ECE237 Project Report

On

Weather Station with MQ135 Sensor and Telegram Integration

B-TECH MECHATRONICS

LOVELY PROFESSIONAL

UNIVERSITY PHAGWARA, PUNJAB

From 07/03/23 to 23/04/23

SUBMITTED

BY

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SUBMITTED

TO

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LOVELY PROFESSIONAL UNIVERSITY

ACKNOWLEDGEMENT

Working on the Project Weather Station with MQ135 Sensor and Telegram Integration was interesting. I have kept my full efforts in this project to make it successful. I have learnt a lot during working on this project.

I pay my deep sense of gratitude to **Mr. Raman Kumar**, to encourage me to the highest peak and to provide me the opportunity to work on this Project. I am immensely obliged to my friends for their elevating for their elevating inspiration, encouraging guidance and kind supervision in the completion of my project.

After completing this Project, I feel more ready to explore IOT Projects using Node MCU and Telegram Chat Bot. This course helped me to grasp the field of iot and helped me understand how to operate and work on sensors and different types of communication protocol.

Index

1. **COMPONENTS** 6
2. **NodeMCU** 6
    1. **DHT 11** 7
    2. **MQ-135** 8
    3. **BMP 180** 9
3. **BLOCK DIAGRAM** 10
4. **CIRCUIT DIAGRAM** 11
5. **Telegram Bot Setup** 12
6. **CODE** ..... **Error! Bookmark not defined.**
7. **Telegram Bot Output** 14
8. **APPLICATION** 16
9. **CONCLUSION** 17
10. **REFERENCE** 17

INTRODUCTION

Weather stations are an essential tool for monitoring and predicting weather patterns in a given region. They allow meteorologists and researchers to collect data on temperature, humidity, air pressure, and other environmental factors that impact weather conditions. In recent years, DIY weather stations have become increasingly popular due to their affordability, accessibility, and ease of customization.

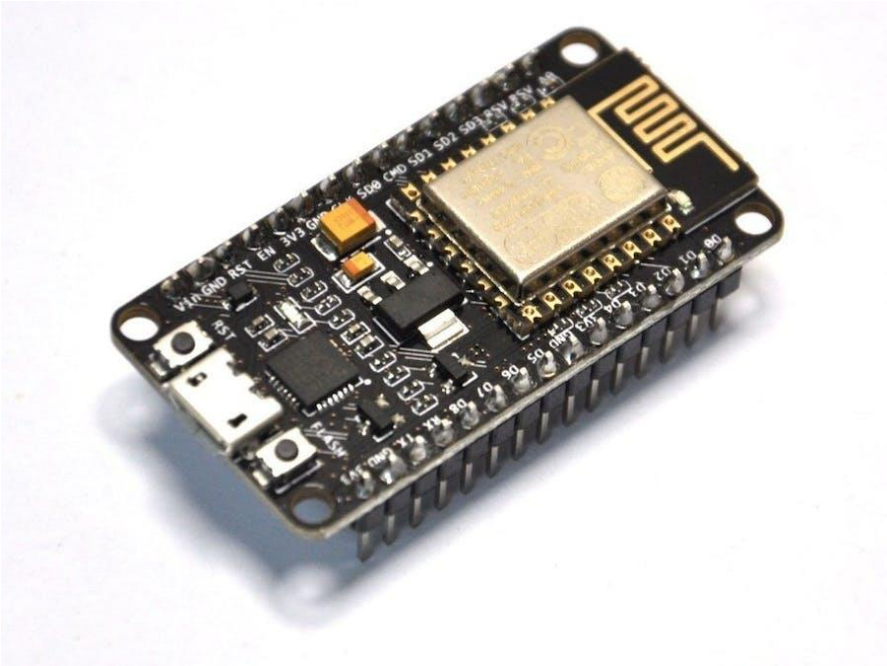
This report outlines the steps involved in building a DIY weather station that integrates the DHT11 temperature and humidity sensor, MQ135 air quality sensor, BMP180 barometric pressure sensor, and NodeMCU microcontroller. The station is designed to collect data on temperature, humidity, air quality, and barometric pressure, and transmit this data in real-time to a Telegram bot.

The NodeMCU microcontroller is used as the central component of the weather station, which connects to the sensors and processes the data. The DHT11 sensor measures temperature and humidity, while the MQ135 sensor measures air quality by detecting the presence of harmful gases such as carbon dioxide, ammonia, and nitrogen oxides. The BMP180 sensor measures barometric pressure, which is used to determine changes in weather patterns.

The weather station is also equipped with a Wi-Fi module, which allows it to connect to the internet and send data to a Telegram bot. The Telegram bot is used to receive and display the weather data in a user-friendly format, allowing users to monitor the weather conditions in real-time.

COMPONENTS

NodeMCU

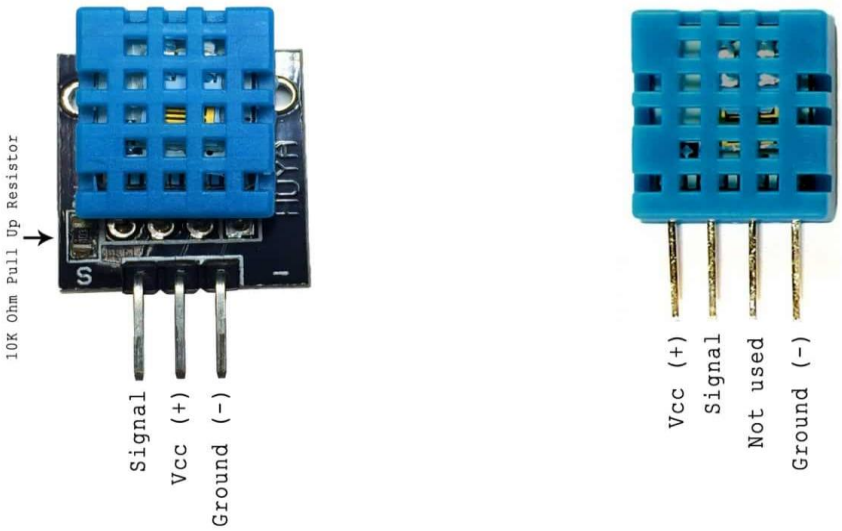


NodeMCU is an open-source firmware and development board based on the ESP8266 Wi-Fi module. The ESP8266 is a low-cost Wi-Fi-enabled microcontroller chip that has become popular in the IoT community due to its affordability and ease of use. NodeMCU is designed to make it easier for developers to prototype and build IoT applications using the ESP8266 chip.

Specification

- Microcontroller: ESP8266-12E module with Tensilica Xtensa LX106 processor
- Clock speed: 80MHz (can be overclocked up to 160MHz)
- Flash memory: 4MB (32Mb) integrated SPI flash
- Wi-Fi: 802.11 b/g/n Wi-Fi connectivity with WPA/WPA2 encryption
- GPIO: 17 GPIO pins, including 1 analog input pin (3.2V max input)
- ADC: 10-bit ADC with a voltage range of 0 to 3.3V
- Programming: Lua scripting language support, NodeMCU API for GPIO, PWM, I2C, and 1-Wire
- Operating voltage: 3.3V DC (powered via USB or external power source)
- USB: Micro USB for power and serial communication (via CP2102 USB-to-UART bridge)
- Dimensions: 49mm x 24mm x 13mm

DHT 11



The DHT11 sensor is a simple and inexpensive sensor that provides basic temperature and humidity sensing capabilities. While it may not be as accurate or precise as some other sensors, it is still a useful tool for many applications. The single-wire digital interface and low power consumption make it easy to use with microcontrollers and other electronic devices.

Specification

- Operating voltage: 3 to 5.5 volts DC
- Temperature range: 0°C to 50°C with an accuracy of ±2°C
- Humidity range: 20% to 80% with an accuracy of ±5%
- Output: Single-wire digital interface with a resolution of 1°C and 1% RH
- Refresh rate: 1Hz
- Response time: 2 seconds
- Dimensions: 12mm x 15.5mm x 5.5mm
- Weight: 1.8 grams

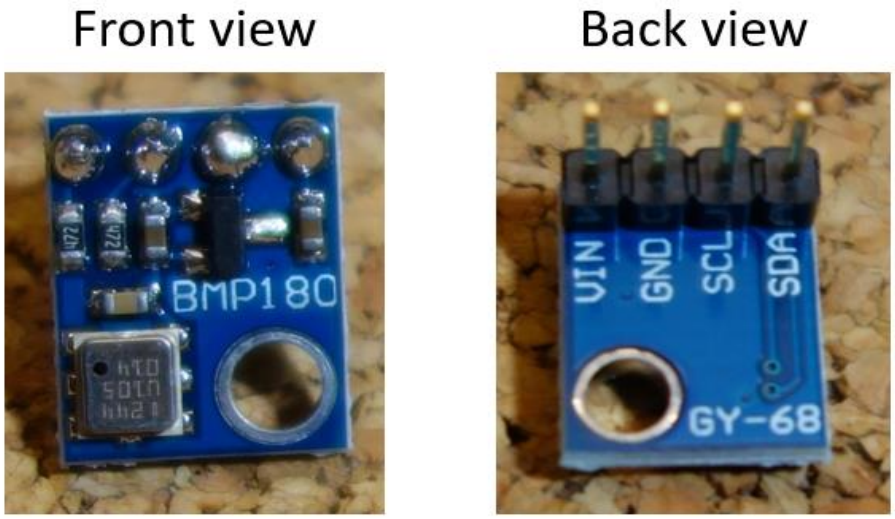
MQ-135

The MQ-135 gas sensor is a popular choice for air quality monitoring applications due to its low cost, versatility, and ease of use. Its detection range covers a wide range of common air pollutants, making it a useful tool for monitoring indoor and outdoor air quality. The adjustable sensitivity allows users to customize the sensor's response to their specific needs. The analog output makes it easy to use with microcontrollers and other electronic devices.

Specification

- Operating voltage: 5V DC
- Detection range:
    - Ammonia (NH3): 10 to 300 ppm
    - Nitrogen oxides (NOx): 10 to 1000 ppm
    - Benzene: 1 to 50 ppm
    - Toluene: 1 to 50 ppm
    - Alcohol: 10 to 500 ppm
    - Carbon Monoxide (CO): 10 to 500 ppm
    - Smoke: 1 to 10 mg/m3
- Sensitivity can be adjusted using a potentiometer.
- Analog output
- Dimensions: 36mm x 22mm x 25mm
- Weight: 5 grams

BMP 180

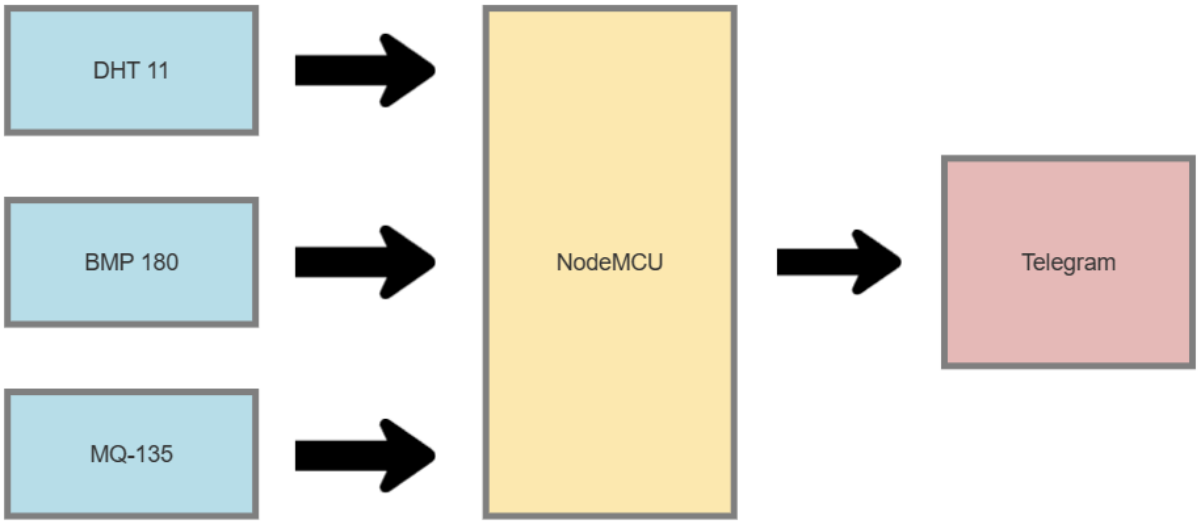


The BMP180 sensor is a small and low-power device, which makes it suitable for portable and battery-operated applications. It is commonly used in weather stations, altimeters, and other applications where accurate measurement of atmospheric pressure is required.

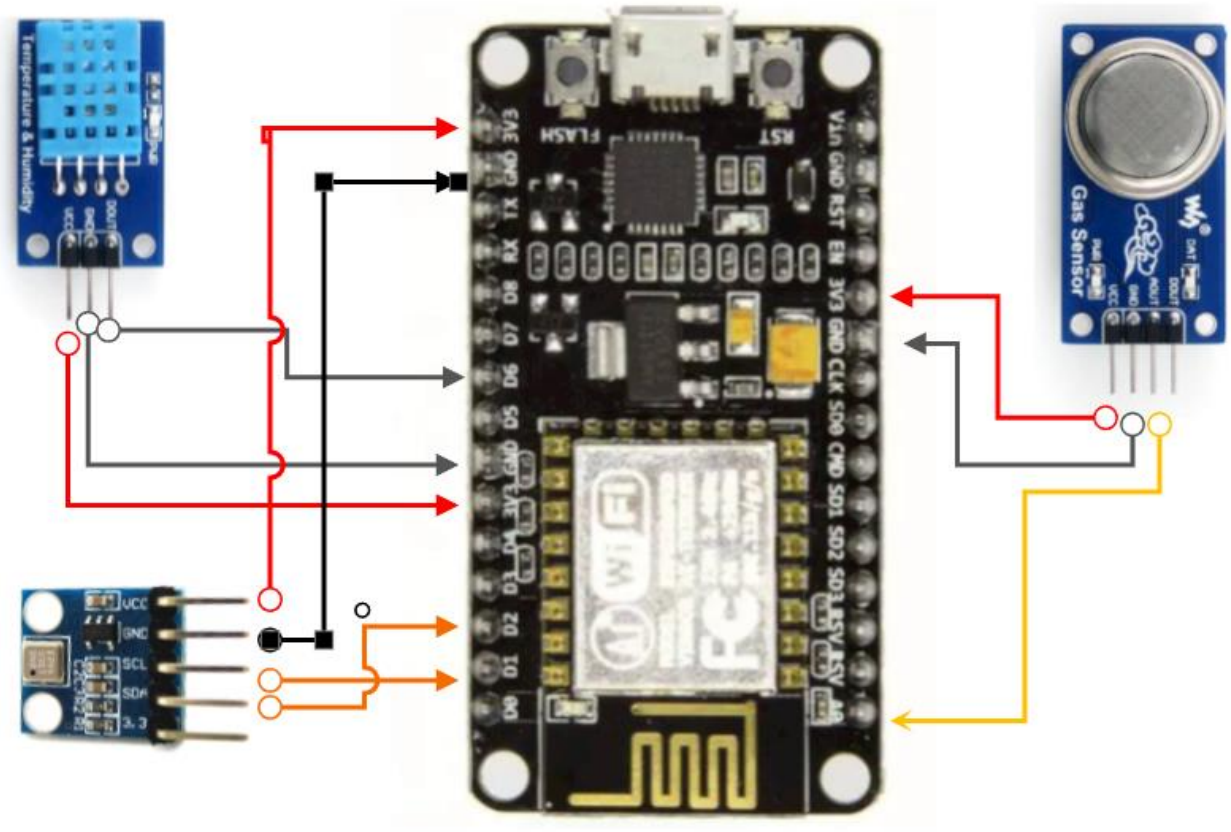
Specification:

- Measurement range: 300 to 1100 hPa (hectopascals), equivalent to an altitude range of -500 to 9000 meters above sea level
- Accuracy: ±1 hPa
- Resolution: 0.1 hPa
- Temperature measurement range: -40°C to +85°C
- Temperature measurement accuracy: ±1°C
- Digital interface: I2C (Inter-Integrated Circuit)
- Power supply: 1.8V to 3.6V
- Current consumption: 5μA (at standard mode) to 23μA (at ultra-low power mode)
- Dimensions: 3.6mm x 3.8mm x 0.93mm
- Operating temperature range: -40°C to +85°C

BLOCK DIAGRAM



CIRCUIT DIAGRAM

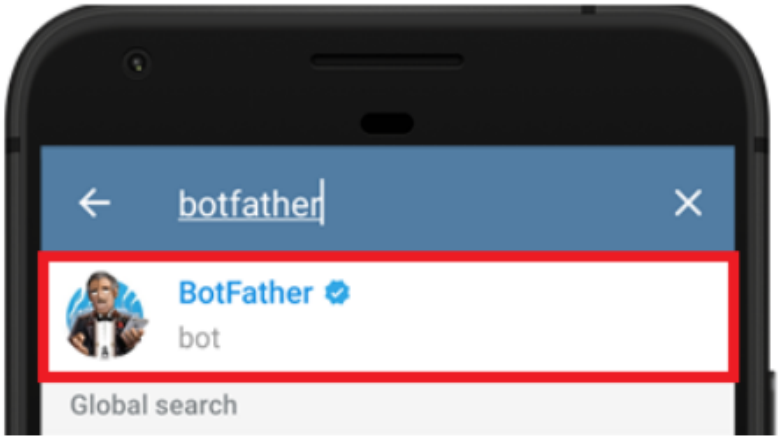


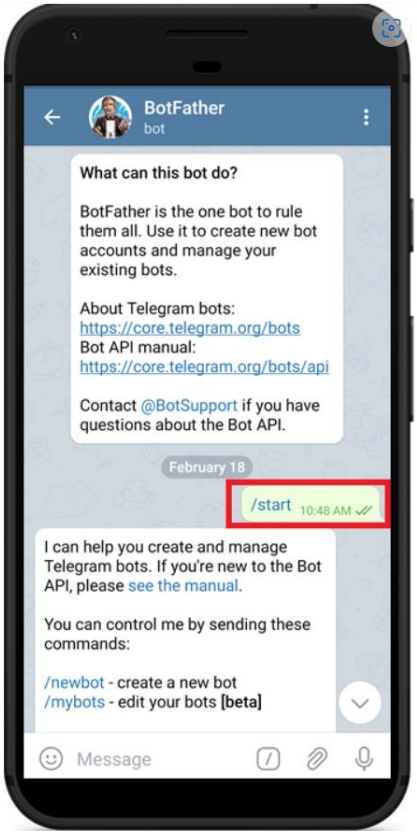
TELEGRAM BOT SETUP

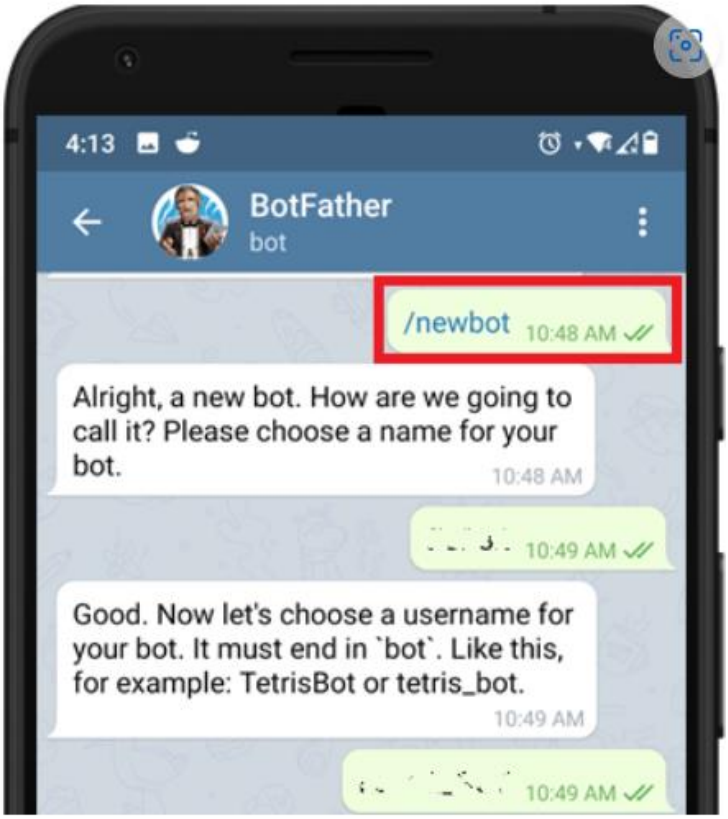
- Open the Telegram app and search for the "BotFather" account.
- Start a chat with the BotFather and type "/newbot" to create a new bot.
- Follow the instructions provided by the BotFather to give your bot a name and username.
- After creating the bot, the BotFather will provide you with an API token. This token is essential for accessing the Telegram bot API and sending and receiving messages with your bot.
- Now, you can add your bot to a Telegram group or channel where you want it to send messages.
- To add the bot to a group or channel, simply invite it using its username. For example, "@mybot".
- You can then use a programming language like Python to create a script that interacts with the Telegram bot API using the API token provided by the BotFather.
- In your script, you can use the "requests" library to send messages to the Telegram bot API and receive messages from it. You can also use the "python-telegram-bot" library to simplify the process of sending and receiving messages with your bot.

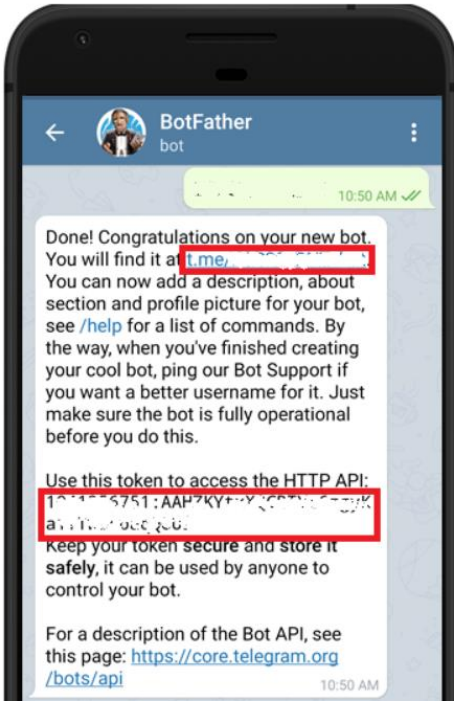
That's it! With these steps, you can set up a Telegram bot and start sending and receiving messages with it.

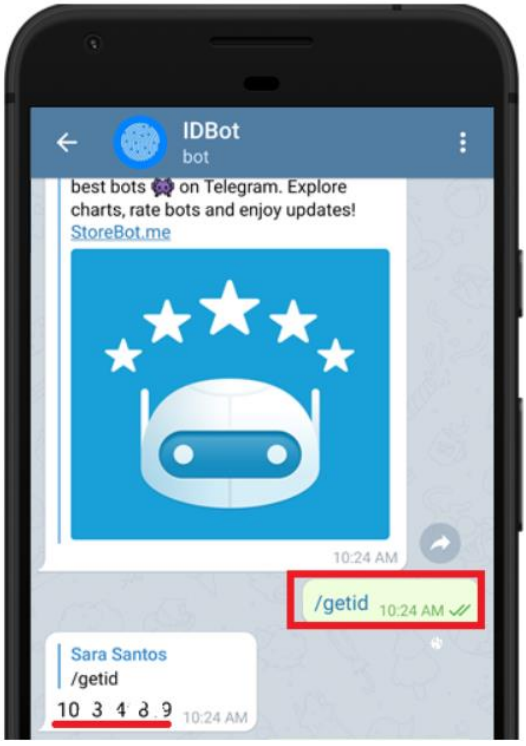
Images




BotFather
bot
What can this bot do?
BotFather is the one bot to rule them all. Use it to create new bot accounts and manage your existing bots.
About Telegram bots:
https://core.telegram.org/bots
Bot API manual:
https://core.telegram.org/bots/api
Contact @BotSupport if you have questions about the Bot API.
February 18
/start 10:48 AM
I can help you create and manage Telegram bots. If you're new to the Bot API, please see the manual.
You can control me by sending these commands:
/newbot - create a new bot
/mybots - edit your bots [beta]
Message

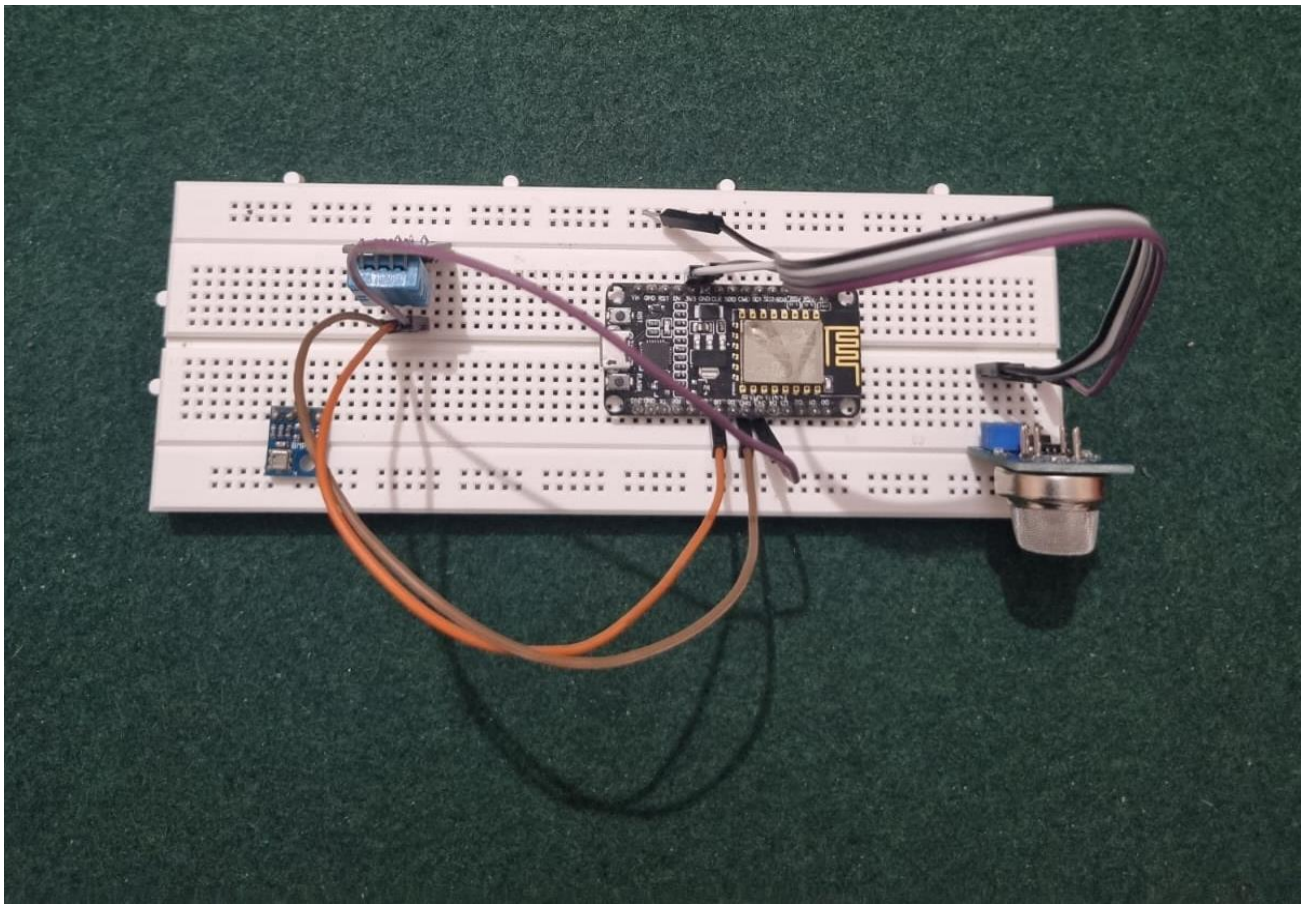

4:13
BotFather
bot
/newbot 10:48 AM
Alright, a new bot. How are we going to call it? Please choose a name for your bot. 10:48 AM
10:49 AM
Good. Now let's choose a username for your bot. It must end in `bot`. Like this, for example: TetrisBot or tetris_bot.
10:49 AM
10:49 AM


BotFather
bot
10:50 AM
Done! Congratulations on your new bot. You will find it at t.me/
You can now add a description, about section and profile picture for your bot, see /help for a list of commands. By the way, when you've finished creating your cool bot, ping our Bot Support if you want a better username for it. Just make sure the bot is fully operational before you do this.
Use this token to access the HTTP API:
Keep your token secure and store it safely, it can be used by anyone to control your bot.
For a description of the Bot API, see this page: https://core.telegram.org/bots/api
10:50 AM


IDBot
bot
best bots on Telegram. Explore charts, rate bots and enjoy updates!
StoreBot.me
10:24 AM
/getid 10:24 AM
Sara Santos
/getid
10 3 4 8 9
10:24 AM

TELEGRAM BOT OUTPUT

Project Image



APPLICATION

The weather station project, which integrates sensors like DHT11, MQ135, and BMP180 with NodeMCU and sends data to Telegram, has numerous applications. Here are some of the potential applications of this project:

Agriculture: Farmers can use this weather station to monitor the temperature and humidity levels in their fields. This data can help them make informed decisions about crop selection, planting times, and irrigation schedules. The air quality sensor can also detect the presence of harmful gases like ammonia, which can be harmful to plants.

Smart homes: This project can be integrated with a smart home system to control temperature and humidity levels. The data collected by the sensors can be used to automatically adjust the temperature and humidity settings of the home to create a comfortable living environment.

Weather forecasting: Weather enthusiasts can use the data collected by this weather station to predict local weather patterns. The data can be used to create accurate weather forecasts, which can be shared with the community.

Environmental monitoring: The air quality sensor can be used to monitor the level of pollutants in the air. This data can be used by environmentalists and government agencies to monitor and regulate air pollution.

Industrial monitoring: The weather station can be used to monitor the temperature and humidity levels in factories and warehouses. This data can be used to optimize production processes and ensure the safety of workers.

Aviation: Airports and air traffic control centers can use this weather station to monitor weather conditions and ensure the safety of aircraft. The data collected by the sensors can be used to provide pilots with real-time weather updates and help them make informed decisions during flights.

CONCLUSION

In conclusion, the weather station project that integrates sensors like DHT11, MQ135, and BMP180 with NodeMCU and sends data to Telegram is an excellent example of the potential of IoT and smart systems. By combining sensors with a microcontroller, we can collect data on various environmental factors, including temperature, humidity, air quality, and atmospheric pressure.

The integration of Telegram makes this project even more powerful, as it allows for easy sharing of data and notifications in real-time. With this project, we can monitor weather conditions, predict weather patterns, optimize production processes, and ensure the safety of workers, among other things.

This project is also an excellent example of how simple components can be combined to create a sophisticated system. With some programming knowledge and access to affordable components, anyone can build their weather station and contribute to environmental monitoring and data analysis.

Overall, this project has numerous applications, ranging from agriculture to aviation. It has the potential to improve our understanding of the environment and help us make informed decisions about various processes. It is an excellent example of the potential of IoT and smart systems to create a more sustainable and efficient world.

REFERENCE

GitHub - Phoenix1747/MQ135: Arduino library for the MQ135 air quality sensor. Allows for temperature and humidity corrected readings.

Create ESP8266-with-telegram-messenger-for-monitoring-temperature-and... · Tech-Trends-Shameer/Esp-8266-Projects@bb17996 · GitHub

ESP32 with BMP180 Barometric Sensor | Random Nerd Tutorials

Telegram: Control ESP32/ESP8266 Outputs with Arduino IDE | Random Nerd Tutorials