IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 12, May 2023

Temperature Based Fan Speed Control using NODEMCU (ESP8266)

Prajwal Lanjewar[1], Ashutosh Sarkar[2], Rahul Iraveni[3], Himanshu Khoke[4], Nikhil Durge[5], Madhavi Sadu[6]
Students, Computer Science Engineering Department [1,2,3,4,5]
Assistant Professor, Computer Science Engineering Department [6]
Rajiv Gandhi College of Engineering, Research and Technology, Chandrapur, Maharashtra, India.

Abstract: *With the rapid advancement of technology, our homes have embraced full automation, leading to a significant increase in our daily electricity consumption. Among the various benefits, the regular use of fans stands out as a means of ensuring comfort, particularly during hot weather. Consequently, it becomes our responsibility to establish a reliable system that promotes efficient electricity usage. This article outlines the procedure and functionality of an ESP8266-based Temperature Based Automatic Ceiling Fan system. The core components of this system include the ESP8266 microcontroller and a dimmer. The ESP8266 microcontroller offers built-in Wi-Fi capabilities, allowing seamless data transmission to the cloud. By leveraging these features, we can create a standalone automatic fan controller that adjusts the fan's speed based on the prevailing room temperature. The proposed system operates by measuring the room temperature using a sensor, such as the DHT22, and transmitting the collected data to the microcontroller. The microcontroller then regulates the fan's speed according to the temperature reading.*
This project serves as a demonstration of how to implement temperature-based fan speed control and monitoring using the DHT22 sensor, ESP8266 microcontroller, and dimmer. By incorporating these components, the microcontroller facilitates efficient operation by dynamically adjusting the fan's speed to meet specific requirements. The dimmer module comprises various components such as capacitors, TRIACs, diodes, and registers. These elements work together to control the power supplied to the fan, thus regulating its speed. Additionally, the inclusion of an LCD screen enhances the user-friendliness of the project by providing real-time displays of the fan speed and temperature at regular intervals.

Keywords: ESP8266, Home Automation, Fan Speed, DHT11 temperature sensor, Fan Speed Controller, LCD, Dimmer, etc

I. INTRODUCTION

Microcontroller plays a crucial role in making the automated things. Microcontrollers have become heart of future technologies. A microcontroller is chip for controlling machines and automates it. This is a simple project which will automate the home and help to consume less electricity.
We will use the ESP8266 microcontroller in this project. This project will help to reduce the energy consumption on daily basis. The temperature sensor will sense the temperature and send to the microcontroller to control the fan by the room temperature. This project have several applications such as we could use this watercoolers, ceiling fans, exhausts fans, engines, home appliances, etc.

II. LITERATURE REVIEW

The research paper authored by M. A. A. Mashud, Dilruba Yasmin, M. A. Razzaque, and M. H. Uddin titled "PT-100-Based Automatic Fan Speed Controller for Room Temperature Control" explores the automatic control of fan speed by utilizing PT-100 temperature sensors. The paper emphasizes the significance of temperature monitoring and control in both industrial and everyday environments, given the ever-changing weather conditions. The electronic circuit includes essential components such as transistors, diodes, resistors, and capacitors, with the PT-100 sensor exhibiting a direct proportionality between its resistance and the fan speed as influenced by the temperature.

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The research paper presented by Srinivas P, Kavinkumar B, and Dr. R. Senthil Kumar on "Temperature-Based Fan Speed Controller" provides an overview of a standalone automatic fan speed controller that meets personalized requirements. This project utilizes a LM-35 temperature sensor, which converts temperature into an electrical (analog) signal. The signal is then processed by the ATmega328 microcontroller on the Arduino UNO Board, converting it into a digital signal. The recorded temperature and fan speed values are displayed on a LCD screen. The objectives of this project include energy conservation, assisting individuals with disabilities by automating fan speed adjustments, and the future integration of monitoring parameters such as humidity and light.

The paper authored by Shwetha S Baligar, Srinidhi S Joshi, Sujay Mudhole, Spoorti S Jadhav, and Chaitanya K Jambotkar titled "Arduino-Based Temperature-Controlled Fan Speed Regulation using PWM Technique" proposes a low-cost and user-friendly automated temperature-controlled fan regulator. The project employs the Arduino UNO and a LM-35 sensor, utilizing pulse width modulation (PWM) technique for temperature and fan speed monitoring and control. The paper includes experimental results obtained by operating a prototype at various temperatures, showcasing the real-time behaviour of the embedded system in response to temperature variations.

The research paper by Nigade, Deepanshu Verma, Brajesh Kumar Pandey, and Pranjal Srivastav titled "Temperature-Based Automatic Fan Speed Controller with Signal Amplification" focuses on utilizing an amplifier to strengthen the signal from the temperature sensor, which is typically weak in amplitude and strength. The paper highlights the application of this system in cooling electronic devices, where the fan speed needs to increase with higher heat dissipation. The main objective is to replace manual fan settings with temperature-based control, enabling the detection of temperature variations and automatic adjustment of fan speed. The project aims to enhance energy efficiency and demonstrates the existence of a linear relationship between fan speed and ambient temperature.

The research paper authored by Dr. M. Jamuna Rani, M. Senthil Vadivu, Surya K, Vallamsetti Krishna, and Lokesh R titled "Arduino-Based Fan Speed Control with Temperature Monitoring" proposes a temperature-based fan speed control and monitoring system using an LM-35 sensor and Arduino microcontroller. The project allows dynamic and efficient fan operation by adjusting the speed according to the desired requirements. The inclusion of an LCD screen enhances the user-friendliness of the system, displaying real-time temperature changes and fan efficiency. The proposed approach replaces conventional regulators with the LM-35 sensor, enabling proportional fan speed adjustment based on room temperature and aiming to reduce electricity consumption while ensuring an user-friendly interface.

III. METHODOLOGY

The primary goal of this project is to control the fan speed using microcontroller with the help of various other components. We use DHT11 sensor to take the temperature of the room as an input and sends this data to microcontroller ESP8266.DHT11 identifies the appropriate temperature to monitor the temperature of the room. Microcontroller with the help of dimmer automatically controls the fan speed using this temperature.

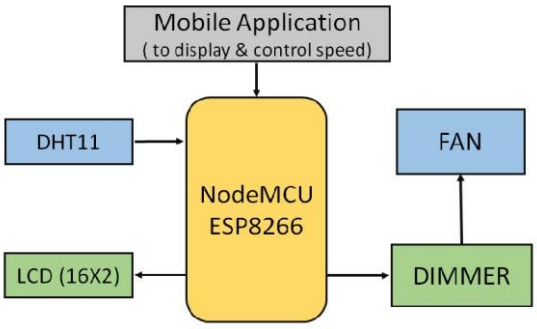

Fig. 1 Block Diagram.

The different hardware components that we use for this project are given below:

NodeMCU

DHT11 Sensor

Capacitor

TRIAC

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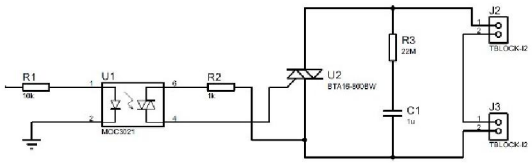
Diode
Registers
Battery
Connecting Wires
The software components that are used for the project are as follows:
Arduino IDE
Blynk



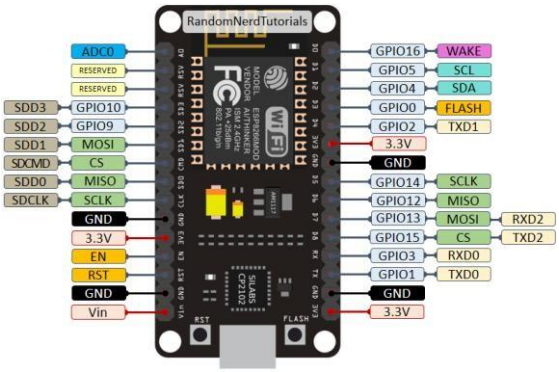
One of the main circuit of project AC dimmer. The circuit diagram of AC dimmer given below:

3.1 Components

1. Hardware Components

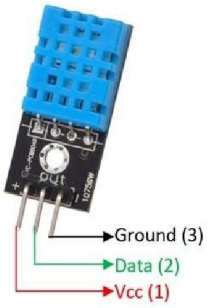
NodeMCU:

The NodeMCU is a microcontroller developed by Espressif Systems, known as ESP8266. It serves as a standalone WiFi networking solution, bridging microcontrollers to WiFi and supporting standalone applications. The NodeMCU devkit has a built-in USB connector and can be easily connected to a laptop using a micro USB cable. It can also be used on breadboards for prototyping purposes.



DHT Sensor:

The DHT sensor, short for Digital Humidity and Temperature Sensor, is commonly used to measure temperature and humidity. The DHT11 is a specific type of DHT sensor that includes a separate NTC (Negative Temperature Coefficient) to measure temperature. It provides temperature and humidity values as serial data output, which can be read by an 8-bit microcontroller..



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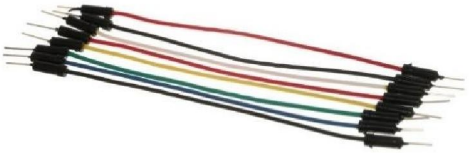
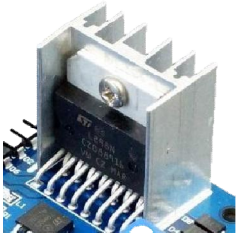
Jumper Wires:

Jumper wires are simple wires with pins on both ends, allowing for easy connections between different points. They are commonly used with breadboards and other prototyping tools to create flexible and temporary electrical connections. Jumper wires provide a convenient way to modify circuits quickly.



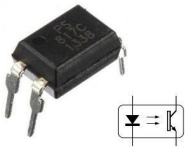
TRIAC:

A TRIAC is a three-prong AC (Alternating Current) device used for controlling AC power. It differs from other thyristor rectifiers by being able to switch in both directions, regardless of whether the gate signal is positive or negative. TRIACs are commonly used for AC system modifications and are available in various power ratings, with commercial options reaching up to 16 kW.



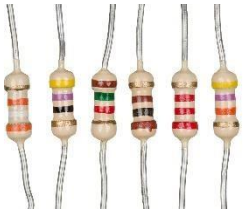
Optocoupler

An optocoupler, also referred to as an optoisolator, is an electronic device that allows electrical signals to be transmitted between two separate circuits. It consists of an LED that emits infrared light and a light sensor that detects the emitted light. The LED and light sensor are enclosed within a black box with connection pins. Optocouplers are used to electrically isolate two c ircuits while allowing signal transmission between them.



Resistors

Resistors are fundamental electronic components that restrict the flow of electric current within a circuit. They are used to control current, voltage levels, and signal attenuation. Resistors come in different resistance values and are commonly used to limit current flow, set voltage levels, or divide voltages in various electronic applications.



Capacitor

Polyester capacitors, also known as Mylar capacitors, consists of two plates separated by a Mylar film. Alternatively, a metallized film may be used as the dielectric. Polyester capacitors have capacitance values ranging from 1nF to 15µF and operating voltages between 50 and 1500V. They have tolerance levels of 5%, 10%, or 20% and exhibit a high temperature coefficient. These capacitors are widely used in electronic circuits for various applications.

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VI. CONCLUSION

Traditionally the manual switching is a way long method to control the fan speed. So we proposed this to overcome the drawbacks. With this project you can control the speed of the fan from automatically and displays the speed to the user. This paper is effectively experimented & implemented for automation Smachine is cost effective, reliable, versatile and easy to use.

VII. ACKNOWLEDGEMENT

We would like to express our deepest gratitude and respects to Z. J. Khan, Principal, RCERT and Prof. Dr. Nitin Janwe, The Head of Department of Computer Scienceand Engineering, RCERT, Chandrapur, Maharashtra. We are grateful to Prof. Dr. Madhavi Sadu our Project Guide for their precious assistance and guidance. We received enormous support and help from our professors. Thanking them for their valuable feedbacks. We could not have undertaken this journey of this project without all guidance and experience they shared with us.

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