National University of Computer & Emerging Sciences

Karachi Campus

SHELL SCRIPT FOR A SENSOR USING RASPBERRY Pi

Project Report

Operating Systems

Section: F

Group Members:

Syed Usman Javed - 21K-4863

Mohammad Burhanuddin - 21K-3358

Mohammad Hanzala Shamsi - 21K-4865

Introduction:

Plants are vital to life on earth, as they are responsible for producing oxygen and supporting a variety of ecosystems. It is essential to maintain healthy plants to ensure their continued growth and vitality. The use of sensors is a useful tool to monitor the health of plants, providing real-time data that can be analyzed and acted upon to maintain the optimal conditions required for plant growth.

We are creating an atmosphere providing a general solution to our Agriculture Sector in Pakistan, knowing the problem arises due to unpredicted climate change.

The aim of this project is to develop a shell script that can detect moisture, temperature and humidity levels in plant soil using sensors connected to a Raspberry Pi. The use of shell scripts is becoming increasingly popular due to their simplicity and flexibility in automating repetitive tasks. By creating a shell script that can detect these soil parameters, this project will enable users to easily monitor the health of their plants and optimize watering schedules.

Objective:

The objective of this project is to design and implement a sensor-based system to monitor and maintain the health of plants. The system will be capable of collecting data on the environmental conditions that affect plant growth, such as temperature, humidity, and soil moisture, and providing this information to the user in a way that is easy to interpret and act upon.

Methodology:

The proposed system will consist of sensors placed in the plant's environment to monitor the conditions that affect its growth. The sensors will be collect data and show some indicating upon threshold set. Overall, this methodology will enable the development of a highly effective and reliable system for detecting and monitoring the soil parameters of moisture, temperature and humidity in plant soil.

1. Hardware Setup: The first step will be to set up the hardware components, including the Raspberry Pi and the sensors for moisture, temperature and humidity. The sensors will be connected to the Raspberry Pi and configured according to their specifications.

2. Script Development: The next step will be to develop a shell script using a text editor or Integrated Development Environment (IDE). The shell script will be designed to read the data from the sensors and analyze the data to detect the moisture, temperature and humidity levels in the plant soil. The script will then perform actions based on the data, such as logging the data to a file, sending an email alert or triggering an action in another system.

3. Testing: The shell script will be tested using various input scenarios to ensure that it is functioning correctly. The testing will involve both manual and automated tests, and any issues identified will be fixed before the final implementation.

4. Implementation: Once the shell script is working as intended, it will be implemented and deployed to the Raspberry Pi. The implementation will involve setting up the necessary permissions and scheduling the script to run at regular intervals using tools like Cron.

5. Evaluation: The final step will be to evaluate the system to ensure that it meets the project's objectives. The evaluation will involve assessing the accuracy and reliability of the shell script in detecting the moisture, temperature and humidity levels in the plant soil. The feedback from users will also be collected to improve the system further.

Expected Outcomes:

The proposed system is expected to provide several benefits to the user, including:

1. Improved plant health and growth through real-time monitoring and timely intervention.
2. Reduced water and energy consumption by ensuring that the plant receives only the necessary resources.
3. Increased efficiency and productivity in plant care by automating the monitoring and maintenance process.
4. Enhanced user experience through the provision of user-friendly and intuitive interfaces for plant management.

Timeline:

The proposed project will be divided into the following stages:

1. Design and prototyping: Includes a designed system to illustrate and check examine the working of sensors
2. Development of the sensor network and data collection system
3. Integrating hardware to software: Writing Shell scripting for Sensors.
4. Testing and validation

Hardware:

1. Raspberry Pi: This is a credit-card sized computer that can be used for more complex projects. It has built-in Wi-Fi and Bluetooth, which makes it ideal for IoT projects.
2. Bread Board, Beep, Indicating light for individual sensors, wires.
3. DHT11/DHT22 Temperature and Humidity Sensor: These sensors can measure temperature and humidity in the environment around the plant.
4. Light Dependent Resistor (LDR): An LDR is a sensor that can measure the intensity of light in the plant's environment.
5. Moisture /Water level sensor: This sensor can be used to measure the water or moisture level of the soil to avoid water logging in soil. (Exceptional)

Note: These sensors can be change in project upon the availability in market.

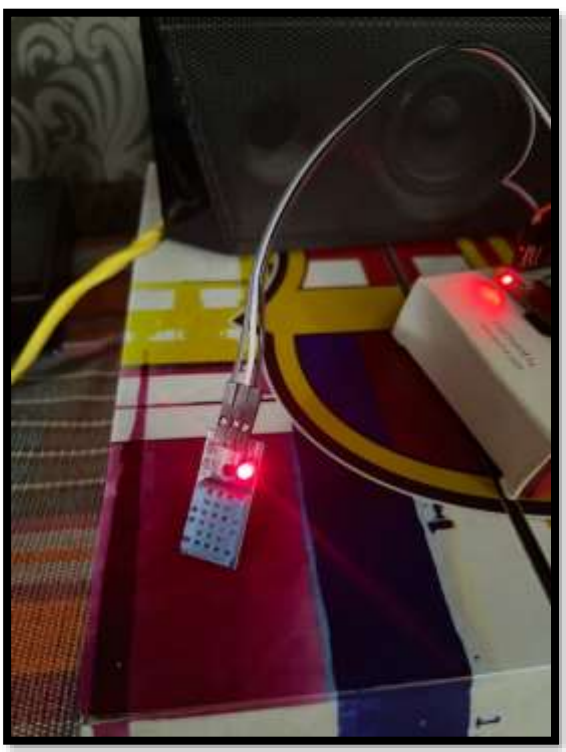
Modeling:

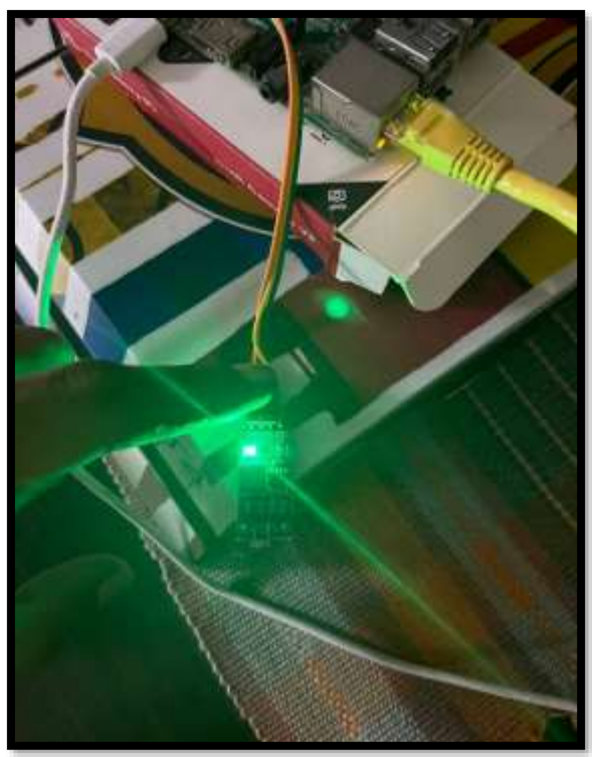
1. **Raspberry Pi Setup**: The Raspberry Pi 2B is a significant upgrade from the Raspberry Pi 1, with a faster quad-core processor, more memory, and improved connectivity options. It is capable of running a wide range of operating systems, including various flavors of Linux, Windows 10 and even Android. The GPIO header provides easy access to the Raspberry Pi's pins, making it ideal for electronics projects.

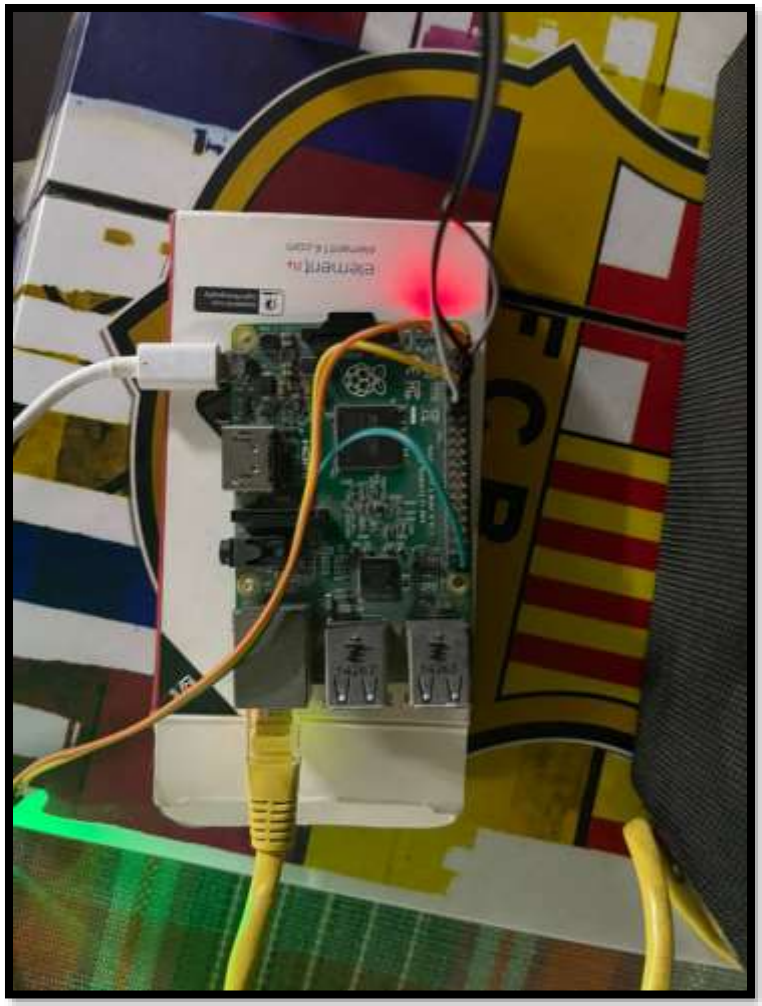
- Following Steps Are Required to Boot Raspberry Pi:
  Download Raspberry Pi OS image and flash it onto the SD card.
  Connect Hardware (Monitor, Keyboard, Mouse) to Raspberry Pi.
  Connect Power supply and Raspberry start boot.

2. **LDR Sensor**: Shell scripting is used for LDR sensor programming.
   An LDR (Light-Dependent Resistor) sensor is a type of sensor that detects the presence or absence of light. When light falls on the surface of the LDR sensor, its resistance decreases, and when there is no light, the resistance increases. Raspberry Pi can read the analog output of an LDR sensor using its ADC (Analog to Digital Converter) input pins.

3. **DHT11/22 Sensor:** Python is used for DHT sensor programming.
   The DHT11/22 sensors use a proprietary protocol to communicate with the Raspberry Pi, which requires precise timing and synchronization between the sensor and the Raspberry Pi. This protocol is not supported by shell scripting, which is a higher-level scripting language and may not have the necessary low-level access to the GPIO pins required to read data from the sensors. This is because shell scripts are not well-suited for low-level hardware access and may not provide the necessary precision and timing required to read data from the DHT11/22 sensors accurately. This is why we using Adafruit DHT library.







Outputs:

```
pi@raspberrypi: ~/Desktop
pi@raspberrypi:~/Desktop $ sudo ./bash.sh
./bash.sh: line 25: echo: write error: Device or resource busy
Temperature: 34.0 °C
Humidity: 95.0%
Receiving sunlight: No
Warning: Move your plant under sunlight, the humidity level has reached more than your set threshold.
Temperature: 34.0 °C
Humidity: 95.0%
Receiving sunlight: No
Warning: Move your plant under sunlight, the humidity level has reached more than your set threshold.
Temperature: 34.0 °C
Humidity: 95.0%
Receiving sunlight: Yes
Warning: Move your plant under sunlight, the humidity level has reached more than your set threshold.
Temperature: 34.0 °C
Humidity: 95.0%
Receiving sunlight: Yes
Warning: Move your plant under sunlight, the humidity level has reached more than your set threshold.
Temperature: 34.0 °C
Humidity: 95.0%
Receiving sunlight: No
Warning: Move your plant under sunlight, the humidity level has reached more than your set threshold.
Temperature: 34.0 °C
Humidity: 95.0%
Receiving sunlight: No
Warning: Move your plant under sunlight, the humidity level has reached more than your set threshold.
```

Conclusion:

The use of sensors in plant monitoring can bring several benefits, including improved plant health and growth, reduced resource consumption, increased efficiency and productivity, and enhanced user experience in plant management.

The project can be Analyze in either of ways:

1. Individual sensors indicate user upon the threshold set.
2. Produce a cumulative result by taking the result of all sensors used in project.

Moreover, we will learn in-depth knowledge about how to integrate hardware with software. Our course (Operating System) provide knowledge and will help us in writing shell scripting of sensor. Additionally, it will demonstrate how many embedded and other systems generate their own unique results while centralized systems use data to produce definitive results.

X--------------------------------X--------------------------------X