



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 7, Issue 10, October 2024



**INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA**

Impact Factor: 7.521



6381 907 438



6381 907 438



ijmrset@gmail.com



www.ijmrset.com



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

MQTT Based Energy Conservation with Automation

MR.V. Naga Mahesh¹, K. Gayathree², N. Niharika³, P. Chandana⁴

Assistant Professor, Department of Electronics and Communication Engineering, Malla Reddy Engineering College for Women, Hyderabad, Telangana, India ¹

UG Scholar, Department of Electronics and Communication Engineering, Malla Reddy Engineering College for Women, Hyderabad, Telangana, India ^{2,3,4}

ABSTRACT: This task investigates the combination of MQTT (Message Lining Telemetry Transport) with the ESP8266 microcontroller to make an energy-efficient mechanization framework. The system aims to reduce energy consumption in both residential and commercial settings by utilizing a combination of LEDs, motors, LDR (Light Dependent Resistor) sensors, and the DHT11 humidity and temperature sensor. The central node for data collection and communication is the low-cost Wi-Fi microcontroller known as the ESP8266. The DHT11 sensor tracks temperature and humidity, while the LDR sensor measures ambient light levels. The information assembled is sent by means of MQTT to a focal server or cloud stage. In light of this information, mechanized control signals are shipped off the LEDs and engines to likewise change their activity. For instance, motors can be adjusted or turned off to conserve energy based on temperature or humidity readings, and LEDs can be dimmed or turned off based on the conditions of the surrounding light.

I. INTRODUCTION

In the contemporary mission for energy proficiency, the coordination of clever computerization frameworks assumes an essential part in diminishing utilization and improving functional productivity. This task presents an imaginative way to deal with energy protection using MQTT (Message Lining Telemetry Transport) convention related to the ESP8266 microcontroller, LEDs, engines, LDR (Light Ward Resistor) sensors, and the DHT11 mugginess and temperature sensor. The ESP8266 is a versatile, low-priced Wi-Fi microcontroller that serves as a sturdy foundation for the development of Internet of Things (IoT) applications. It is ideal for implementing wireless communication systems due to its ability to connect to Wi-Fi networks. MQTT, a lightweight messaging protocol, is an excellent choice for energy management systems' real-time control and monitoring because it enables the efficient and dependable exchange of data between devices.

II. EXISTING SYSTEM

Because they lack the ability to dynamically adjust to the conditions of the surrounding light, traditional lighting systems frequently rely on simple on/off switches or timers. As a result, when lights are left on during daylight hours, these systems may cause an excessive amount of energy consumption. While a few high level frameworks integrate movement sensors to control lighting in view of inhabitation, they actually don't adjust to differing light levels over the course of the day. In applications like heating, ventilation, and cooling, motor control systems typically work with fixed schedules or manual inputs. Energy consumption is inefficient as a result of these systems' failure to take into account real-time environmental data like the current temperature or humidity. For instance, a ventilation framework could run ceaselessly no matter what the real room conditions, squandering energy.

2.1 Disadvantage

- Intricacy in Execution
- Reliance on Organization Solidness
- Upkeep and Adjustment
- Restricted Scope of Sensors



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

III. PROPOSED SYSTEM

The proposed framework for energy preservation and computerization use the ESP8266 microcontroller and MQTT convention to make an exceptionally productive and responsive arrangement. The ESP8266, which serves as the system's communication hub and makes it possible for various components to exchange real-time data using the MQTT protocol, is at the center of this system. Control over the system's functions and seamless coordination are guaranteed by this setup. The framework coordinates LDR (Light Ward Resistor) sensors to screen surrounding light levels. Based on the amount of natural light that is present, these sensors provide data that is used to adjust the brightness of LEDs. For example, when the LDR sensors identify satisfactory sunshine, the framework diminishes or switches off the counterfeit lighting to moderate energy. This dynamic adjustment reduces overall electricity consumption by ensuring that lighting is only used when absolutely necessary.

3.1 Advantages

- Real-time monitoring and control
- remote access
- improved energy efficiency
- automation
- fewer manual steps

IV. LITERATURE SURVEY

4.1. Title: "Leveraging MQTT and ESP8266 for Wise Energy The executives: A Review of Current Innovations and Implementations"

abstract

The MQTT (Message Queuing Telemetry Transport) protocol and the ESP8266 microcontroller are examined in this literature review for their use in the creation of intelligent energy management systems. The systems that automate energy efficiency by combining LEDs, motors, LDR (Light Dependent Resistor) sensors, and DHT11 sensors are the primary focus. The ESP8266 is a cost-effective and versatile platform for Internet of Things applications, and the review demonstrates how MQTT makes efficient real-time communication and control possible. Key studies show that these technologies are effective at automating HVAC and lighting systems, which results in significant energy savings and improved system responsiveness.

4.2. The title of this paper is "Automated Lighting Control Using LEDs and LDR Sensors: Bits of knowledge and Advances with MQTT and ESP8266"

Abstract

The advancements in automated lighting control systems that make use of LEDs and LDR (Light Dependent Resistor) sensors are the subject of this survey, with an emphasis on MQTT-based solutions. The incorporation of ESP8266 microcontrollers empowers consistent correspondence and control, streamlining lighting in view of surrounding light circumstances. By dynamically adjusting LED brightness in response to real-time light levels, the reviewed literature demonstrates how such systems reduce energy consumption. The outcomes, advantages, and practical applications of these automated lighting systems are presented in detail in this survey.



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

V. BLOCK DIAGRAM

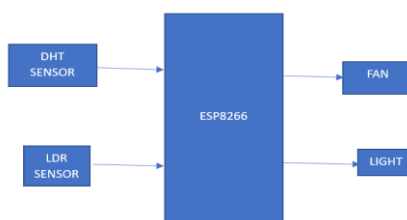


Diagram 1

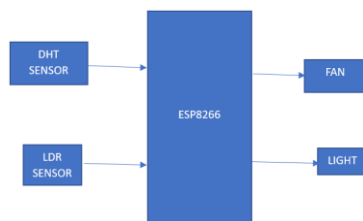


Diagram2

VI. HARDWARE REQUIREMENTS

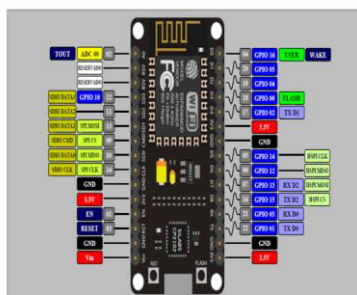
- ESP8266
- DHT SENSOR
- LDR SENSOR
- MOTER FAN
- LIGHT

VII. SOFTWARE REQUIREMENTS

- ARDUINO IDE
- MQTT

VIII. HARDWARE DESCRIPTION

8.1 ESP8266 MICROCONTROLLER



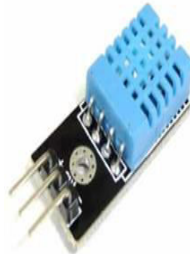


International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

The ESP8266 is an extremely easy to understand and minimal expense gadget to give web network to your ventures. Because the module is able to function both as an access point (which can create a hotspot) and as a station (which can connect to Wi-Fi), it is able to quickly retrieve data and upload it to the internet, making the Internet of Things as simple as it can be. It can also use APIs to get data from the internet, making it possible for your project to access any information on the internet and making it smarter. This module's ability to be programmed with the Arduino IDE, which makes it significantly more user-friendly, is yet another exciting feature. Anyway this form of the module has just 2 GPIO pins (you can hack it to utilize upto 4) so you need to utilize it alongside another microcontroller like Arduino, else you can look onto the more independent ESP-12 or ESP-32 renditions. So in the event that you are searching for a module to begin with IOT or to give web network to your venture then this module is the ideal decision for you.

8.2 DHT sensor



DHT11 sensor comprises of a capacitive dampness detecting component and a thermistor for detecting temperature. The dampness detecting capacitor has two cathodes with a dampness holding substrate as a dielectric between them. Changes in humidity result in a change in the capacitance value. The IC measures, processes, and converts the altered resistance values into digital form. For estimating temperature this sensor utilizes a Negative Temperature coefficient thermistor, which causes a decline in its opposition esteem with expansion in temperature. To get bigger obstruction esteem in any event, for the littlest change in temperature, this sensor is normally comprised of semiconductor ceramics or polymers.

8.3 LDR SENSOR



Non-linear devices are photocells or LDRs. The wavelength of light that hits them varies how sensitive they are. Some photocells might not respond at all to a particular wavelength range. Different cells have different spectral response curves depending on the material that was used. When light hits a photocell, it usually takes between 8 and 12 milliseconds for the resistance to change. When light is removed, the resistance takes one or more seconds to return to its initial value. The term for this occurrence is resistance recovery rate. Audio compressors utilize this property. Additionally, LDRs are less sensitive than phototransistor and photodiode. A photograph diode and a photocell (LDR) are not something similar, a photograph diode is a pn intersection semiconductor gadget that converts light to power, though a photocell is a detached gadget, there is no pn intersection in this nor it "changes over" light to power).



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

8.4 MOTOR



An electrical device that converts electrical energy into mechanical energy is known as an electric motor. A DC motor's fundamental working principle is as follows: A mechanical force is applied to a current-carrying conductor when it is placed in a magnetic field. Fleming's left-hand rule indicates this force's direction and magnitude by formula $F = BIL$, where B is the density of the magnetic flux, I is the current, and L is the length of the conductor in the magnetic field.

8.5 LIGHT



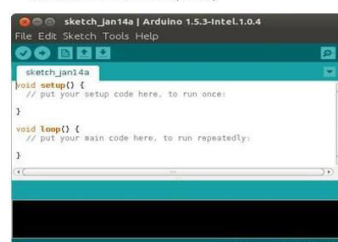
Light Emitting Diode

LEDs are developed by keeping three layers of semiconductor material over a substrate, which brings about an exceptionally clear development. The middle region is active, the top region is P-type, and the bottom region is N-type. The order of these three layers is reversed. The three areas of semiconductor material are visible in the construction. The openings are incorporated into the P-type location in the development; The dynamic region includes both openings and electrons, whereas the N-type location includes decisions. Right when the voltage isn't applied to the Drove, then there is no movement of electrons and openings so they are consistent. The Drove will move one way when the voltage is applied, bringing electrons from the N region and openings from the P district to the dynamic region. The exhaustion location is another name for this area. Light can be produced through the recombination of extremity charges because the charge transporters, like openings, have a positive charge while electrons have a negative charge.

IX. SOFTWARE DESCRIPTION

9.1 ARDUINO IDE

ArduinoSoftware(IDE)



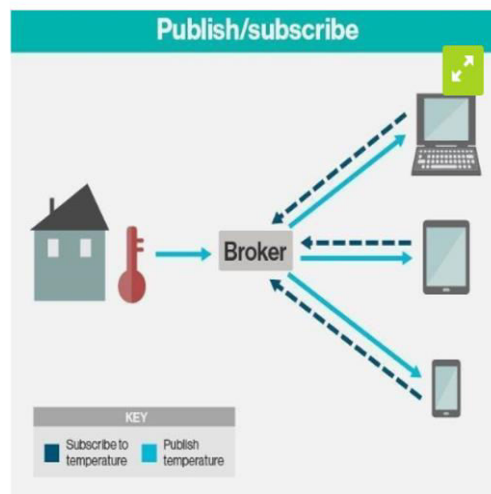


International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Programs composed utilizing Arduino Programming (IDE) are called draws. The file extension.ino is used to save these sketches, which were written in the text editor. The editor has tools for searching and replacing text as well as cutting and pasting. The message region gives input while saving and trading and furthermore shows blunders. The Arduino Software (IDE) outputs text to the console, which includes all of the information, including complete error messages. The base righthand corner of the window shows the designed board and sequential port. You can open the serial monitor, create, open, and verify programs, and upload and upload programs using the toolbar buttons.

9.2 MQTT



Each MQTT client that connects to an MQTT broker is identified by its ClientId. The dealer utilizes the ClientID to distinguish the client and the present status of the client. As a result, this ID ought to be unique for each broker and client. If you don't want the broker to hold a state, you can send an empty ClientId in MQTT 3.1.1, the current standard. A connection with no state is created when the ClientID is unpopulated. The broker will reject the connection if the clean session flag is not set to true in this instance. Clean Meeting The spotless meeting banner tells the merchant regardless of whether the client needs to lay out a determined meeting. In a steady meeting (CleanSession = bogus), the representative stores all memberships for the client and all missed directives for the client that bought in with a Nature of Administration (QoS) level 1 or 2. In the event that the meeting isn't diligent (CleanSession = valid), the representative stores nothing for the client and cleanses all data from any past determined meeting.

X. CONCLUSION

In rundown, the MQTT-based energy preservation framework using the ESP8266 microcontroller, alongside LEDs, engines, LDR sensors, and DHT11 sensors, addresses a profoundly successful way to deal with current energy the board. By utilizing MQTT's lightweight, ongoing correspondence abilities and the ESP8266's network, the framework improves computerization and control across different energy applications. The reconciliation of LEDs and LDR sensors considers dynamic lighting changes in view of surrounding light levels, altogether lessening energy utilization. In a similar vein, HVAC systems can be optimized by adjusting operations in response to real-time data on temperature and humidity using the combination of DHT11 sensors and motor controls. This automation contributes to a more sustainable environment and saves a lot of money. System complexity, network dependence, and sensor accuracy are just a few of the issues that need to be addressed in spite of the obvious advantages. To fully realize the potential of MQTT-based energy management systems, future advancements ought to concentrate on increasing the performance of sensors, system reliability, and security. In general, this approach gives a hearty and versatile answer for effective energy preservation, offering important bits of knowledge and pragmatic advantages for both private and business applications.



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

REFERENCES

- [1] Mtshali, Progress, and Khubisa's Freedom. Smart home appliance control for physically challenged individuals" 2019 Information Communication Technology and Society Conference (ICTAS). IEEE, 2019.
- [2] Waleed, Jumana, Areej M. Abduldaim, TahaMohammed Hasan, and Qutaiba Salih Mohaisin. "Smart home as a new trend, a revolution was sparked by simplicity." Pages 30–33 of the first International Scientific Conference of Engineering Sciences and Engineering Science (ISCES) in 2018 IEEE, 2018.
- [3] Yue, Chan Zhen, and Shum Ping. " Voiceactivated brilliant home plan and execution. "The Second International Conference on Frontiers of Sensor Technologies (ICFST) was held in 2017. IEEE, 2017.
- [4] P. J. Radcliffe, Salma, and Nasrin. DIY home automation is made possible by novel protocol. The Australasian Telecommunication Networks and Applications Conference (ATNAC) took place in 2014. IEEE, 2014.
- [5] ElKamchouchi, H., and Ahmed ElShafee. "The design and implementation of a prototype of an SMS-based home automation system." 2012 International Conference on Electronics Design, Systems, and Applications (ICEDSA) organized by the IEEE IEEE, 2012.
- [6] NodeMCU can be found at <https://randomnerdtutorials.com/esp8266-andnoered-with-mqtt/>. Online availability: (Accessed on February 5, 2020) <http://nodemcu.com>
- [7] ESP8266. Online availability: (accessed on February 5, 2021) <http://espressif.com/esp8266ex/>



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com