IOT ENHANCED AIR CONDITIONER REMOTE CONTROLLING SYSTEM USING MOBILE APPLICATION

A PROJECT REPORT

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BONAFIDE CERTIFICATE

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ABSTRACT

In recent trends, smart buildings, and conference halls have become the base for the Internet of Things (IoT). The usage of the internet is increased by connecting the devices in the homes to make the places more comfortable, provident, and delightful. The proposed approach addresses a remote control in smart home technologies, namely the Air Conditioner remote controlling system using the mobile application. The Automatic and Manual Air Conditioner system helps the owner to monitor the Air Conditioner with a Smartphone-controlled, Wi-Fi-connected system using Node MCU. Users can on, off, and control the air conditioner by installing the developed Android application on devices like tablets, smartphones, laptops, etc. This approach can further be scaled to commercial sectors like ATMs, Malls, etc. by using wireless communication.

Keywords - Internet of Thing, Android Application, Node MCU ESP8266.

LIST OF FIGURES

LIST OF ABBREVIATIONS

IOT	Internet of thing
GND	Ground
MCU	Microcontroller
AC	Air conditioner
VCC	Voltage common collector
IDE	Integrated development environment
UART	Universal asynchronous receiver-transmitter

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

Automatic sensing of an air conditioner using an ultrasonic sensor with Node MCU ESP8266 is an interesting project that combines IoT (Internet of Things) and sensor technology. The purpose of this project is to detect the presence of a person in a room and automatically control the air conditioner based on their proximity. Here's a high-level overview of how the system works:

Hardware Setup: Node MCU ESP8266: This is a popular microcontroller board that has built-in Wi-Fi capabilities, making it suitable for IoT applications. Ultrasonic Sensor: An ultrasonic sensor is used to measure the distance between the sensor and an object by emitting ultrasonic waves and calculating the time taken for the waves to bounce back.

Circuit Connection: Connect the VCC and GND pins of the ultrasonic sensor to the 3.3V and GND pins of the NodeMCU ESP8266.Connect the trigger pin of the ultrasonic sensor to a GPIO pin of the Node MCU ESP8266. Connect the echo pin of the ultrasonic sensor to another GPIO pin of the Node MCU ESP8266.

Software Implementation: Install the necessary libraries for the ultrasonic sensor and the ESP8266 board in the Arduino IDE. Write a program that reads the distance measured by the ultrasonic sensor and communicates with the air conditioner. Set up Wi-Fi connectivity on the NodeMCU

ESP8266 to connect to your local network. Define thresholds for the distance measurement to determine when someone is present or not..

Integration with Air Conditioner: Depending on the type of air conditioner you have, you may need additional components such as an infrared (IR) transmitter. Research the protocol and codes used by your air conditioner's remote control to send signals for turning it on or off. Connect the IR transmitter to an appropriate GPIO pin on the Node MCU ESP8266.Modify the software to include the necessary code to send IR signals to the air conditioner based on the detected proximity.

Testing and Deployment: Upload the code to the NodeMCU ESP8266 and test the system. Place the ultrasonic sensor in a suitable location in the room to ensure accurate distance measurements. Monitor the behavior of the air conditioner as you move closer or farther away from the sensor. Make adjustments to the code and hardware placement if necessary. Once everything is working correctly, mount the components securely and deploy the system in the desired location.

Remember that this is a general overview, and the specifics of implementation may vary depending on the exact ultrasonic sensor, air conditioner model, and programming environment you're using. Always refer to the documentation and examples provided with your hardware and libraries for detailed instructions.

1.2 EXISTING SYSTEM

This paper proposes a smart door-locking system using Arduino UNO and Bluetooth. Users can open or close the door lock by installing the developed android application in devices like tablets, smartphones, laptops, etc. by providing the login credentials like username and password which is verified in the database over the internet. If the credentials are invalid, the buzzer rings and an SMS alert is sent to the owner of the building which enhances the security. By using Bluetooth, this application can be controlled only in a shorter range.

1.3 PROPOSED SYSTEM

In proposed system it have more futures like it sensors so if the detect value it sense mean it automatically on the relay which are connected to the ac power and also it operated giving commands from the iot server. In this project, we propose a system using Node MCU Esp8266 to control the air conditioner through the Mobile application as we created. In this system manually and automatically control the air conditioner. Range of ultrasonic sensor more than 80 cm. Control the Air Conditioner automatically (on / off) system. The ultrasonic sensor detects the signal if it’s Presence near the sensor**.**

CHAPTER 2

LITERATURE SURVEY

“The research paper titled “Iot Enhanced Smart Door Locking System” by Shanthini M, Vidya G, Arun R the main objective of this paper is to enhance the security of the door locking system. The mobile device will be sending a signal via Bluetooth to the Arduino circuit that acts as a connection between the smartphone and the servo motor after proper authentication is provided using the database. The use of Bluetooth on smartphones is to provide ease of access with better security than the conventional key

.

“Design And Development Of Micro Controller Based Air Conditioning System**”** by Indeevar Reddy describes the design and development of air conditioner control card based PIC16F877A microcontroller to get a comfortable thermal feeling for air conditioning system. Various types of air conditioner control cards are available in the markets nowadays but this control card in this system is different depending on microcontroller technology by changing control design and parameters. It is more reliable to use for the consumer. To be controlled based PIC16F877A for air conditioning system is only the temperature to provide more comfortable and conductive environment. The outputs of microcontroller are given commands to drive inputs of ULN 2003A which drives relays for output loads. The control card based on PIC16F877A will be constructed on air conditioning system to control temperature values for heating and cooling process, and speeds for compressor motor and fan. LCD display has been constructed for showing operations of air conditioning system. IC LM35 temperature sensor is used to

detect the environment temperature change. In this paper, control card for air conditioner is implemented by Micro C programming language embedded in microcontroller.

"Android Application Based Controller For Air Conditioning Units" describes that automation of electronic appliances through an Android-based mobile application has been a significant development in digital technology. This study focuses on the implementation of Node MCU ESP8266-12E, a microcontroller development board with Wi-Fi capabilities specially designed for IoT-based Applications, and a Solid State Relay (SSR) as the initiating component of the device. Android Studio serves as the platform for making the application to provide an automated approach in controlling the air conditioning units (ACU) within a 60- meter range. A Java based program was developed to interface to an electronic component connected to an android device which regulates the air conditioner's power switch. After a number of trials, the system device achieved an accuracy of 100% in controlling the device's ON/OFF mechanism and 96.875% rate including delays.

"Development Of Ac Voltage Stabilizer With Microcontroller Based Control System", by Sudha Kousalya describes the model and prototype of the AC stabilizer have been developed based on the AVR ATmega328P microcontroller. The block diagram of the device, the electronic circuit and the algorithms of the system operation have been developed. In particular, the algorithm includes software in C in the Arduino IDE. The AC voltage stabilizer is designed using the

modular principle, which makes it possible to quickly upgrade. The AC voltage stabilizer makes it possible to maintain the supply voltage on the load within acceptable limits with significant deviations, has the ability to adjust the voltage range of the network to operate the stabilizer, manual adjustment potentiometers

"Design And Development Of Microcontroller Based Air Conditioning Units Controller As Input To Energy Conservation For University Of Batangas" by Leni A. Bulan University of Batangas not only aims to provide an effective method of instruction delivery through a conducive learning environment but also aspires to satisfy the needs of its clients. One initiative that could address this goal is thru the installation of Air-Conditioning Units (ACU) in all classrooms in the university. Doing so poses a liability because ACU misuse is widespread in some buildings. Observation showed that considerable amount of energy has been wasted due to ACU misuse. The main objective of this research was to develop an ACU controller that would empower the faculty members in controlling the use of the ACU. Developmental research method was used where each aspect of the process was documented. The developed device was installed in one engineering classroom where it was tested for its functionality, accuracy, and yielded impact in terms of cost savings. With the implementation of the developed device, a 32.3052% average daily savings was observed. If this percentage would be converted to savings, the university would be able to set aside a considerable amount. A longer period of testing would show further improvement and would benefit the institution in terms of cost savings relating to energy consumption

“Smart Controller For Air Conditioning In Car Using Iot” by Pradeep Kumar G. Manigandan P. Rathika P. Senthil T The vast majority of automobiles now have intelligent controllers. During the hot summer months, the interior temperature of the car rapidly rises, necessitating the use of the air conditioner to maintain comfort. This necessitates the need to turn ON the AC before getting into the car. The proposed mobile application is mainly developed to monitor the temperature range inside the car by using the Internet of Things (IoT). With the proposed mobile application, the air conditioning can be switched ON before getting into the vehicle as the AC controller is linked to the mobile app. On the other hand, it is highly required to ensure that the air conditioner has sufficient power. This necessitates the use of a lithium-ion battery. Electrical energy is created by converting kinetic energy. The wingtips will generate kinetic energy as the vehicle moves. The intelligent air conditioner's energy consumption will decrease as the battery is charged. The results show that the proposed system can contribute significantly to the proposed temperature reduction. The proposed strateger will monitor the temperature inside the vehicle as simple as possible

“Android Application-Based Controller For Air Conditioning Units” by Roselyn Q. Castrodes ,Emmy Jill J. Funa, Hermine Nessa G. Lim Automation of electronic appliances through an Android-based mobile application has been a significant development in digital technology. This study focuses on the implementation of Node MCU ESP8266-12E, a microcontroller development board with Wi-Fi capabilities specially designed for IoT-based Applications, and a Solid State Relay (SSR) as the initiating component of the device. Android Studio serves as the

platform for making the application to provide an automated approach in controlling the air conditioning units (ACU) within a 60- meter range. A Java based program was developed to interface to an electronic component connected to an android device which regulates the air conditioner's power switch. After a number of trials, the system device achieved an accuracy of 100% in controlling the device's ON/OFF mechanism and 96.875% rate including delays.

“Research On Energy Saving Control Of Building Central Air Conditioning Based On Neural Network” Qiushi Li During the construction design period, the amount of energy consumption of the central air-conditioning system occupies a large proportion in the overall energy consumption, so how to control its comprehensive energy consumption, improve the application efficiency of the internal energy system, effectively enhance the suitability of the living environment, has a positive effect on the steady development of China's national economy. Therefore, modern researchers have proposed a number of topics on the energy control of building central air conditioning appliances from the perspective of neural network by using the theoretical way of artificial intelligence, and the final results prove that the building electrical energy saving project has a certain theoretical significance and practical value. On the basis of understanding the structure and energy principle of central air conditioning system, this paper studies the prediction of vAV system in central air conditioning system, and constructs the neural network predictive controller structure. The final experimental results show that this method can not only improve the control effect of the air conditioning system, but also change the dynamic performance of the air conditioning control system, so as to ensure that

the central air conditioning system inside the building can effectively control the energy consumption.

"Research On Air-Sending Characteristics Simulation Of Air-Conditioning System Of Air-Conditioning Support Equipment For Airplane" Shenyang Liu,kai Wang,Li Wang, Wei Hu Aiming at moisture condensation of air-conditioning support for airplane, this paper analyzes air-conditioning system of air-conditioning support equipment for airplane theoretically, and sets up the air-conditioning simulation model through the Transient System Simulation Program (TRNSYS). Then the influence of different enthalpy humidity ratio and weather conditions to energy consumption are analyzed. Finally the security and efficiency of supplied air state is discussed, which improve air-condition support efficiency of airplane.

"Research On Visual Operation And Maintenance Of Building Air Conditioning System" by Wenhong Yu,Guoao Song,Jinchao Bai The development of 5G technology is driving the development of digital industry in China. change the traditional on-site management mode of air- conditioning systems in existing buildings and reduce the maintenance costs of existing buildings.

This paper proposes an economical and practical three dimensional visualisation air conditioning management system. The system applies open source free software such as Three. The system is convenient for managers to carry out energy consumption analysis and "health diagnosis", and has certain engineering application value for the construction of intelligent operation and maintenance systems for existing buildings. This paper develops the system for an existing.

CHAPTER 3

MODULE DESCRIPTION

3.1 HARDWARE DESCRIPTION

The implementation of the project is with the help of hardware interfacing to the software. The hardware components are

Node MCU ESP8266

Relay Module

Ultrasonic Sensor

Power Supply

Connecting Wires

3.1.1NODE MCU ESP8266

3.1.1.1 INTRODUCTION

ESP8266 is a single 2.4 GHz Wi-Fi-and-Bluetooth combo chip designed with the TSMC ultra-low-power 40 nm technology. It is designed to achieve the best power and RF performance, showing robustness, versatility and reliability in a wide variety of applications and power scenarios.

The ESP8266 series of chips includes ESP8266-D0WD-V3, ESP8266-D0WDQ6-V3, ESP8266-D0WD, ESP8266-D0WDQ6, ESP8266-D2WD, ESP8266-S0WD, and ESP8266-U4WDH, among which, ESP8266-D0WD-V3, ESP8266-D0WDQ6-V3, and ESP8266-U4WDH are based.

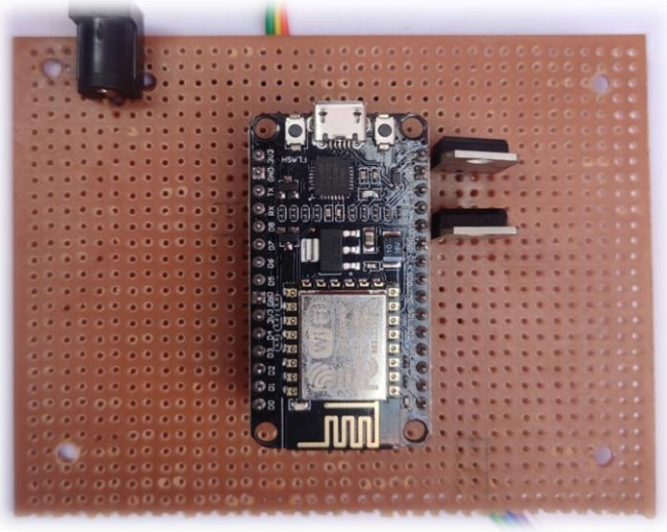

Fig. 3.1 Node MCU ESP8266 diagram

3.1.1.2 FEATURES OF NODE MCU ESP8266

Node MCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects.

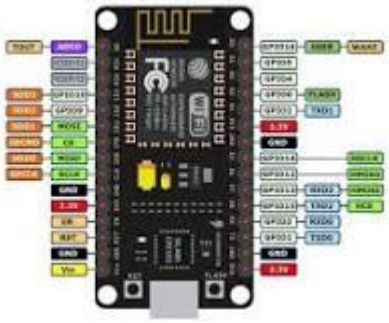

Fig. 3.2 Node MCU ESP8266 Pin diagram

3.1.1.3 ADVANTAGE:

Node MCU is an ESP8266 chip-based microcontroller development board, which is very cheap as compared to Arduino UNO. Breadboard-friendly and compact: The Node MCU can be easily inserted into a breadboard and test various circuit designs

3.1.2 RELAY MODULE

3.1.2.1 INTRODUCTION

A relay is an electrically operated device. It has a control system and (also called input circuit or input contactor) and controlled system (also called output circuit or output contactor). It is frequently used in automatic control circuit.

Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. ... When a relay contact is Normally Closed (NC), there is a closed contact when the relay is not energized.

Relays are simple switches which are operated both electrically and mechanically. Relays consist of a n electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits. They were used to switch the signal coming from one source to another destination. The high end applications of relays require high power to be driven by electric motors and so on. Such relays are called contactors.

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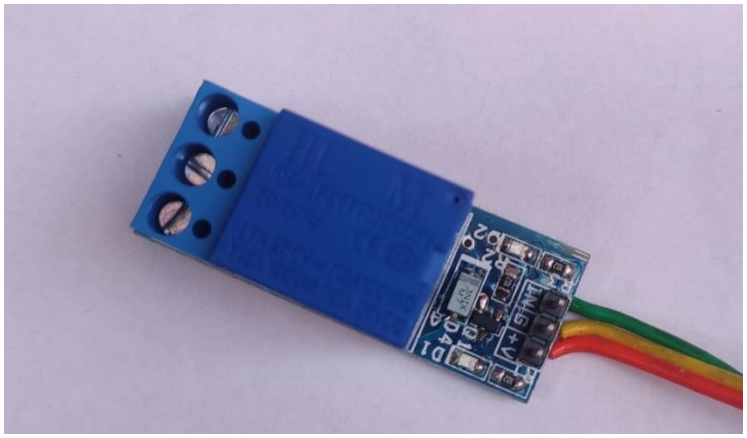

Fig 3.3 Relay Module

3.1.2.2 FEATURES

Input voltage: 12VDC

Driver unit: ULN2003A

Isolation unit: In4007

Fast switching

3.1.2.3 APPLICATIONS

Ac load Switching applications

Dc load Switching applications

Motor switching applications

3.1.3 ULTRASONIC SENSOR

3.1.3.1 INTRODUCTION

An ultrasonic sensor is a device that uses sound waves with frequencies higher than the upper audible limit of human hearing (typically above 20 kHz) to detect objects, measure distances, or monitor environments. It works on the principle of echolocation, similar to how bats navigate and detect objects in their surroundings .The sensor consists of a transmitter and a receiver. The transmitter emits ultrasonic waves, which travel through the air and bounce off objects in their path. When these waves strike an object, they reflect back toward the sensor. The receiver then detects the reflected waves and calculates the time it takes for them to return .By measuring the time between the transmitted and received signals, the sensor can determine the distance to the object. This is achieved by applying the speed of sound in air (approximately 343 meters per second at room temperature) and using the formula distance = (speed of sound × time) / 2.

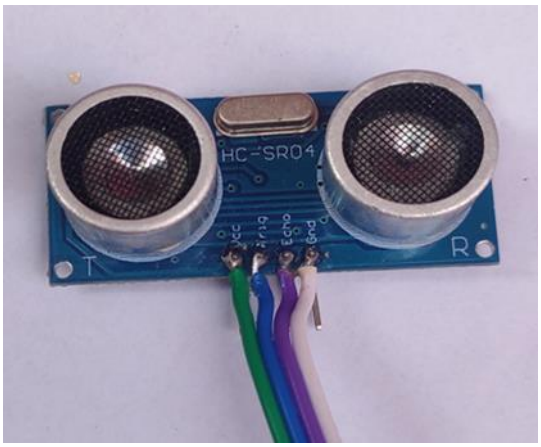

Fig. 3.4 Ultrasonic Sensor

3.1.3.2 APPLICATION

Ultrasonic sensors are commonly used in various applications, including:
Distance measurement: They can accurately measure the distance to an object or surface without physical contact, making them suitable for tasks like obstacle avoidance in robotics or parking assistance systems in vehicles.

Proximity sensing: Ultrasonic sensors can detect the presence or absence of objects within a certain range. This feature is often utilized in automated doors, security systems, and industrial automation.

Level sensing: They can determine the level of liquid or granular materials in tanks or containers, enabling applications such as liquid level monitoring or inventory management.

Object detection and sorting: Ultrasonic sensors can detect the presence or absence of objects on a conveyor belt and facilitate sorting operations in industries like manufacturing and logistics.

Flow rate measurement: By using the Doppler effect, ultrasonic sensors can measure the speed and flow rate of fluids in pipes or channels.

Medical imaging: Ultrasonic sensors play a crucial role in medical diagnostics, particularly in ultrasound imaging, where they generate images of internal organs and tissues by emitting and receiving high-frequency sound waves.

3.1.3.3 FEATURES

Ultrasonic sensors come with a variety of features that make them versatile and suitable for different applications. Here are some common features of ultrasonic sensors:

Distance Range: Ultrasonic sensors are available with different distance ranges, allowing for precise measurements over short or long distances. The range can vary from a few centimeters up to several meters, depending on the sensor model.

Detection Angle: Ultrasonic sensors have a detection angle that determines the width of the sensing area. Some sensors have a narrow detection angle for focused measurements, while others have a wider angle for broader coverage.

Sensing Accuracy: The accuracy of ultrasonic sensors is an important feature, especially for applications that require precise distance measurements. Higher-quality sensors provide more accurate results, often with millimeter-level accuracy.

Adjustable Sensitivity: Many ultrasonic sensors allow for adjusting the sensitivity to optimize the detection range and adapt to different environments. This feature is particularly useful when dealing with varying object sizes or challenging conditions.

Multiple Outputs: Ultrasonic sensors can have various output options to communicate the detected data. Common outputs include analog voltage, digital signals (e.g., GPIO pins), or serial communication protocols such as UART or I2C.

3.1.4 POWER SUPPLY UNIT

3.1.4.1 DESCRIPTION

A power supply unit (or PSU) converts mains AC to low-voltage regulated DC power for the internal components of a computer. Modern personal computers universally use switched-mode power supplies. Some power supplies have a manual switch for selecting input voltage, while others automatically adapt to the mains voltage.

A power supply is used to reduce the mains electricity at 240 volts AC down to something more useable, say 12 volts DC. There are two types of power supply, linear and switch mode. A linear power supply uses a transformer to reduce the voltage. The AC signal is rectified and regulated to produce a high DC voltage.

An AC adapter, AC/DC adapter, or AC/DC converter is a type of external power supply, often enclosed in a case similar to an AC plug. Adapters for battery-powered equipment may be described as chargers or rechargers (see

also battery charger). AC adapters are used with electrical devices that require power but do not contain internal components to derive the required voltage and power from main power. The internal circuitry of an external power supply is very similar to the design that would be used for a built-in or internal supply.

Fig 3.5: power adapter

An adapter is a device that converts attributes of one electrical device or system to those of an otherwise incompatible device or system. Some modify power or signal attributes, while others merely adapt the physical form of one electrical connector to another. In a computer, an adapter is often built into a card that can be inserted into a slot on the computer's motherboard. The card adapts information that is exchanged between the computer's microprocessor and the devices that the card supports.

3.1.4.2FEATURES

Output current:1A

Supply voltage: 220-230VAC

Output voltage: 12VDC

Reduced costs

3.1.4.3APPLICATIONS

Back-end systems which need to send purchase order data to oracle applications send it to the integration service via a integration server Client and SMPS applications**.**

3.2 SOFTWARE DESCRIPTION:

3.2.1ARDUINO IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them. Programs written using Arduino Software (IDE) are called **sketches**. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives

feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

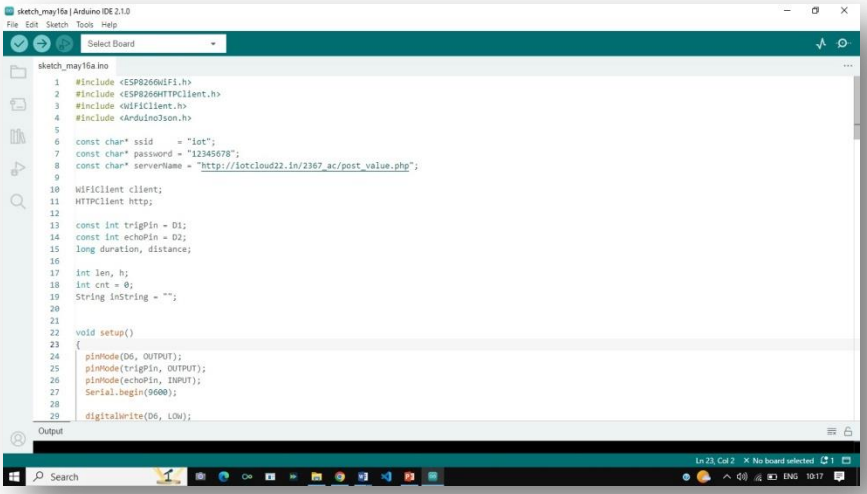

Fig 3.6 Arduino Software IDE

Before uploading your sketch, you need to select the correct items from the **Tools > Board** and **Tools > Port** menus. The boards are described below. On the Mac, the serial port is probably something like **/dev/tty.usbmodem241** (for an Uno or Mega2560 or Leonardo) or **/dev/tty.usbserial-1B1** (for a Duemilanove or earlier USB board), or **/dev/**tty.USA19QW1b1P1**.1** (for a serial board connected with a Keyspan USB-to-Serial adapter). On Windows, it's probably COM1 or COM2 (for a serial board) or COM4, COM5, COM7, or higher (for a USB board) - to find out, you look for USB serial device in the ports section of the Windows Device Manager. On Linux, it should be **/dev/tty ACMx**, **/dev/ttyUSBx** or similar. Once you've selected the correct serial port and board, press the upload button in the toolbar or select the **Upload** item from the **Sketch** menu. Current Arduino boards will reset automatically and begin the upload. With older boards (pre-Diecimila)

that lack auto-reset, you'll need to press the reset button on the board just before starting the upload. On most boards, you'll see the RX and TX LEDs blink as the sketch is uploaded. The Arduino Software (IDE) will display a message when the upload is complete, or show an error.

When you upload a sketch, you're using the Arduino **bootloader**, a small program that has been loaded on to the microcontroller on your board. It allows you to upload code without using any additional hardware. The bootloader is active for a few seconds when the board resets; then it starts whichever sketch was most recently uploaded to the microcontroller. The bootloader will blink the on-board (pin 13) LED when it starts (i.e. when the board resets).

3.2.2EMBEDDED C

Embedded C is a set of language extensions for the C programming language by the C Standards Committee to address commonality issues that exist between Cextensions for different embedded systems.

Embedded C is a set of language extensions for the C programming language by the C Standards Committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often

including hardware and mechanical parts. Embedded systems control many devices in common use today. Ninety-eight percent of all microprocessors are manufactured as components of embedded systems.

Examples of properties of typical embedded computers when compared with general-purpose counterparts are low power consumption, small size, rugged operating ranges, and low per-unit cost. This comes at the price of limited processing resources, which make them significantly more difficult to program and to interact with. However, by building intelligence mechanisms on top of the hardware, taking advantage of possible existing sensors and the existence of a network of embedded units, one can both optimally manage available resources at the unit and network levels as well as provide augmented functions, well beyond those available. For example, intelligent techniques can be designed to manage power consumption of embedded systems.

Modern embedded systems are often based on microcontrollers (i.e. CPU's with integrated memory or peripheral interfaces), but ordinary microprocessors (using external chips for memory and peripheral interface circuits) are also common, especially in more-complex systems. In either case, the processor(s) used may be types ranging from general purpose to those specialized in certain class of computations, or even custom designed for the application at hand. A common standard class of dedicated processors is the digital signal processor (DSP).

Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

Embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, and largely complex systems like hybrid vehicles, MRI, and avionics. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

CODE:

WIFI SETUP CODE

```
#include <ESP8266WiFi.h>
#include <ESP8266HTTPClient.h>
#include <WiFiClient.h>
#include <ArduinoJson.h>

const char* ssid     = "iot";
const char* password = "12345678";
const char*     serverName          =
"http://iotcloud22.in/2367_ac/post_value.php";

WiFiClient client;
HTTPClient http;

const int trigPin = D1; const int echoPin = D2; long duration,
distance;

int len, h; int cnt = 0; String inString = "";
```

PIN SETUP CODE:

```
voId setup()
{
  pinMode(D6,      OUTPUT);                pinMode(trigPin,      OUTPUT);
pinMode(echoPin, INPUT);
  Serial.begin(9600);
```

```
  digitalWrite(D6, LOW);                WiFi.begin(ssid, password);
Serial.println("Connecting");   while (WiFi.status() != WL_CONNECTED)
{
   Serial.print(".");    delay(500);
  }
  Serial.println("");
  Serial.print("Connected to WiFi network with IP Address: ");
  Serial.println(WiFi.localIP());

}

void loop ()
{

  digitalWrite(trigPin,LOW);delayMicroseconds(2);
digitalWrite(trigPin,HIGH);delayMicroseconds(10);
digitalWrite(trigPin, LOW);    duration = pulseIn(echoPin, HIGH);
distance = duration * 0.034 / 2;      Serial.print("Distance: ");
Serial.println(distance);   sending_to_db();
}

void sending_to_db()
{
  if (WiFi.status() == WL_CONNECTED)
  {
    http.begin(client,    serverName);                http.addHeader("Content-Type",
        "application/xwww-form-urlencoded");

   String  httpRequestData       =      "&value1=" +
String(distance) + "";
   //    Serial.print("httpRequestData: ");
   //    Serial.println(httpRequestData);
   int  httpResponseCode       =   http.POST(httpRequestData);          if
 (httpResponseCode > 0) {      Serial.print("HTTP Response code: "); +
     Serial.println(httpResponseCode);
   }
{
     Serial.print("Error code: ");
```

```
    Serial.println(httpResponseCode);
   }     http.end();   }   else {
   Serial.println("WiFi Disconnected");     delay(1000);
  }
  Get data();
  //Send an HTTP POST request every 3 seconds
  delay(1500);

}

void getdata() {   if (WiFi.status() == WL_CONNECTED) {
    //HTTPClient http;  //Object of class HTTPClient
    http.begin(client,
"http://iotcloud22.in/2367_ac/light.json");          int  httpCode  =
http.GET();     //Check the returning code     if (httpCode > 0) {
      // Parsing
    }
  }
  StaticJsonDocument<256> doc;

  DeserializationError          error      =      deserializeJson(doc,
http.getString());   Serial.println(http.getString());
  if (error) {
    Serial.print(F("deserializeJson() failed: "));     Serial.println(error.f_str());
    return;
  }
  //StaticJsonDocument<256> doc;
  //             deserializeJson(doc,  json);       //           auto  error  =
deserializeJson(doc, json);
  if (error) {
    Serial.print(F("deserializeJson() failed with code "));
    Serial.println(error.c_str());
    return;
  }

  String light = doc["light"]; // "on"
  // Extract values
  //Serial.print(F("Response:"));
```

```
 //Serial.println(light);   if (light == "on")
 {
  digitalWrite(D6, HIGH);
 }   if (light == "off")
 {
  digitalWrite(D6, LOW);
 }


 String light1 = doc["light1"]; // "on"
 // Extract values
 //Serial.print(F("Response:"));   //Serial.println(light);   if (light1 == "on")
 {     automode();
 }   if (light1 == "off")
 {
   Serial.println("MANUAL");
 }

  http.end();     //Close  connection     //Serial.println(flag);
delay(1000); }

void   automode()   {         if   (distance   <   10uj0)   {
digitalWrite(D6, HIGH);   } else {      digitalWrite(D6,
LOW);
 }
```

3.2.3 INTERNET OF THINGS (IoT)

The Internet of things (IoT) describes the network of physical objects “things” that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the Internet.

Things have evolved due to the convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems. Traditional fields of embedded systems, wireless sensor networks, control systems,

automation (including home and building automation), and others all contribute to enabling the Internet of things. In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home", including devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smartphones and smart speakers. IoT can also be used in healthcare systems.

The IoT is the strategy for gadgets that encase hardware, and network, which enables these devices to fix, act together and switch information. IoT incorporates broadening Internet beneficial than standard gadgets, for example, work areas to any decision of generally non web get to material gadgets and on a day by day source objects. Inserted through innovation.

3.3 BLOCK DIAGRAM

To control an air conditioning unit using a relay via a Node MCU (ESP8266), you'll need to follow these general steps:

Gather the necessary components: Node MCU (ESP8266) development board. Relay module (make sure it's suitable for the voltage and current requirements of your air conditioning unit).Jumper wires. Power supply for the Node MCU and the relay. Connect the relay to the Node MCU: Connect the VCC pin of the relay module to a 5V power supply. Connect the GND pin of the relay module to the GND of the power supply and the Node MCU. Connect the IN or Signal pin of the relay module to a digital pin on the Node MCU (e.g., D1).Write the code: Set up the Node MCU by including the necessary libraries and defining the pin connections. In the setup function, initialize the digital pin connected to the relay module as an output. In the loop function, control the relay by setting the pin HIGH or LOW based on your desired state (ON or OFF) for the air conditioning unit.

Here's an example code snippet to get you started:

```
cpp
#include <ESP8266WiFi.h>

// Pin Definitions
#define RELAY_PIN D1
```

```
// WiFi Settings
const char* ssid = "your_SSID";
const char* password = "your_PASSWORD";

void setup() {
  // Initialize relay pin as an output
  pinMode(RELAY_PIN, OUTPUT);
  digitalWrite(RELAY_PIN, LOW);

  // Connect to Wi-Fi network
  WiFi.begin(ssid, password);
  while (WiFi.status() != WL_CONNECTED) {
    delay(1000);
    Serial.println("Connecting to WiFi...");
  }
  Serial.println("Connected to WiFi!");
}

void loop() {
  // Control the relay
  digitalWrite(RELAY_PIN, HIGH);  // Turns the relay ON
  delay(5000);  // Wait for 5 seconds
  digitalWrite(RELAY_PIN, LOW);   // Turns the relay OFF
  delay(5000);  // Wait for 5 seconds }
```

Note: This is a basic example that toggles the relay ON and OFF every 5 seconds. You can modify the code to implement more complex control logic or integrate it with other systems. Upload the code: Install the necessary board and libraries in your Arduino IDE for the Node MCU (ESP8266).Connect the Node MCU to your computer using a USB cable. Open the code in the Arduino IDE, select the correct board and COM port. Click the upload button to upload the code to the Node MCU. Connect the relay to the air conditioning unit: Ensure that the air conditioning unit is powered off.

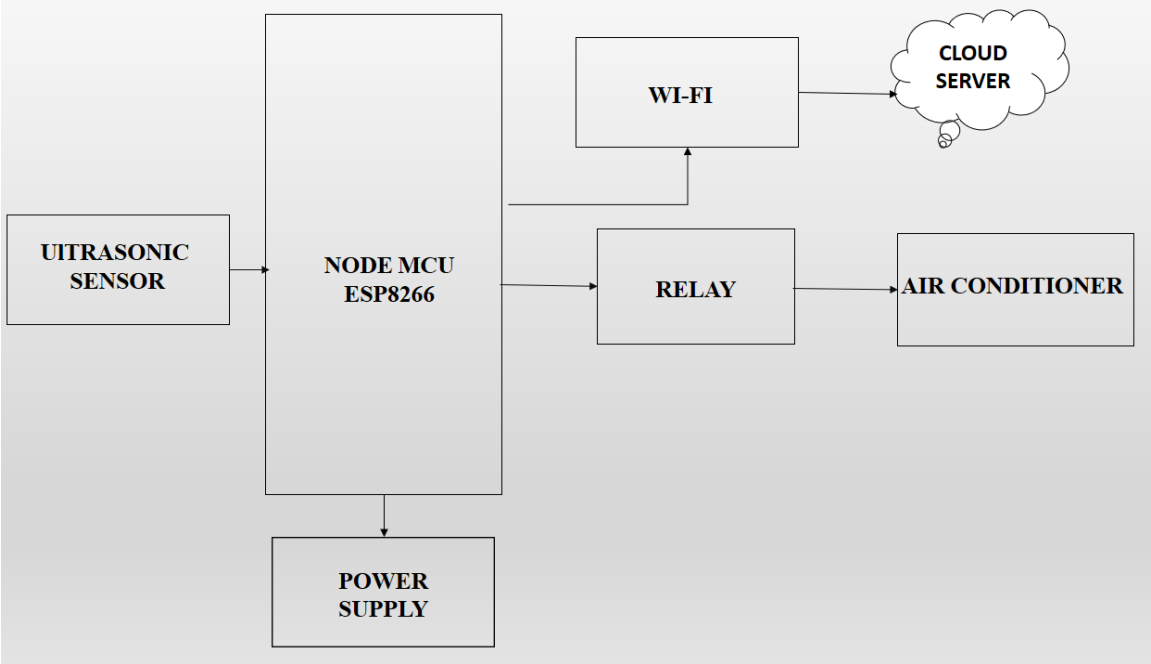

Fig 4.1Block Diagram

This block diagram describes Ultrasonic sensors primarily utilize sound waves to detect objects or measure distances, but they are not typically integrated into standard air conditioning systems for sensing purposes.

Air conditioners typically rely on other types of sensors and components to sense and control various parameters. These may include: Temperature Sensors: Temperature sensors are commonly used in air conditioners to monitor the ambient temperature in the room or space being cooled. They provide feedback to the system to adjust the cooling or heating operation accordingly

Ultrasonic Sensors: Humidity sensors are used to measure the level of moisture or humidity in the air. They help the air conditioner maintain the desired humidity level in the room, especially in humid …

The Node MCU ESP8266 is a popular development board based on the ESP8266 Wi-Fi module. While it is not typically used directly in air conditioners, it can be utilized for various purposes related to air conditioning systems with some additional components and programming. Here are a few examples of how the Node MCU ESP8266 can be integrated into an air conditioning system:

Mobile Control:

The Node MCU ESP8266 can be used to create a Wi-Fi-enabled remote control interface for an air conditioner.

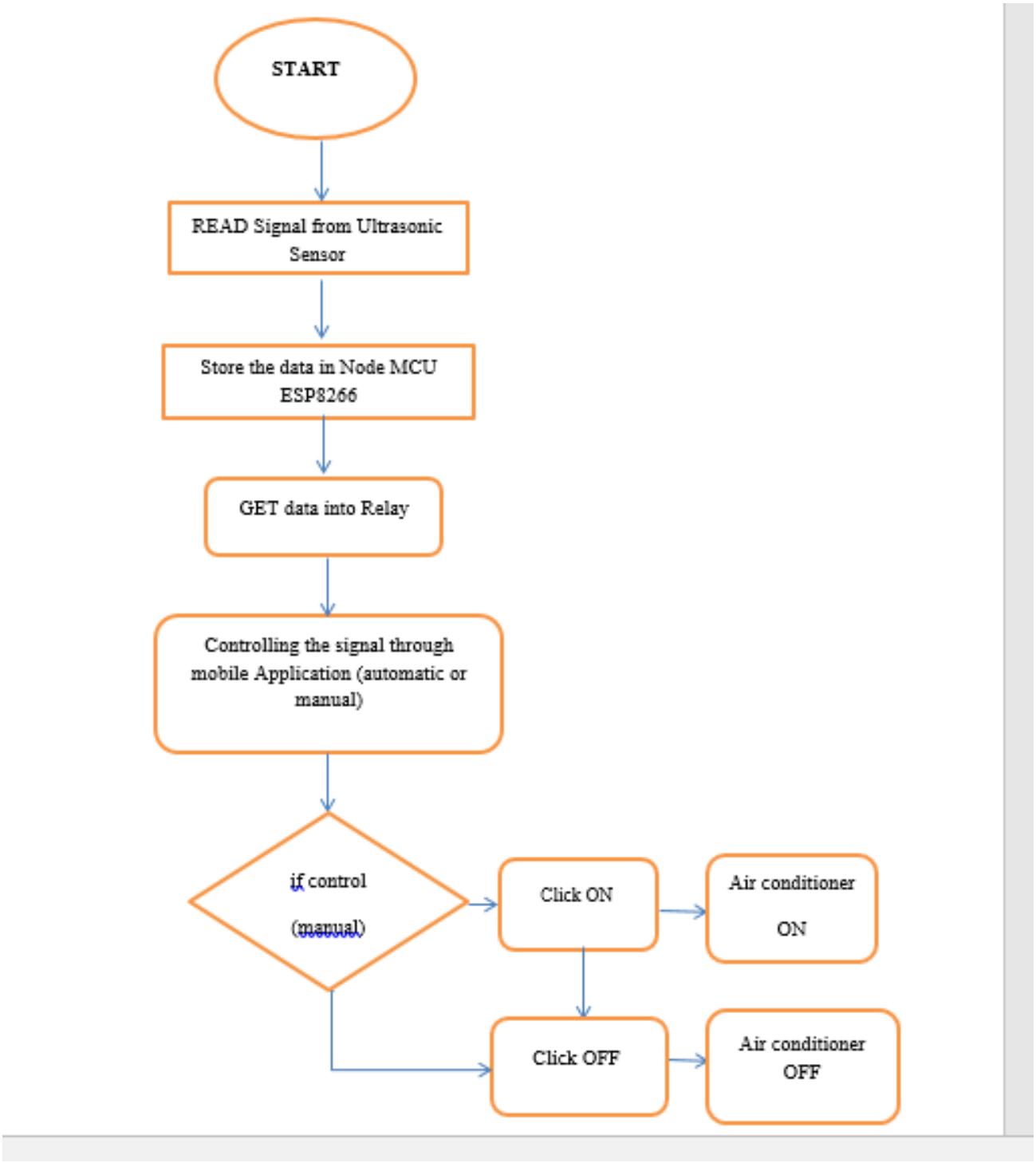

Fig. 4.3 Flow chart for manual switch on Air Conditioner

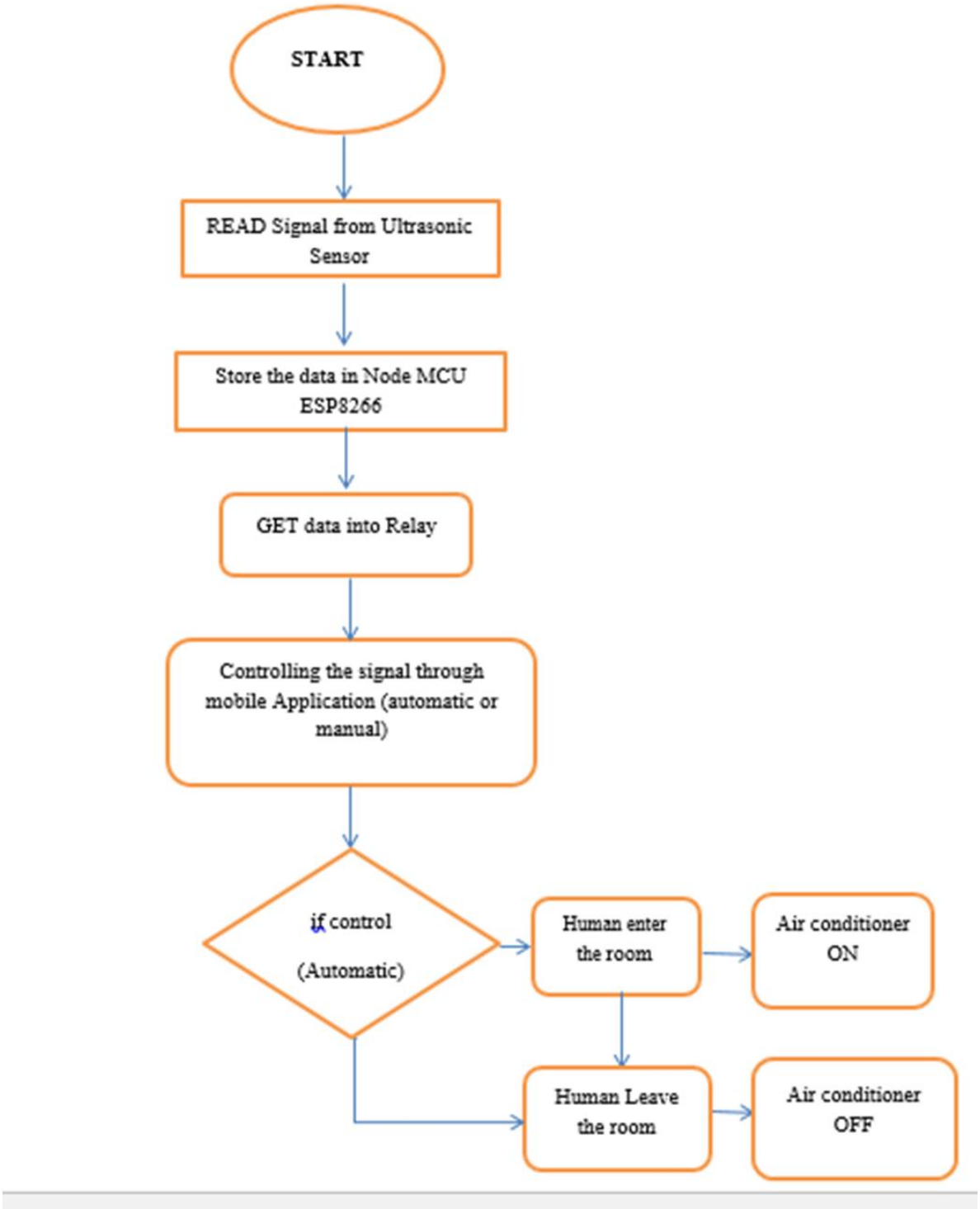

Fig. 4.3 Flow chart for manual switch on Air Conditioner

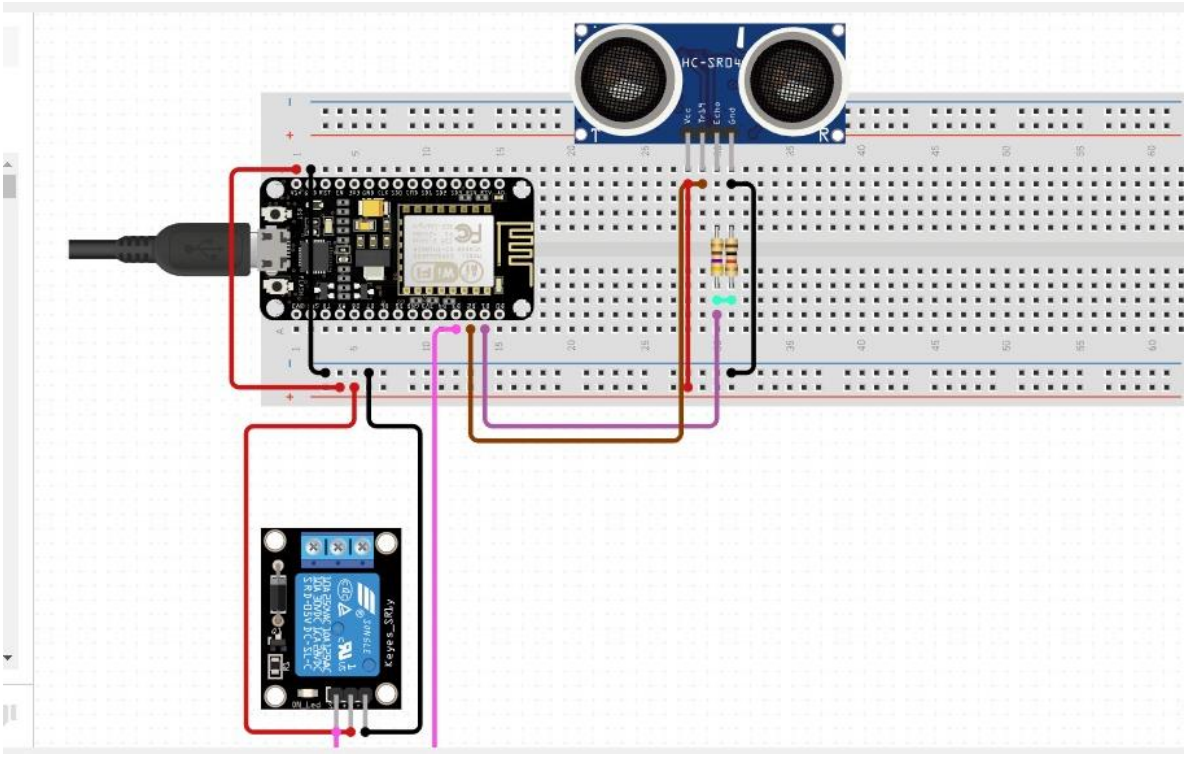

Fig. 4.5 Circuit Diagram

The circuit diagram describes the Node MCU to the air conditioner's control system, you can send commands over Wi-Fi to control the air conditioner remotely through a mobile app or web interface.

Temperature and Humidity Monitoring: The Node MCU ESP8266, along with additional sensors l…

Relays can be used in air conditioning systems for various purposes, primarily for controlling the power supply to different components or functions

Wi-Fi connectivity in air conditioners has become increasingly common in recent years, enabling remote control, monitoring, and integration with smart home systems

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CHAPTER 4

RESULT AND CONCULSION

4.1 RESULT

To carry out the process of controlling and monitoring the work of air conditioning equipment, it can be done via an Android smart phone through a smart IoT application program that is embedded in an Android smartphone, or via a web server. The steps that can be taken for the process of controlling the work of air conditioning equipment, via an Android smartphone are as follows:

Automatic On / Off Control of Air Conditioning Equipment via Android Smart Phone To carry out the process of activating the work of air conditioning equipment through the smart IoT application, what is done is to press the Power button. The activation of air conditioning equipment is indicated by a change in the indicator writing OFF to ON, The process of activating the work of air conditioning equipment when the power button is pressed is as follows: When the power button is pressed, the smart IoT application will connect to the web server. After the connection process is complete, The smart IoT application sends the "AC ON" data to the web server, then the data is sent from the web server to the controller through the ultrasonic sensor When the system is activated and the controller is connected to the web server, the controller will read data from the web server. If the data received from the web server is "AC ON", then the controller processes the data to activate the air conditioning equipment by sending data "0x880095E" to the air conditioning equipment via ULTRASONIC sensor transmission.

IOT Project

S.no	IR Status	Date And Time
1	Object Not Detected	2023-05-09 19:17:51
2	Object Not Detected	2023-05-09 19:17:47
3	Object Detected	2023-05-09 19:17:43
4	Object Not Detected	2023-05-09 19:17:40
5	Object Not Detected	2023-05-09 19:17:37
6	Object Not Detected	2023-05-09 19:17:33
7	Object Not Detected	2023-05-09 19:17:30
8	Object Detected	2023-05-09 19:17:27
9	Object Detected	2023-05-09

Figure 4.5 Activating the air conditioner automatically

Manual Control of On / Off of Air Conditioning Equipment via Android Smart Phone

Control of the work of the manual section of air conditioning equipment can be done by pressing the Swing On button to activate on/ off. When the controller receives data from the web server sent via the smart IoT application on the android smartphone in the form of "manual" data, the controller will activate the work of the swing section on the air conditioning equipment by sending data "0x8810001" to the air conditioning equipment via an infrared sensor. The test results are as shown .

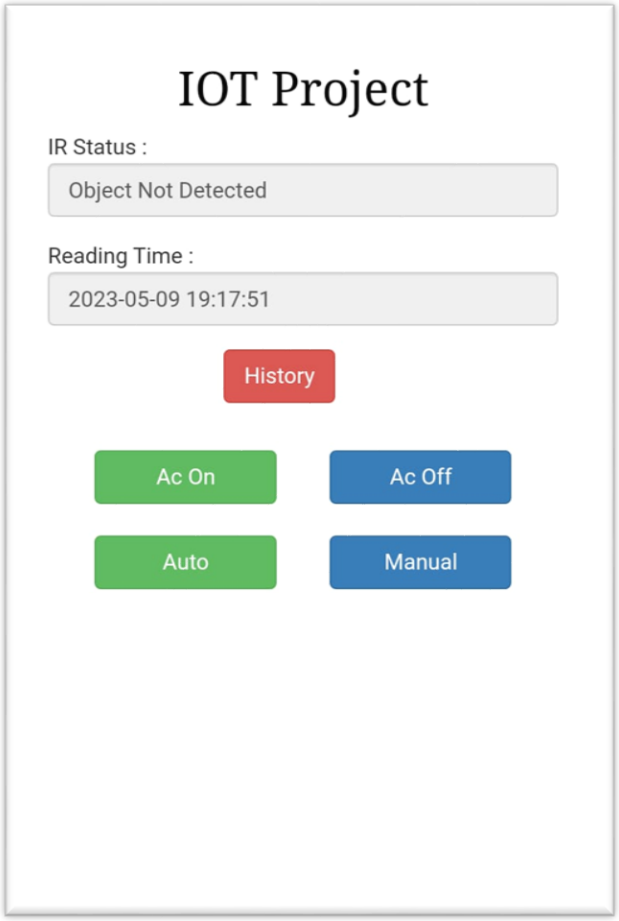

Figure 4.6 Activating the air conditioner Manually

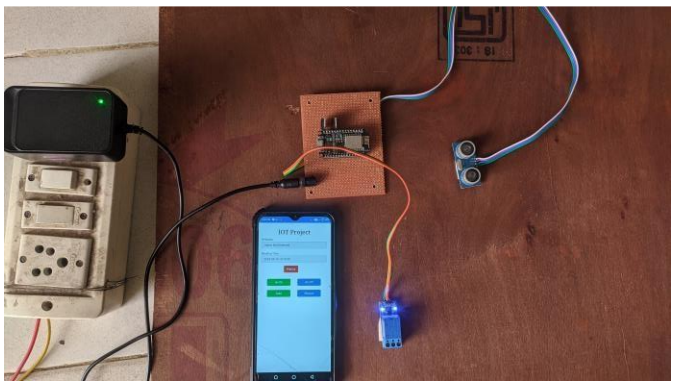

Figure 4.7 Physical Hardware Setup

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4.2 CONCLUSION

Since there would be no need to continuously turn on and off the air conditioning when more vital work is needed, the IOT Smart Air Conditioning Control System would create a comfortable working atmosphere. The Ulrtasonic sensors will keep track of who enters and leaves the room and relay that information to the microcontroller. Depending on how many people are in the room, the microcontroller will turn the AC on or off. It significantly minimizes the amount of power used and the time required for humans to periodically alter the temperature.

FUTURE SCOPE

The future scope of using ultrasonic sensors for automatic on/off processes in air conditioning systems is quite promising. Here are a few potential benefits and implications:

Energy Efficiency: Ultrasonic sensors can detect the presence of people in a room or area and automatically adjust the air conditioning system accordingly. This feature helps in conserving energy by turning off or reducing the cooling when no occupants are present. It can lead to significant energy savings in commercial buildings, offices, and residential spaces.

Enhanced Comfort and Convenience: With ultrasonic sensors, air conditioning systems can dynamically adjust the temperature and airflow based on the number of occupants and their location within a room. This capability ensures personalized comfort and eliminates the need for manual temperature adjustments.

Cost Savings: By optimizing energy consumption, ultrasonic sensors can help reduce electricity bills associated with air conditioning usage. The automatic on/off functionality prevents unnecessary cooling when spaces are unoccupied, resulting in cost savings for both residential and commercial users.

Environmental Impact: Energy-efficient air conditioning systems contribute to reducing carbon emissions and overall environmental impact. By incorporating ultrasonic sensors for automatic on/off processes, the technology helps promote sustainability and aligns with global efforts to combat climate change.

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