DAFFODIL INTERNATIONAL UNIVERSITY

Home Automation Using IOT Module & Sensor Network

Submitted by

Omayer Hassan

191-35-2702

Department of Software Engineering

Daffodil International University

Supervised by

Kaushik Sarker

Associate Professor & Associate Head

Department of Software Engineering

Daffodil International University

This Project report has been submitted in fulfillment of the requirements for the Bachelor of Science in Software Engineering degree.

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APPROVAL

This thesis titled on "**Home Automation Using IOT Module & Sensor Network**", submitted by **Omayer Hassan (ID: 191-35-2702)** to the Department of Software Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science in Software Engineering and approval as to its style and contents.

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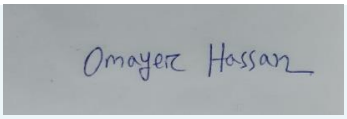
DECLARATION

It hereby declares that this thesis has been done by **me** under the supervision of **Kaushik Sarker, Associate Professor & Associate Head**, Department of Software Engineering, Daffodil International University. It also declares that neither this thesis nor any part of this has been submitted elsewhere for award of any degree.



Student Name: Omayer Hassan

Student ID: 191-35-2702

Batch: 28th

Department of Software Engineering

Faculty of Science & Information Technology

Daffodil International University

Kaushik Sarker

Assistant Professor & Associate Head

Department of Software Engineering

Faculty of Science & Information Technology

Daffodil International University

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TABLE OF CONTENT

ABSTRACT

The Internet of Things (IoT) is the Internet's next evolution. Home automation has grown in popularity in recent years as technological advancements have made daily life easier. Almost everything is automated and digitalized these days.

Home automation, often known as a "smart home," is essentially the wireless smart control or operation of all household items, such as lights, fans, doors etc. All of these items are included in the "Internet of Things" because they are all connected to the internet. With the use of a phone, we can effortlessly automate our house from anywhere. On the internet, there is a wealth of open-source code and software applications that may be used for this.

Keywords: Home Automation, Node MCU ESP-8266, Internet of Things (IoT), Sensor Network.

Chapter 1 – INTRODUCTION

1.1. Background

An Internet of Things (IoT) module is a tiny electronic gadget placed in machines, equipment, and things that connects to wireless networks and transmits and receives data.

IoT technology is already being used by several developing nations to automate their homes, offices, shops and hospitals. In future we can also move ahead using IOT technology.

1.2. Motivation

Home automation brings a significant change in people's lives. We were motivated by this to develop a novel system that manages lights, fans, and doors by employing a variety of sensors, including IR sensors, Node MCU ESP8266, sound sensors and temperature sensor. By using temperature sensor, we can determine room temperature and humidity. There are some sensors through which we can increase the security in the house.

As a result, our daily life will become easier.

1.3. Objective

- It helps us save a lot of time by minimizing the amount of human work.
- Increase in home and workplace security.
- Patient care can be delivered more effectively in real-time without the need for a doctor's visit.

- Optimization of Technology.

1.4. Scope

- It must use the installed sensors to gather various types of sensor data.
- These data must be provided to the ESP-8266 Node MCU for processing.
- To access data from anywhere in the world, one must upload it to the internet server.
- Using Wireless sensor.

1.5. Methodology

The Node MCU ESP-8266 microcontroller's operational characteristics, as well as some sensors and modules, as well as microcontroller programming, were utilized to design and build that sensor network.

1.6. Block Diagram

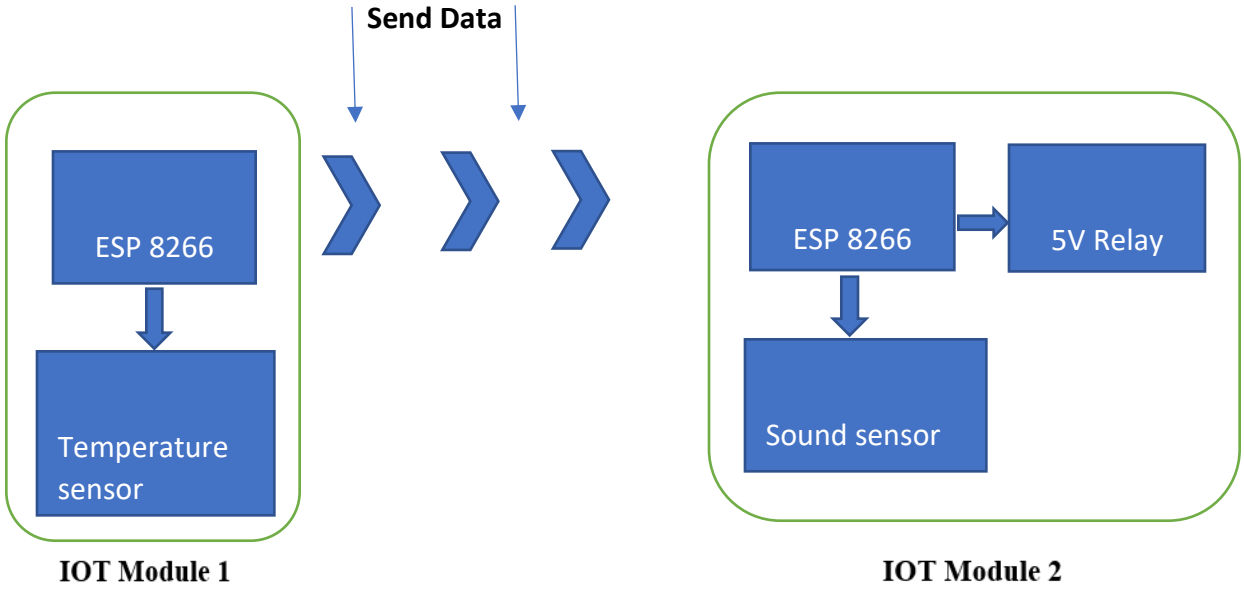


Fig 1: Block Diagram

Chapter 2: LITERATURE REVIEW

2.1 Background

The literature review is written after the research background. As a result, after choosing a research area and before developing the research's goals and objectives, the literature review must be the first and the most time-consuming stage of the research process. After deciding on a study topic, a literature review is conducted to determine any gaps in the field.

Chapter 3 - PARTS AND TESTING

3.1 Approach

I was able to conduct extensive research on their capabilities, including those of the temperature sensor and sound sensor as well as the microcontroller Node MCU ESP-8266. The microcontroller is programmed in C and C++.This implies that we can create platform-compatible programs using this language.

I have been using Arduino IDE to program the microcontroller. However, I need to install the Adafruit ESP library before I can use the Node MCU ESP-8266.

3.2 Components Study

a. Micro-Controllers :

Node MCU ESP-8266

Node MCU stands for Node Micro-Controller Unit. A low-cost System-on-a-Chip (SoC) called the ESP8266 serves as the foundation of the open-source Node MCU software and hardware development environment. The expressive Systems-designed and -produced ESP8266 has all of the essential components of a computer, including RAM, networking (Wi-Fi), and even a contemporary operating system and SDK. This makes it a fantastic option for all types of Internets of Things projects.

ESP8266 Feature:

- Open-source
- Programmable
- Low price

- Wifi connectivity

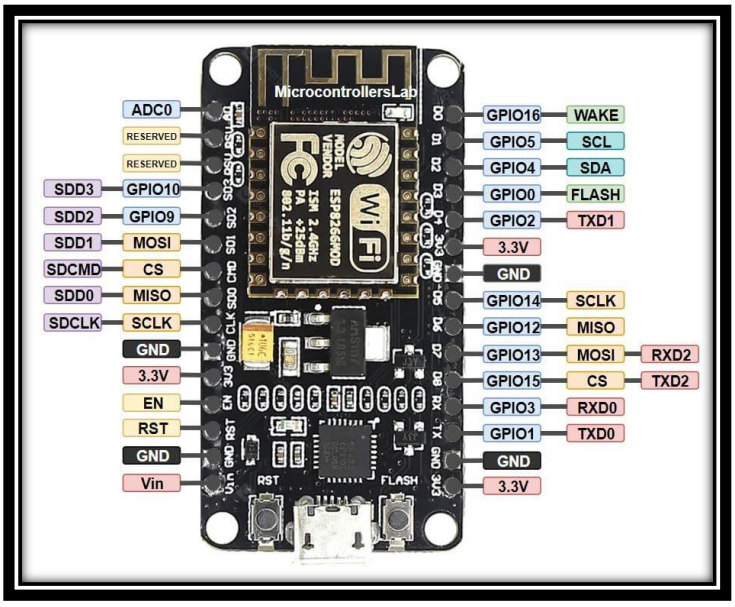


Fig 2: Node MCU ESP-8266

There is two version available for this Node 0.9 which contains ESP-12 and other 1.0 which contains ESP-12E where E stands for 'Enhanced'. For this project I am using 0.9 version. The features of this version are listed in the table below.

Microcontroller	ESP-8266 32-bit
Node MCU Model	Amica
Node MCU Size	49mm * 26mm
Carrier Board Size	102mm * 51mm
Clock Speed	80MHz
USB to Serial	CP2102
USB Connector	Micro USB
Operating Voltage	3.3v
Input Voltage	4.5v to 10v
Flash Memory/SRAM	4MB / 64 KB
Digital I/O Pins	11
Analog I/O Pins	1
ADC Range	0 to 3.3v
Wi-Fi Built in	802. 11 b/g/n
Operating Temperature	-40^0C to 155^0C

Table 1: Node MCU ESP8266

3.3 Sensors

1. Temperature Sensor

The DHT11 sensor module is frequently used as a humidity and temperature sensor. It has an exclusive NTC for temperature measurement. It contains an 8-bit microprocessor that generates serial data with the temperature and humidity values.

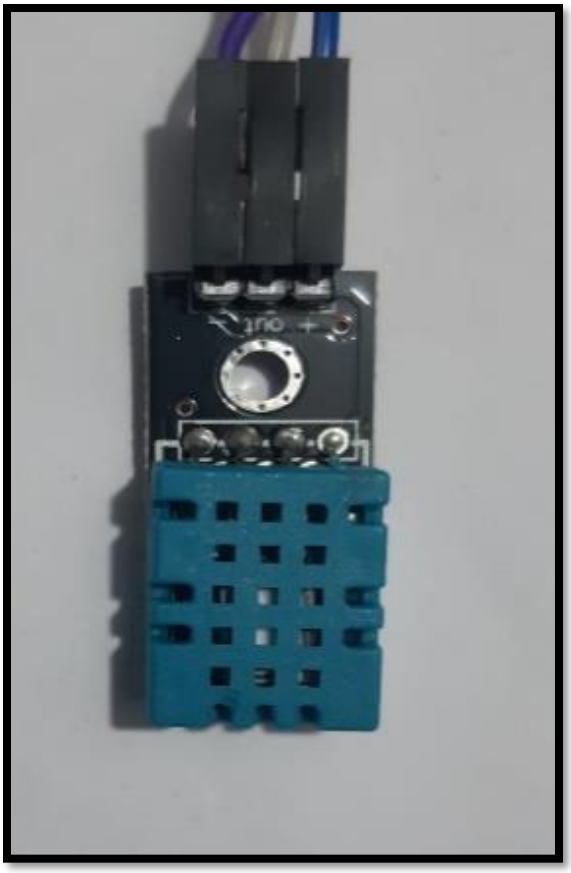


Fig 3: Temperature Sensor

1	VCC	Power supply 3.5v to 5.5v
2	Data	I/O
3	Ground	Connect to the ground

Specifications:

- Temperature range (0-50) degree C.
- Humidity range 20% to 90%.
- Temperature and humidity are both 16-bit
- Outputs serial data.
- Accuracy ±1oC and ±1%.

2. Sound Sensor

One form of module used to pick up on sound is the sound sensor. This module is typically used to measure sound intensity. This module is mostly used for the switch, security, and monitoring purposes. For the convenience of use, the precision of this sensor can be altered.

Fig 4: Sound Sensor.

Pin Configuration

- Pin1 (VCC): (3.3V - 5V) DC
- Pin2 (GND): This is a grounding pin
- Pin3 (DO): This is a pin used for output

Specifications:

- Working voltage: DC 3.3-5V
- Dimensions: 45 x 17 x 9 mm
- Indication of signal output
- Signal output on a single channel

3. 5v Relay Module

An automatic switch called a 5-volt relay is frequently used in automatic control circuits to regulate high currents with low current signals. The relay signal's input voltage spans the 0 to 5V range. A coil and two contacts, such as ordinarily open (NO) and usually closed (NC), are often found in a single-channel 5V relay module (NC).

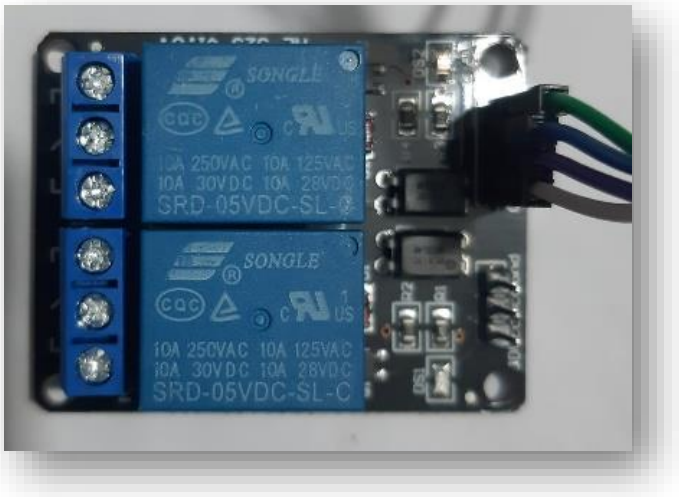


Fig 5: Relay Module

Specifications:

- Voltage of supply – 3.75V to 6V
- Quiescent current: 2mA
- When the relay is turned on, current flows: ~70mA
- Maximum contact voltage of a relay – 250VAC or 30VDC
- Maximum current relay – 10A

Dual-Channel Relay Module Applications

- Switching mains loads
- Automation in the home
- Backup power supply
- Switching a high current load

4. Jumper Wire

Jumper wires are used for this. It is used to resemble wiring by joining several electrical components together.

It is frequently employed for prototyping circuits. Here, I wired all the modules and sensors together using them on a microcontroller.

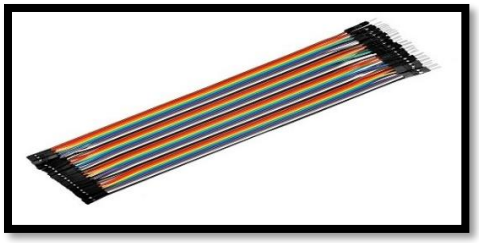


Fig 6: Jumper Wire

Chapter 4 – ASSEMBLING

Temperature Sensor connected to the Node MCU ESP-8266.

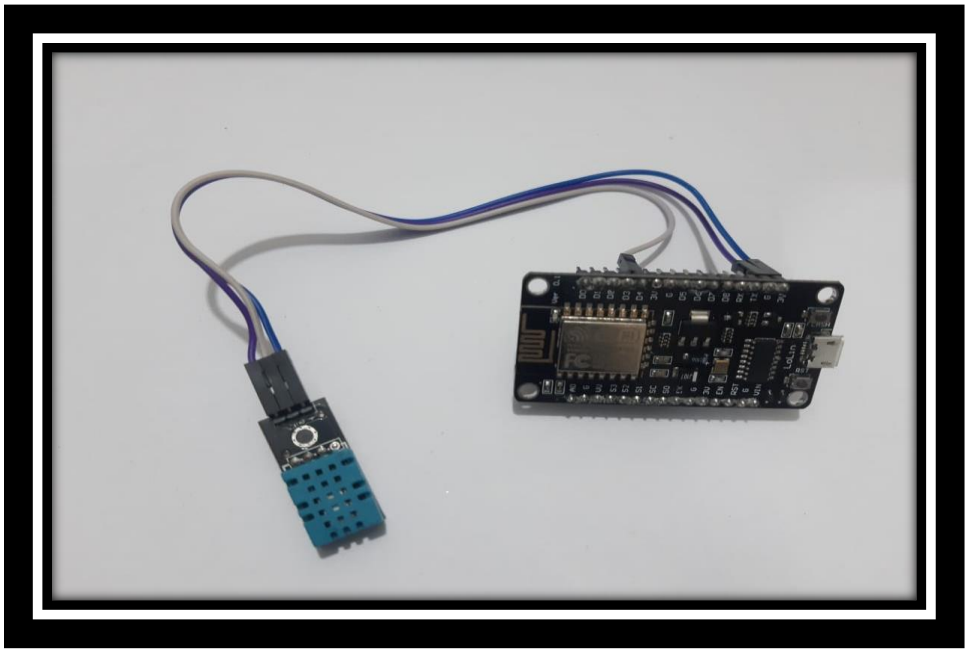


Fig 7: Temperature Sensor connect.

Then sound sensor and 5v relay connected to Node MCU ESP-8266.

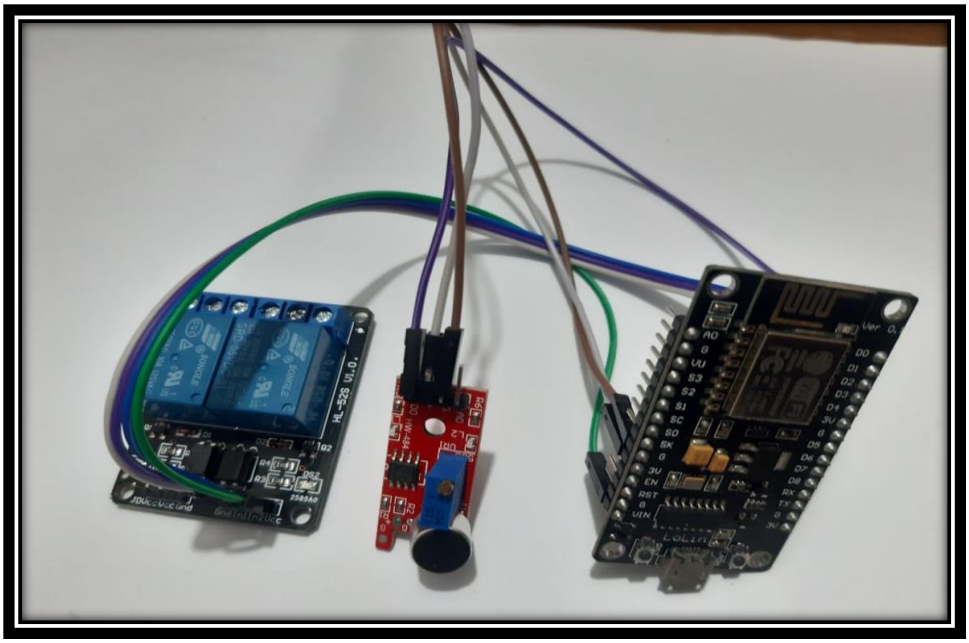
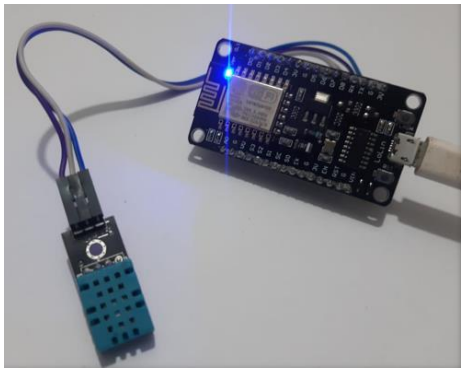


Fig 8: Sound Sensor & relay connect.

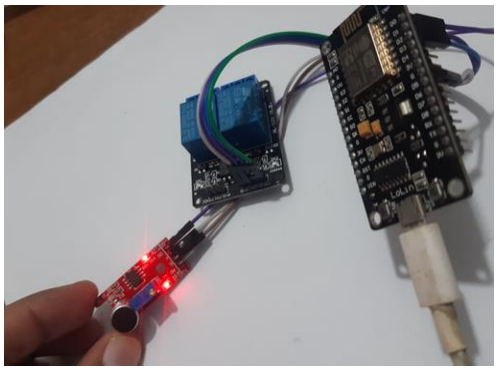
Learning Experience

I've learned a lot during this model-building process. There are numerous issues, therefore I had to redo the wiring. Some parts were discovered to be incompatible with the Node MCU ESP-8266. I gained knowledge of new troubleshooting methods and many other things.

Chapter 5 - RESULT & DISCUSSION



IOT Module 1



IOT Module 2

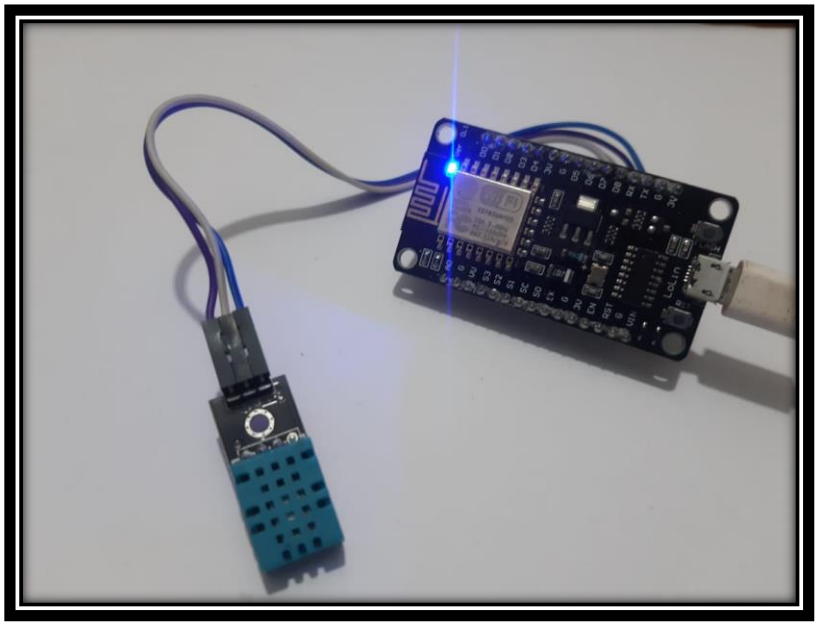


Fig 9: Upload the code on ESP-8266.

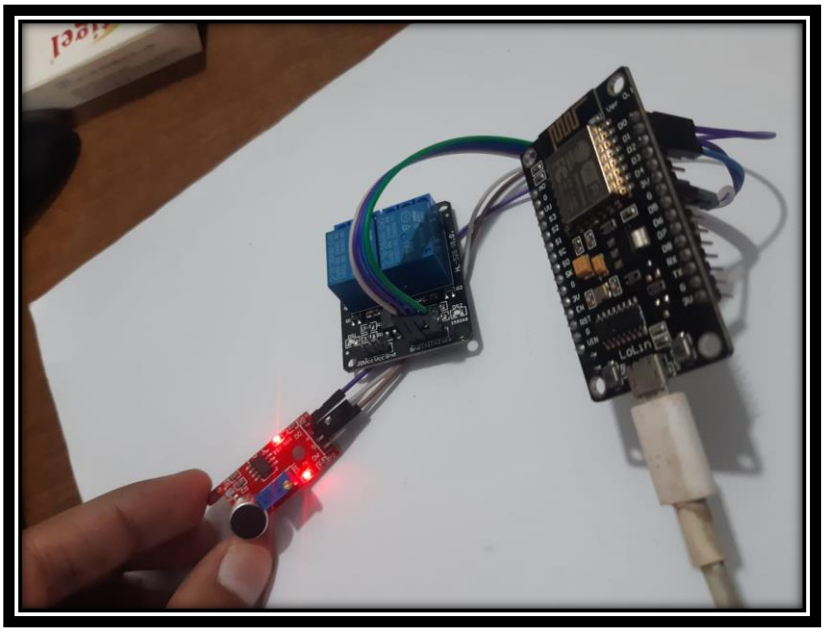


Fig 10: Upload the code on ESP-8266.

Chapter 6 - CONCLUSIONS AND COMMENDATIONS

6.1 Conclusion

- This sensor network allows a user to access all of their home's data from anywhere in the world.
- Safety factor went up.
- The user can keep his house secure.

6.2 Future Works

Since this is only a sensor network, numerous changes and enhancements could be made. This is made up of several modules, but in the future, a single circuit board (PCB) with space for all the components to be soldered can be made. Its price will go down. One can add more sensors. Star topology is the current network topology, however, we can also explore other topologies, such as a hybrid. Its dependability will rise as a result.