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Experiment No. 2

IoT-Based Temperature and Humidity Monitoring using Raspberry Pi 5 and Blynk Cloud

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Title

Implementation of a Cloud-Edge IoT System for Real-Time Temperature and Humidity Monitoring using Raspberry Pi 5 and Blynk IoT Platform

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Objective

The objective of this experiment is to interface a DHT11 temperature and humidity sensor with Raspberry Pi 5 and transmit real-time environmental data to the Blynk IoT Cloud for remote monitoring through web and mobile dashboards.

Theory

In modern IoT systems, data is often processed at the **edge device** and then transmitted to the cloud for visualization, storage, and analysis. In this experiment, the Raspberry Pi 5 acts as the **edge gateway**, collecting environmental data using the DHT11 sensor and sending it to the Blynk IoT Cloud.

The DHT11 sensor measures temperature and humidity and communicates with the Raspberry Pi using a single-wire digital protocol. Since Raspberry Pi 5 uses the RP1 I/O controller architecture, proper timing control through supported libraries is required for reliable communication.

Blynk IoT is a cloud-based platform that allows developers to create customizable dashboards using **Virtual Pins (V0, V1)**. These virtual pins represent physical sensor values and allow remote visualization on web or mobile applications.

The system follows a **Cloud-Edge Architecture**, where:

- Raspberry Pi collects sensor data (Edge Processing)

- Data is transmitted over the internet

- Blynk Cloud displays data in real time

This experiment demonstrates real-time IoT data acquisition, cloud communication, and remote monitoring using a secure and scalable IoT framework.

Equipment's

- Raspberry Pi 5
- DHT11 Temperature and Humidity Sensor
- Jumper wires
- Blynk IoT Cloud account

Circuit Connections

SENSOR PIN	FUNCTION	RASPBERRY PI 5 PIN	PHYSICAL PIN NO
VCC (+)	Power	3.3V	Pin 1
GND (-)	Ground	GND	Pin 6
DATA (OUT)	Signal	GPIO 4	Pin 7

Procedure

1. The DHT11 sensor was connected to Raspberry Pi 5 using GPIO 4 with proper 3.3V power supply.

2. A Blynk IoT account was configured and virtual pins were created for temperature and humidity.

3. A project folder and Python virtual environment were created on the Raspberry Pi.

4. Required IoT libraries were installed inside the virtual environment.

5. The monitoring script was configured with the Blynk authentication token.

6. The script was executed to read temperature and humidity values from the sensor.

7. The Raspberry Pi transmitted the data to the Blynk Cloud at regular intervals.

8. Real-time readings were verified on the Blynk web/mobile dashboard.

Code :

blynk_dht11.py

```python
import BlynkLib
import board
import adafruit_dht
import time

# --- BLYNK CONFIGURATION ---
BLYNK_AUTH = 'YOUR_AUTH_TOKEN'

blynk = BlynkLib.Blynk(BLYNK_AUTH, server='blynk.cloud', port=80)

# --- SENSOR CONFIGURATION ---
sensor = adafruit_dht.DHT11(board.D4)

print("Starting Blynk DHT11 Monitoring on Pi 5...")

def send_sensor_data():
    try:
        temp = sensor.temperature
        humi = sensor.humidity

        if humi is not None and temp is not None:
            print(f"Blynk Update -> Temp: {temp:.1f}°C | Hum: {humi:.1f}%")
            blynk.virtual_write(0, temp)   # V0 for Temperature
            blynk.virtual_write(1, humi)   # V1 for Humidity
        else:
            print("Sensor returned null reading...")
    except RuntimeError:
        pass
    except Exception as error:
        sensor.exit()
        raise error

last_send_time = 0

while True:
    blynk.run()
    current_time = time.time()

    if current_time - last_send_time > 5.0:
        send_sensor_data()
        last_send_time = current_time
```
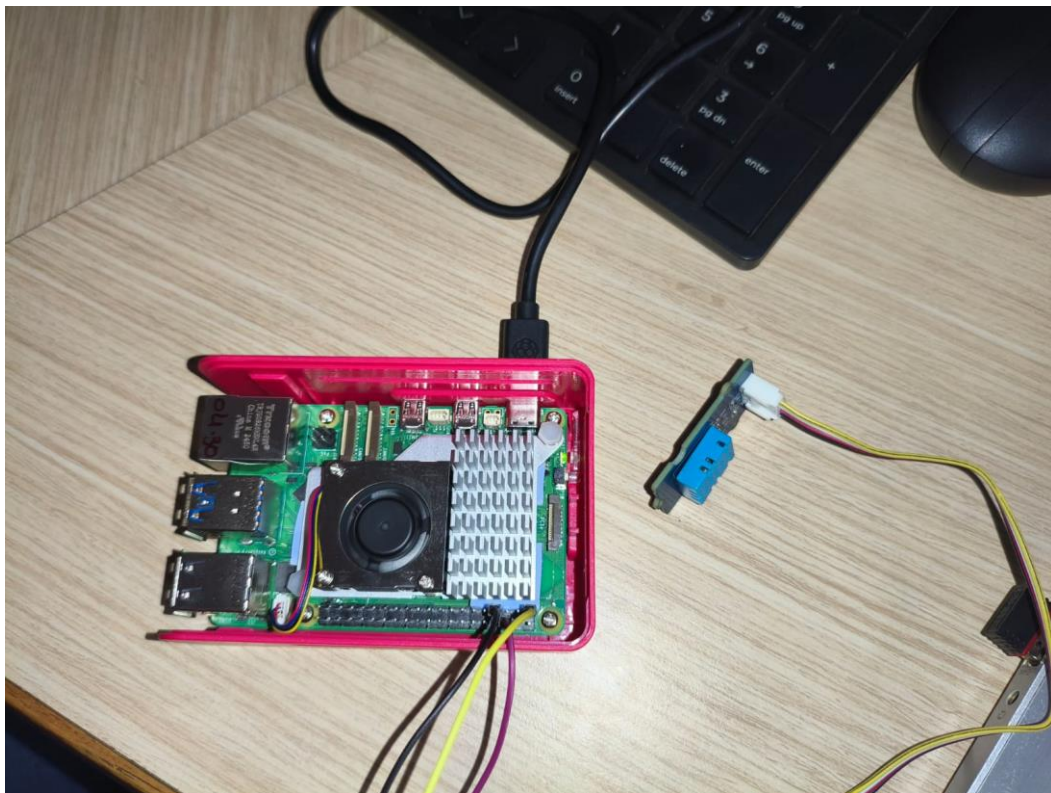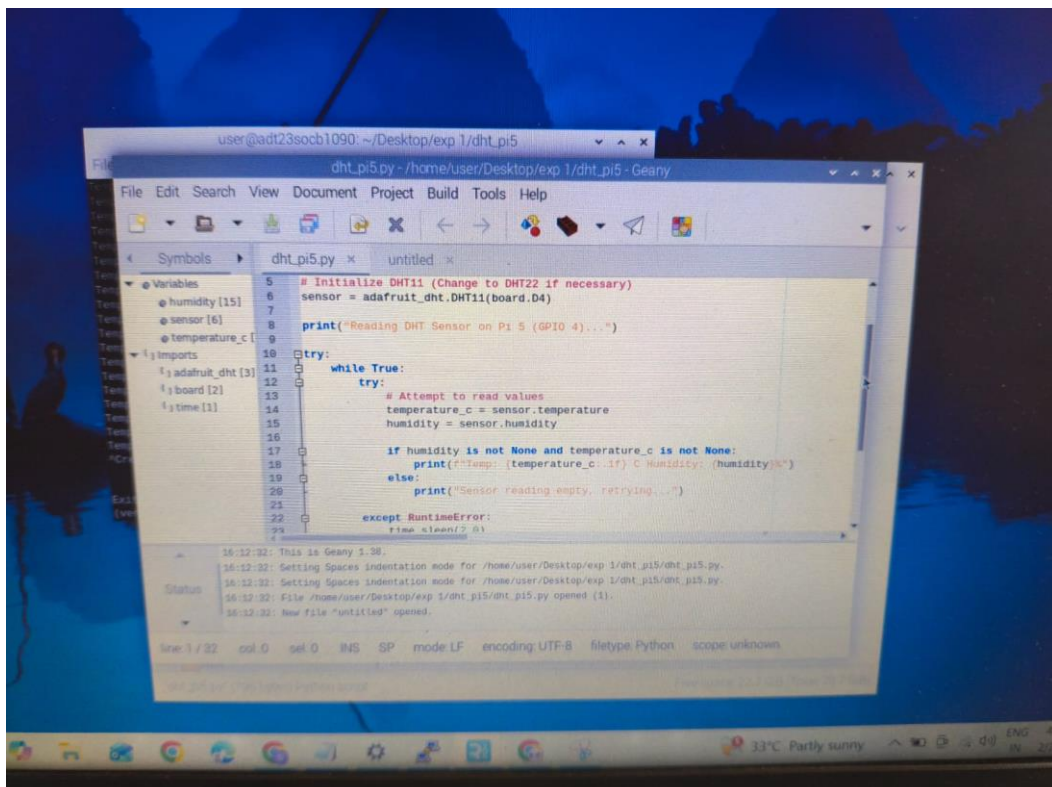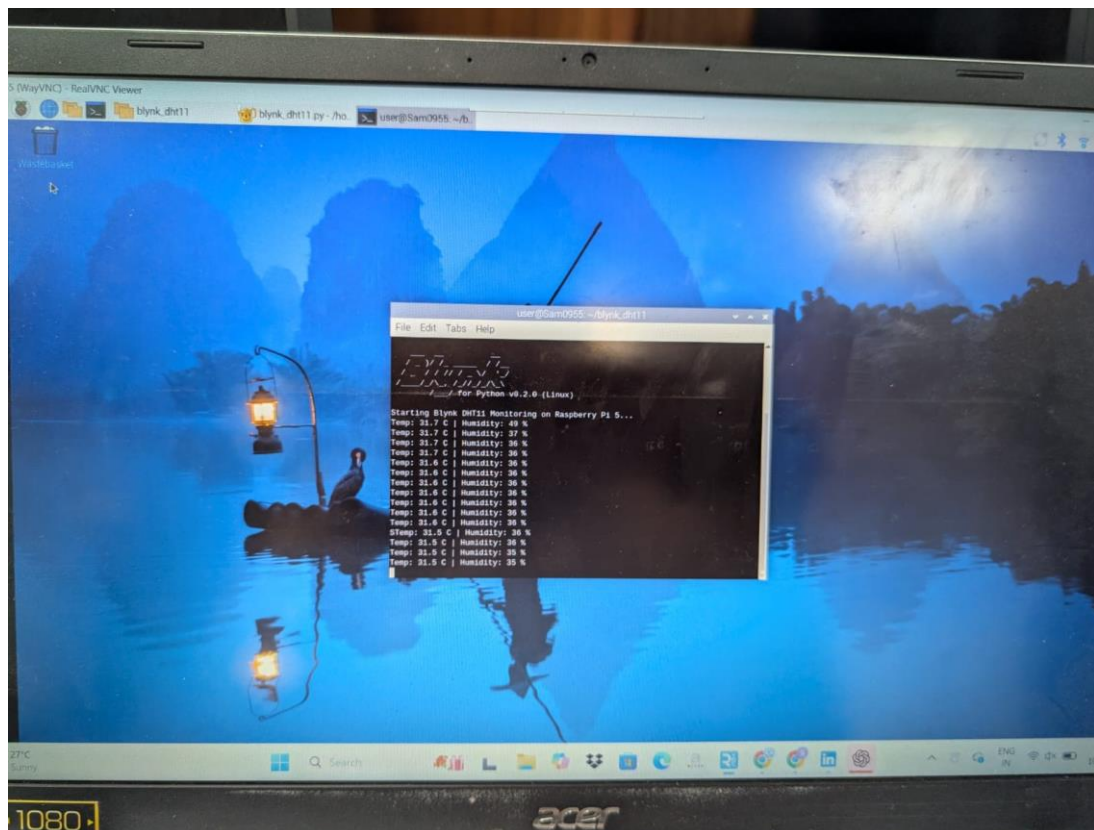
1. **Physical Sensor & Wiring Setup**

2. **Script Execution & Blynk Cloud Connection**

3. Console Data Output

4. Blynk Dashboard