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# IoT based Fan speed control

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**ABSTRACT—**

This study introduces an Internet of Things (IoT)-based fan speed control system intended to maximize automation and energy efficiency in temperature control. In order to dynamically modify fan speed in response to current environmental conditions, the system combines an ESP32 microcontroller, temperature sensors, and Pulse Width Modulation (PWM) techniques. Users can monitor and adjust the fan speed remotely by utilizing Wi-Fi connectivity, which increases flexibility and convenience. Results from experiments show how well the system works to precisely regulate temperature, which enhances user experience and promotes sustainability. Cloud-based data processing for advanced analytics and machine learning algorithms for predictive control are possible future improvements.

**Keywords** : IoT, Fan Speed Control, ESP32, Temperature Sensor, PWM, Wi-Fi Module, Smart Automation, Energy Efficiency, Embedded Systems, Real-Time Data Visualization, Home Automation, Industrial Applications, Wireless Communication.

## I.Introduction

Automation and energy efficiency are improved when IoT technology is incorporated into fan speed control systems. Conventional techniques use manual adjustments, which results in ineffective cooling. ESP32, temperature sensors, and PWM techniques are used in this paper's IoT-based fan speed control system, which allows for remote accessibility, real-time monitoring, and optimal temperature regulation for smart environments.

## II. Literature survey

Energy efficiency, automation, and real-time monitoring have been the main focuses of recent developments in Internet of Things-based fan speed control systems. Numerous studies demonstrate how well temperature sensors, PWM techniques, and microcontrollers like the ESP32 can dynamically modify fan speed in response to environmental factors. Previous studies show that IoT-enabled solutions are more adaptable and use less power when compared to conventional thermostatic controls. Smarter cooling solutions have been made possible by the use of machine learning algorithms and cloud-based data processing to address issues like sensor accuracy, response time, and system scalability.

## III. EXISTING SYSTEM

Conventional fan speed control systems frequently result in inconsistent temperature regulation and energy inefficiencies because they rely on manual adjustments or simple thermostatic mechanisms. Smart fan control systems that combine microcontrollers, temperature sensors, and wireless communication for real-time monitoring and adaptive speed control have been made possible by recent developments in IoT-based automation. Current solutions, like those based on ESP8266 and ESP32, use Pulse Width Modulation (PWM) techniques to dynamically control fan speed in response to environmental factors. For remote accessibility, some implementations use mobile applications and cloud-based data processing. Modern IoT-enabled fan control systems still need to address issues like sensor accuracy, response time, and system scalability.

## IV. PROPOSED SYSTEM

In order to dynamically modify fan speed in response to environmental conditions, the Internet of Things-based fan speed control system combines an ESP32 microcontroller, temperature sensors, and PWM techniques. Real-time data visualization is provided by an LCD display, and remote monitoring is made possible by a Wi-Fi module. For smart cooling applications, this system improves user convenience, automation, and energy efficiency.

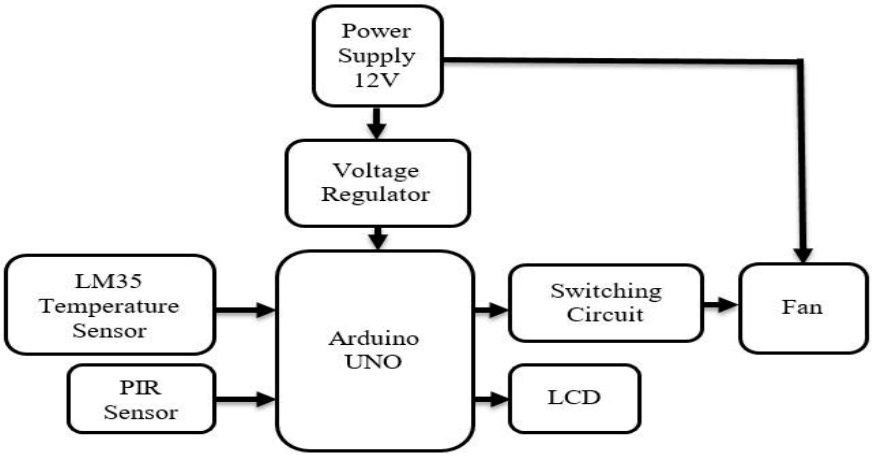


**Fig.1 Block diagram**

***A.COMPONENTS USED***

1. **1. Power Supply (12V):** The *power supply* is responsible for providing stable electrical energy to all components. It ensures that the microcontroller, sensors, and display operate effectively without fluctuations. A *regulated 12V source* is typically used to ensure consistent voltage distribution.
2. *Voltage Regulator:* The *voltage regulator* ensures that each component receives the required voltage. Since the *Arduino UNO* and sensors operate at lower voltage levels, this regulator converts *12V* to a suitable level, preventing damage caused by electrical surges.
3. *Arduino UNO*: The *Arduino UNO* serves as the brain of the system. It processes data from sensors, executes predefined logic, and controls the switching circuit. The microcontroller reads temperature and motion data, determines appropriate fan speed adjustments, and sends commands accordingly.
4. *LM35 Temperature Sensor*: The *LM35* is a precision temperature sensor that measures the ambient temperature and converts it into an electrical signal. The output is in milli volts, where *10mV* corresponds to *1°C*. The *Arduino UNO* reads this data and determines whether to activate or regulate the fan speed.
5. *PIR Sensor*: The *Passive Infrared (PIR) sensor* detects motion in its vicinity. If movement is detected, it sends a signal to the microcontroller. This feature helps optimize energy efficiency by ensuring the fan operates only when necessary.
6. *Switching Circuit*: The *switching circuit* is responsible for regulating the operation of the fan. It works based on input signals from the *Arduino UNO*, turning the fan *ON* or *OFF* as required. The circuit consists of transistors or *MOSFETs*, allowing seamless activation and speed control.
7. *LCD Display*: A *16x2 LCD display* is used to show *temperature readings, fan speed status*, and motion detection updates. The display receives processed data from the *Arduino UNO*, ensuring real-time monitoring. This feature enhances usability, allowing users to track environmental changes efficiently.
8. *Fan*: The *fan* operates based on sensor inputs. When the *LM35 temperature sensor* detects a high temperature, the *Arduino UNO* signals the switching circuit to activate the fan. If temperature decreases or motion is not detected, the fan speed is reduced or switched off.
9. *IoT Module*: The *IoT module* allows remote access and control. Using *Wi-Fi* connectivity, users can monitor temperature, motion detection, and fan operation via an online dashboard or a mobile app.
   This feature makes the system suitable for smart home applications.
10. *Mosfet Unit*: The *Mosfet unit* is responsible for precise fan speed control. It functions as an electronic switch that adjusts voltage levels sent to the fan, enabling automated speed modulation based on environmental conditions.

## VI. RESULT AND CONCLUSION

***RESULT :***

By dynamically modifying fan speed in response to temperature readings from a DHT11 sensor, the Internet of Things-based fan speed control system effectively manages airflow. To ensure accurate motor speed control, the Node MCU (ESP8266) interprets sensor data and sends commands to the Mosfet unit. An LCD display enables real-time monitoring, giving precise environmental feedback, and the IoT module enables automation and remote access. By adjusting fan speed in response to temperature changes, the system dramatically improves energy efficiency and minimizes wasteful power consumption, as shown by experimental validation.

***CONCLUSION:***

For intelligent climate control, the suggested Internet of Things-based fan speed control system effectively combines real-time monitoring, microcontrollers, and smart sensors. It reduces the need for human intervention and increases energy efficiency by automating fan operation.This study demonstrates how IoT can improve user convenience, minimize energy waste, and optimize environmental control systems. For even more optimization, future research might investigate sophisticated control algorithms and more sensor integration.

## V. Result

**Test Result Table**

| Box PWM Set Value (%) | Room Temperature (°C) | Fan Input Voltage (V) | Fan Speed (RPM or %) |
|---|---|---|---|
| 0 | 28.0 | 0 | 0 |
| 20 | 30.5 | 2.4 | 800 |
| 40 | 32.0 | 4.8 | 1500 |
| 60 | 34.0 | 7.2 | 2200 |
| 80 | 35.5 | 9.6 | 2800 |
| 100 | 37.0 | 12.0 | 3500 |

**Fig 3 shows the tabulate form to collect the data**

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