IoT based Energy Efficient Smart Ceiling Fan for Home Automation

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Abstract - **In this paper, a design is proposed using temperature sensor for automation of fans using Arduino, NodeMCU with Internet of Things (IoT) for homes. Now a day there are various requirements of common man. IoT is going to play essential role in application such as smart home, industry, smart cities, etc. In this project, we are implementing smart fan module for controlling fan speed based on room temperature, and also making turn on or off fan by using IR Remote. The NodeMCU is connected to arduino. First it checks whether Wi-Fi connection is established or not. If Wi-Fi is connected, then temperature of room can be sensed by using DHT11 temperature sensor that signal is given to NodeMCU. If temperature is low, then fan will rotate slowly and if temperature is high then fan will be high. ESP8266 Wi-Fi shows the current status of project in the blynk app. If Wi-Fi is not connected, then we can control fan by using IR Remote. Mosquito repeller circuit is also added in this project. The developed approach is benefited regarding preventing waste of energy when it is not hot enough to use a fan and assist the disabled people to switch on or off fan from their location.**

Index Terms - **IoT, DHT11 sensor, ESP8266 Wi-Fi, Arduino, IR sensor and Remote.**

1.INTRODUCTION

Now a day everyone is looking towards smarter and automated technologies. NodeMCU is used to make thing smart. Arduino is used to control and automate processes. It is a single chip that executes a code. It checks whether Wi-Fi connection is established or not. If Wi-Fi is connected, then by using blynk app we can control the fan and by using goggle assistant also we can control fan means if we say turn on fan then that signal is given to arduino that will turn on fan. And if we say turn off fan then signal is send to arduino that will turn off fan. If Wi-Fi connection is not established then also we can turn on or off fan by using IR Remote. Particular button is defined for turn on fan and other

button is defined for turn off fan. The temperature sensed by DHT11 is visible in blynk when Wi-Fi is connected. For mosquito repeller circuit we are using two piezoelectric disks. That disk we are connecting in parallel and setting frequency to 31 KHz which is not audible to human being.

2.LITERATURE REVIEW

In present era, the fans which are used at homes can be switch ON or OFF manually and the speed of these ceiling fans are also controlled by using speed regulator. Several types of speed regulator are developed which can control the speed of fan by twisting it in a particular direction. [1] This paper presents the design and simulation of the fan speed control system using PWM technique based on the room temperature. A temperature sensor has been used to measure the temperature of the room and speed of the fan is varied according to the room temperature using PWM technique. [2] Smart fan is gaining its popularity in past few years due to its affordable cost, simplicity, and easy connectivity with the smart phones and tablets. [3] A new concept "Internet of Things" has made the home automation system more popularized. This assembles the electrical home appliances and devices with each other. The new concept of integration of home environment with information technologies into a well communicates in a one body manner to conserve the electrical power, ease of use and energy efficient system also at safety perspective benefits. [4] In recent years the home automation system is gaining its importance because of its simplicity and easy connectivity with upcoming smart phones and gaining importance with its affordability. As known in home automation system various home appliances are connected to each other using information technology to enhance the energy efficiency and security system. The problem with such

a system is its complexity with user and other devices and adaptability. This results the home automation system more costly and makes accessible to only wealthy crowd. [5]

3. METHODOLOGY

In this paper we are designing an IoT based Energy Efficient Smart Ceiling Fan for Home Automation module. To sense the room temperature we are using DHT11 sensor. According to the temperature sensed by DHT11 sensor from room the arduino control the speed of fan. In this project we first define the sensor, then arduino checks the Wi-Fi connection is established or not. If Wi-Fi is connected then by using blynk app we control the fan. As well as by using voice command like turn on fan or turn off fan we can make on/off fan by using goggle assistant. The minimum temperature is considered in this project is 27^0C. And maximum temperature is 30^0C. If the temperature sensed by DHT11 is below minimum temperature defined then fan will be in OFF condition. If temperature sensed by DHT11 is above minimum temperature and maximum temperature then fan will be in ON condition. The sensed temperature we can see in blynk app. If Wi-Fi is disconnected or not connected in that case we can control fan by using IR Remote. "Volume +" is defined for turn ON fan and "Volume –"is defined to turn OFF fan. If we have to turn on fan then we have to press that volume + button and to turn off fan we have to press that volume – button. The repeller is in the form of a shield that plugs into arduino board and the frequency of the repeller can be changed easily. This project is ideal if we are going camping or hiking outdoors, this device produces a sound of 31 KHz frequency which acts as a mosquito repellent. Human ears are not sensitive to these frequency ranges.
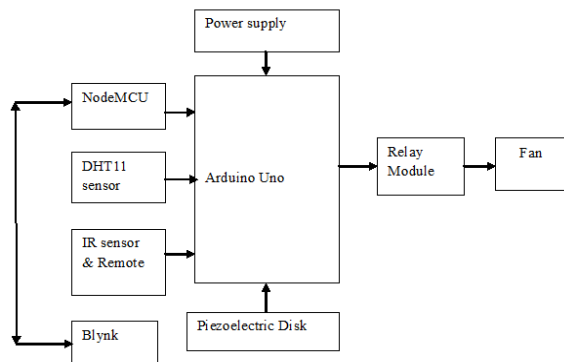

Figure 1: Block Diagram of Project

3.1 Arduino Uno:

An Arduino is an open source computer hardware and software, project and user community that designs and manufactures Microcontroller based tools for building digital devices and interactive objects that can sense and control real world. We have a tendency to be victimization Arduino Uno as a controller that controls all the operations. The Arduino Uno that could be a microcontroller board supported the ATmega 328 as we all know "Uno" suggest that one in Italian thus named to mark the coming unleash of arduino one. 0 it's in tern fourteen digital input or output pins, Six analog inputs, A16 Mc ceramic resonator, A USB affiliation, an influence jack, associate degree ICSP header and a push button.

Figure 2: Arduino Uno

3.2 NodeMCU (ESP8266):

NodeMCU is an open –source Lua based firmware and development board specially targeted for IoT Applications. ESP8266 Wi-Fi module is a device which is interfaced with the Arduino board gives Wi-Fi ability which works similar to Wi-Fi shield. It works with AT command set. This module has power on board processing and storage capability that allows it to be integrated with the sensor and other application through its GPIOs. ESP8266 Wi-Fi module used for storing data in the cloud.
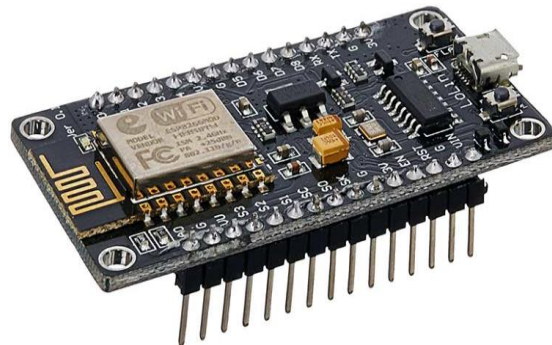

Figure 3: NodeMCU

3.3 DHT11 (Temperature) Sensor:

DHT11 temperature and Humidity sensor features a temperature & humidity sensor complex with a calibrated digital signal output. The calibration coefficients are stored as programmes in the OTP memory, which are used by the sensor's internal signal detecting process. It has excellent quality, fast response. It is available in low cost. DHT11 sensor containing Data, Voltage and Ground that are connected to board.
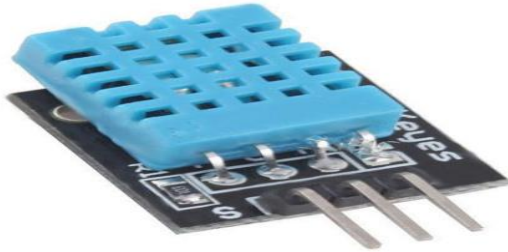

Figure 4: DHT11 sensor.

3.4 IR sensor and Remote:

IR or infrared communication is one of the most common methods of wireless communication due to being easy to use and having an affordable price. A typical infrared communication system requires an IR transmitter and IR receiver. IR Remote we have a tendency to management the speed of the induction motor. These modules have three pins for Vout, VDD, and Ground. So it's very easy to use in circuits. The IR sensor detects infrared light, which is used for switching on/off fan. The feature of IR sensor is that will bounce of object into light sensor.
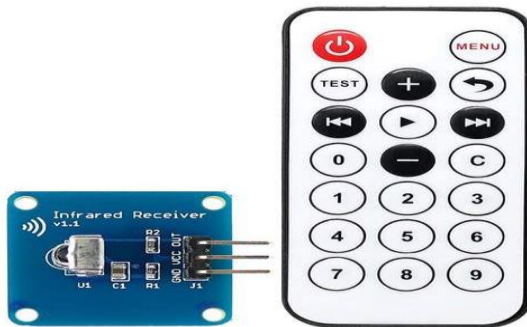

Figure 5: IR sensor and Remote

3.5 Relay:

The fan uses 220 AC voltage but the NodeMCU and all the sensor uses 3.3-5 DC voltage which cannot be wired up together. The relay acted as a switch for the fan when IR remote button is pressed the fan will turn on or off accordingly.

Figure 6: Relay.

3.6 Fan:

Temperature sensor measure the temperature of surrounding. It measures the temperature variations as temperature value reaches some threshold value it switches on the DC fan. This is a simple fan operated by direct current.
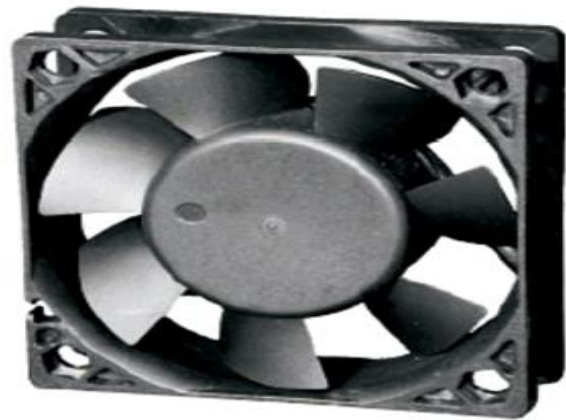

Figure 7: Fan

3.7 Piezoelectric Disk:

A piezoelectric disk (sensor) is a device that uses the piezoelectric effect to measure changes in pressure, acceleration, temperature, strain or force by converting them to an electrical charge.
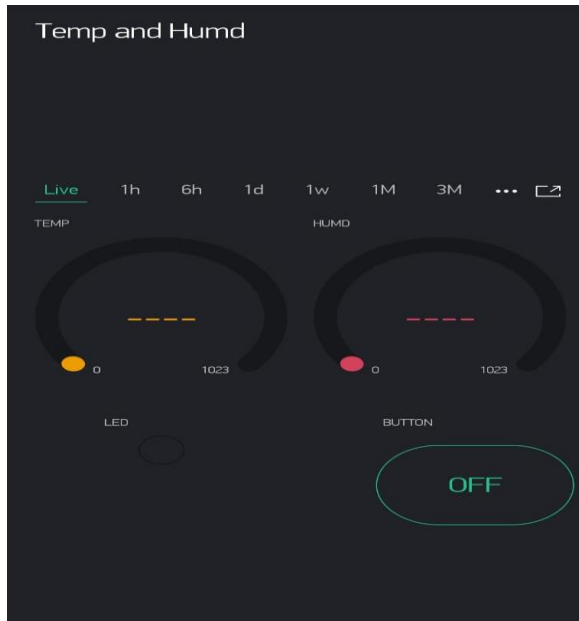

Figure 8: Piezoelectric Disk

4. RESULTS

Figure 9: Blynk status when Wi-Fi is not connected

Figure 10: Blynk status when Wi-Fi is connected

5. CONCLUSION

The design and construction of fan speed control system to control the room temperature by turn on/off with the help of blynk app and IR Remote. The output was checked by the temperature at different levels with the help of DHT11 sensor and it is found that fan controls accordingly. Arduino is successfully programmed using C/C++ language to compare temperature with standard temperature and turn ON/OFF fan. It is very useful to the people who are disabled.

6. ACKNOWLEGMENT

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