-Print-Loop), which is a prompt you can enter Python commands into. Because it's a REPL, you even get the output of commands printed to the screen without using `print`.

BASIC PYTHON USAGE

Hello world in Python:

```
print("Hello world")
```

Simple as that!

Indentation

Some languages use curly braces `{` and `}` to wrap around lines of code which belong together, and leave it to the writer to indent these lines to appear visually nested. However, Python does not use curly braces but instead requires indentation for nesting. For example a `for` loop in Python:

```
for i in range(10):
    print("Hello")
```

Comments

Comments are ignored in the program but there for you to leave notes, and are denoted by the hash `#` symbol. Multi-line comments use triple quotes like so:

```
"""
This is a very simple Python program that prints "Hello".
That's all it does.
"""
print("Hello")
```

PYTHON FILES IN IDLE

To create a Python file in IDLE, click `File > New File` and you'll be given a blank window. This is an empty file, not a Python prompt. You write a Python file in this window, save it, then run it and you'll see the output in the other window.

For example, in the new window, type:

```
n = 0
for i in range(1, 101):
    n += i
print("The sum of the numbers 1 to 100 is:")
print(n)
```

Then save this file (File > Save or Ctrl + S) and run (Run > Run Module or hit F5) and you'll see the output in your original Python window.

EXECUTING PYTHON FILES FROM THE COMMAND LINE

You can write a Python file in a standard editor like Vim, Nano, or LeafPad, and run it as a Python script from the command line. Just navigate to the directory the file is saved in (use cd and ls for guidance) and run with python3 , e.g. python3 hello.py .

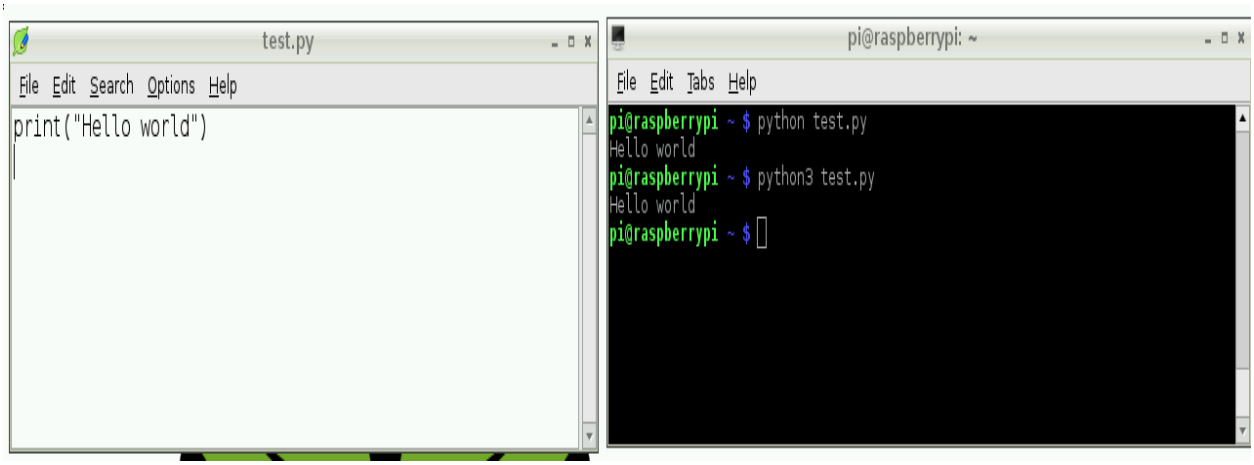

Fig.6.2.2.Exammple of a file execution in python

OTHER WAYS OF USING PYTHON

Command Line

The standard built-in Python shell is accessed by typing python3 in the terminal. This shell is a prompt ready for Python commands to be entered. You can use this in the same way as IDLE, but it does not have syntax highlighting or autocompletion. You can look back on the history of the commands you've entered in the REPL by using the Up/Down keys. Use Ctrl + D to exit.

IPython

IPython is an interactive Python shell with syntax highlighting, autocompletion, pretty printing, built-in documentation, and more. IPython is not installed by default. Install with:

```
sudo pip3 install ipython
```

Then run with `ipython` from the command line. It works like the standard `python3`, but has more features. Try typing `len?` and hitting `Enter`. You're shown information including the docstring for the `len` function:

```
Type:       builtin_function_or_method
String Form:<built-in function len>
Namespace:  Python builtin
Docstring:
len(object) -> integer
Return the number of items of a sequence or mapping.
```

INSTALLATION OF PYTHON LIBRARIES

Python 2 and Python 3 come pre-installed on Raspbian operating systems, but to install Python on another Linux OS or to update it, simply run one of these commands at the command prompt:

sudo apt-get install python3
Installs or updates Python 3.

sudo apt-get install python

Installs or updates Python 2.

RUNNING A PYTHON PROGRAM

To run the program without making it executable, navigate to the location where you saved your file, and enter this at the command prompt:

python hello-world.py.

MAKE A PYTHON FILE EXECUTABLE

Making a Python program executable allows you to run the program without entering python before the file name. You can make a file executable by entering this at the command prompt:
chmod +x file-name.py
Now to run the program, all you need to enter is:

./file-name.py

Here are some additional resources that will help you make the most out of programming in Python:

- Complete list of Python libraries
- Complete list of Python syntax
- The Python Package Index (PyPi)
- Installing Python packages on the Raspberry Pi
- How to get Python on your Raspberry Pi how-to-get-python-on-your-raspberrypi
- Attachments
- Changes
- View Source
- View

Initial Setup

Reset Your Password

Since all Raspian images come with the same password, you'll need to change the root password so no one can access it without your approval:

- At the terminal, run `sudo raspi-config`
- Choose the `change_pass` menu option & enter a new password

Configuring Your Keyboard

By default, the Raspian image uses a English UK keyboard setup, which can lead to some confusion. For those in the US, following the following steps to fix the keyboard:

- At the terminal, run `sudo raspi-config`
- Choose the `configure_keyboard` menu option
  - Other
  - English (US)
  - English (US) - yes, again

Additionally, if you like using the `Caps Lock` as `Ctrl` instead, run the following command:

- `setxkbmap -option "ctrl:nocaps"`

Reboot

To make sure things are in order, reboot your RaspberryPi. This is typically only necessary if you alter the video memory setup or use the entire SD card for the Raspian setup.

- `sudo reboot`

Python Packaging

While the RaspberryPi (& Raspian) run Python out-of-the-box, you'll likely want some common packaging tools for more advanced development. The following gets you some common Python tools (`pip` for easy installation/removal of packages & `virtualenv` for nice isolated environments):

- `sudo apt-get install python-dev`
- `curl -O https://bootstrap.pypa.io/get-pip.py`
- `sudo python get-pip.py`
- `sudo pip install virtualenv`

CHAPTER 7
SOFTWARE IMPLEMENTATION

7.1 SOFTWARE FLOWCHART

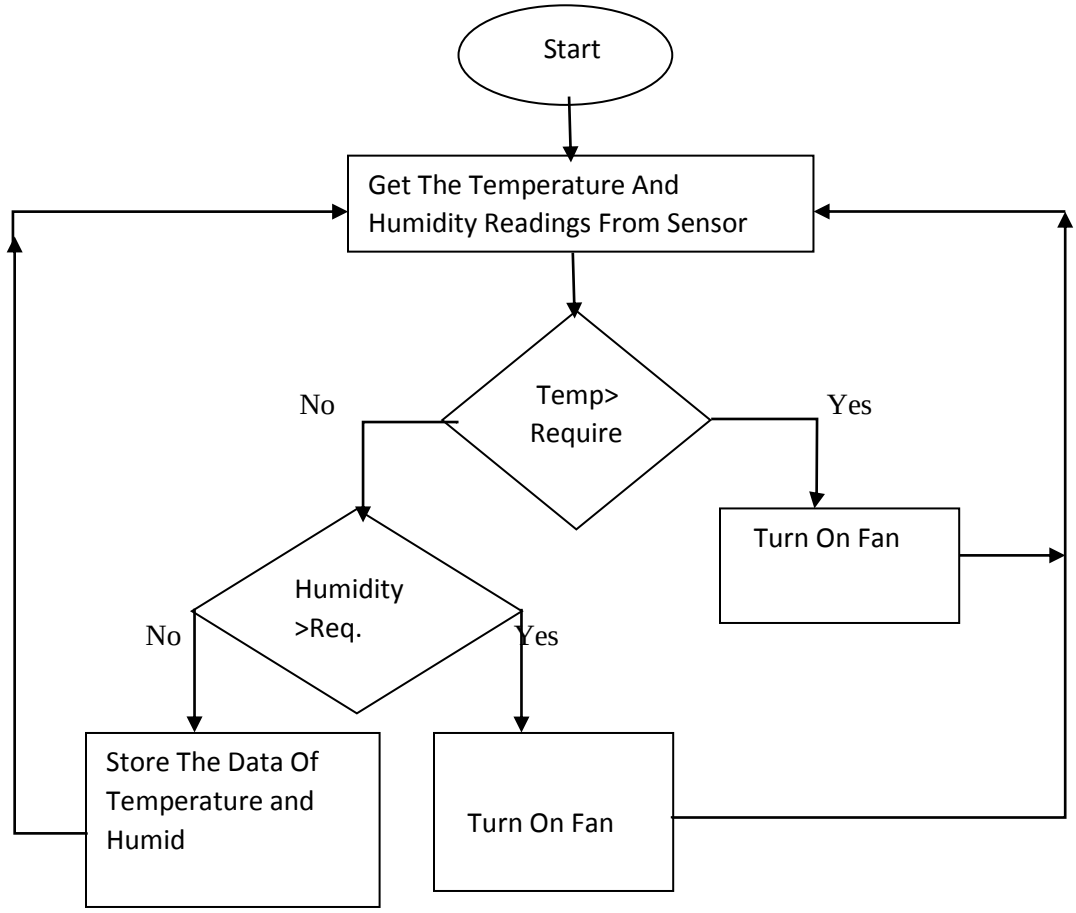

Fig.7.1.1.Flowchart for temperature and humidity

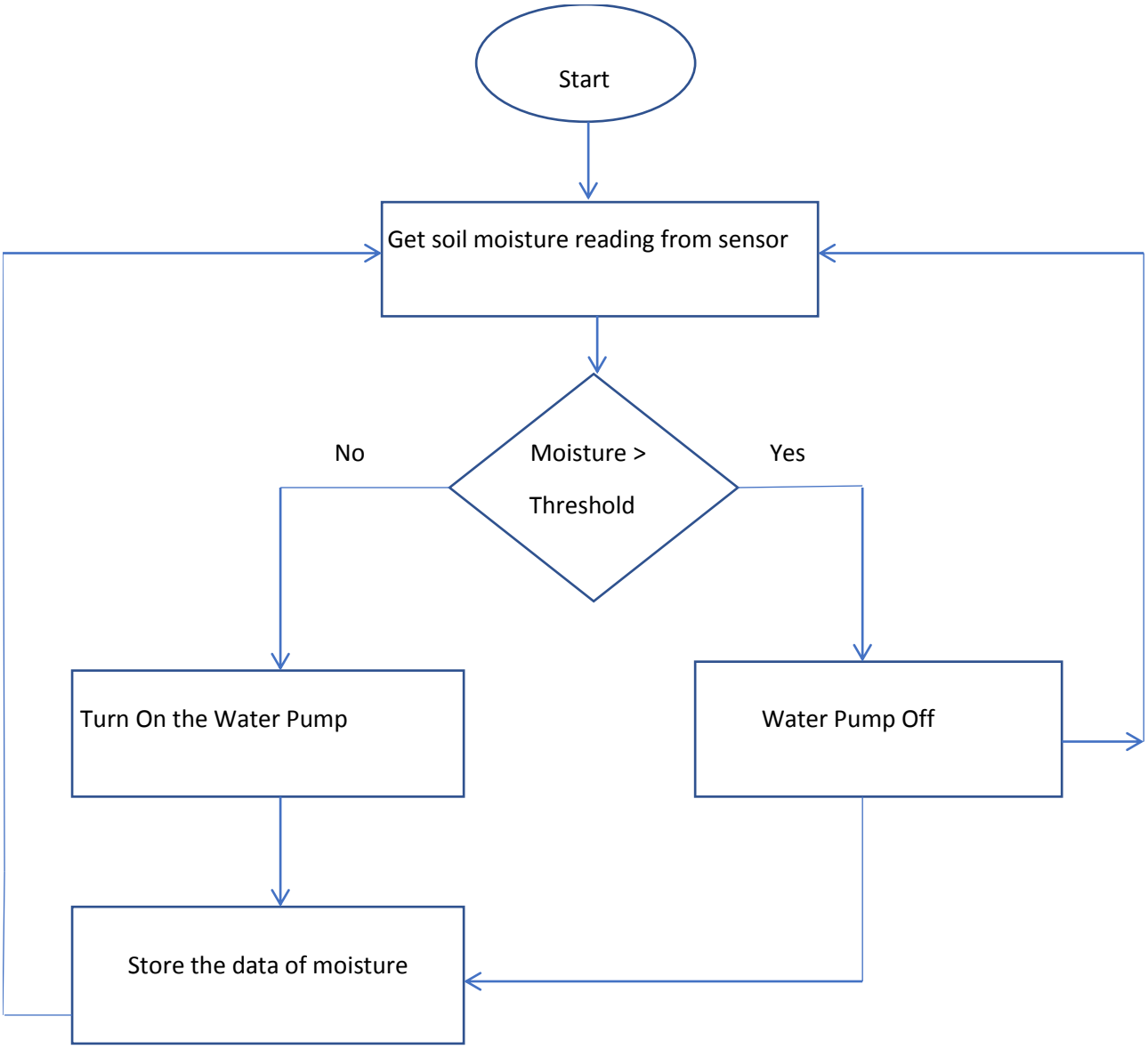

Fig.7.1.2.Flowchart for soil moisture

7.2 ALGORITHM

Sensors from the greenhouse will send the data to the raspberry pi for controlling and maintaining the appropriate environment in the greenhouse. After taking the values from the sensor raspberry pi will compare it with standard threshold value.

Step 1:

Sensor: Sensor will sense the data from the sensors.

Destination: Raspberry Pi.

Data: Sensed information

Data sensed and received information

Task: After receiving the data controlling and maintaining the parameters.

Step 2:

Raspberry Pi compares the values with the standard values.

Step 3:

Monitoring and repeating the process.

CHAPTER 8

ADVANTAGES AND DISADVANTAGES

8.1. ADVANTAGES

- Good distribution of light in the greenhouse. The greenhouse covers have the ability to change the direction of the sun's rays, thus evenly distributed over the entire surface, benefiting the entire greenhouse and avoiding the sun's rays directly to the plant.

- Energy efficiency. Take advantage of the environmental conditions, such as optimizing the heat inside the greenhouse.

- Control of microclimate. One of the main advantages of a greenhouse is to control and establish the optimal environment for cultivation. You can adjust the temperature, humidity, etc.

- Protection against diseases, pests and other vermin. Another advantage of a greenhouse is that it is very difficult to enter as it is a closed space.

- Excellent ventilation. You can ventilate the greenhouse quickly, thanks to their zenithal or side windows.

- Optimum sealing against rain and air.

- Increased production. This is a great advantage of a greenhouse, can intensify production due to weather conditions, can accelerate the growth of the plants and also allows a greater amount of crop on the surface.

8.2. DISADVANTAGES

- Greenhouse farming can get expensive. Depending on the material you intend to use, they can be costly in construction.
- In rainy season because of heavy rain, crops may get damage.

CHAPTER 9

RESULT

RESULT

After getting the readings from the sensors Raspberry Pi will check the temperature and humidity readings with the standard values and if the temperature value is greater than standard value then fan will be ON and if it is less then it checks for humidity, if the humidity is greater than the standard value then fan will be ON and if it is less then it stores the data and displays it in the excel spreadsheet.

For soil moisture sensor if the sensed data reading is less than the required standard value then water pump will be ON and after sometimes it will automatically TURN OFF.

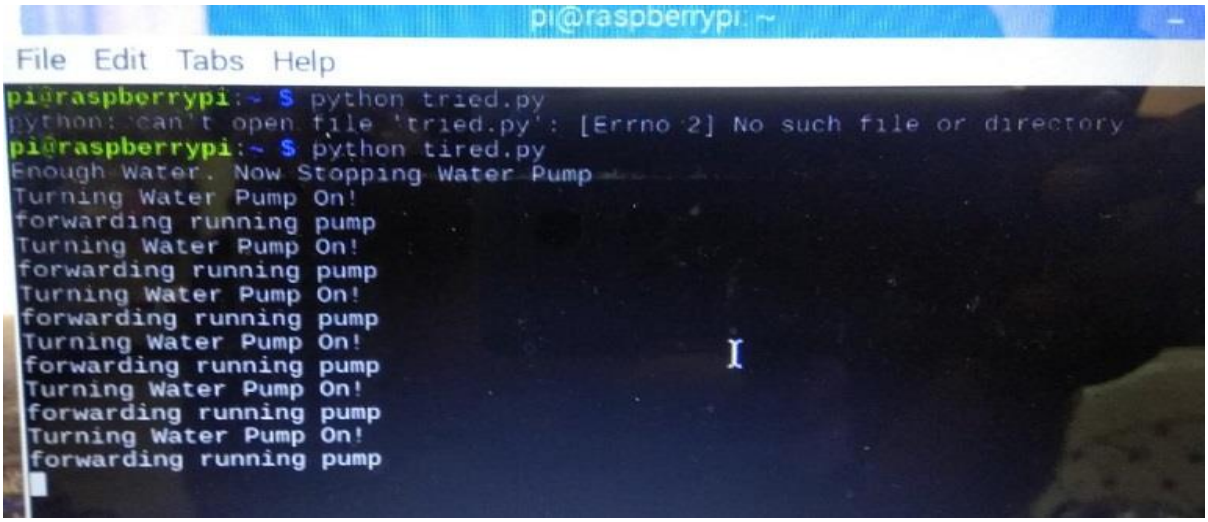

Fig.9.1.Output of water pump and soil moisture

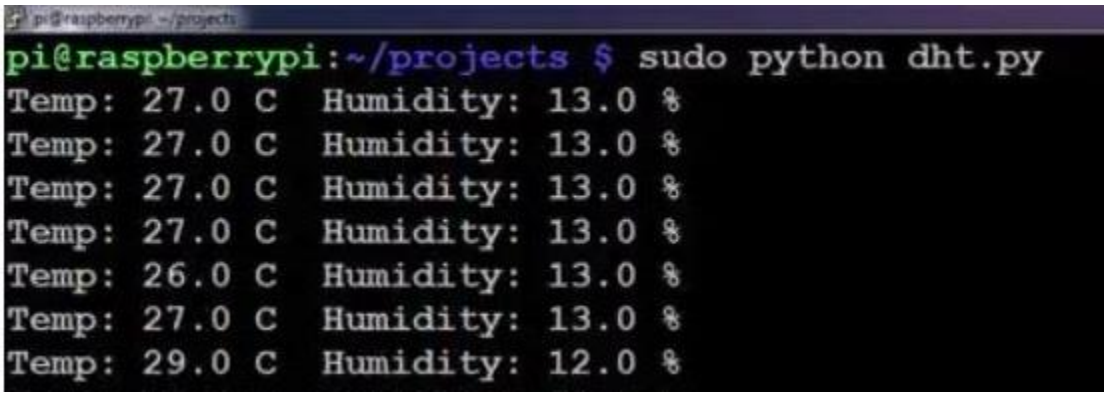

Fig..9.2. Output of temperature sensor and humidity sensor

CHAPTER 10
APPLICATIONS

APPLICATIONS

- The greenhouse is used in the fields for maintaining the plants.
- It can also be used in the gardens where the maintenance is important.
- Production of vegetable crops.
- Production of off-season flowers, vegetables.
- Primary and secondary hardening nursery of Tissue cultured plant.
- Growth / Production of rare plants, orchids / herbs, medicinal plants.

CHAPTER 11
FUTURE SCOPE

FUTURE SCOPE

- By extending the project greenhouse can be handled remotely by using the computer as well as by the mobile phones with internet connection and more parameters can be added to the monitor and more information can be achieved.
- The quality of crops can be improved by taking more parameter in consideration.
- In future the responsibilities are needed to be taken by developing the independent agriculture practices that can take decisions of their own independent of the climatic conditions.
- The design is focused on smaller places. It can be further improved to be used in the industries.

CHAPTER 12
CONCLUSION

CONCLUSION

The prototype is implemented to gather the data of sensor and signal is sent to the servo and fan to take the action when the threshold value is reached. The project is suitable for the small scale greenhouse and it is cheaper per square foot option. The system consists of three objectives set at the start of the project such as temperature humidity and soil moisture. The above objectives give automated greenhouse with the flourished plants when these are achieved.

CHAPTER 13
BIBLIOGRAPHY

BIBLOGRAPHY

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