AUTOMATED FAN SPEED CONTROL SYSTEM

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***Abstract*—Thispaper present the design of automated fan speed control system. The method to develop this kind of fan is divided into two parts which are hardware and software development. The speed control system is accomplished using relay module, ultrasonic sensor and temperature sensor. The speed control is automated according to the room temperature. The automated fan speed control system is successfully designed and developed.**

Keyword— automatic fan, temperature sensor, ultrasonic sensor, Relay Module.

I. INTRODUCTION

Nowadays, almost everything is automated.The need of automating the electronic devices is increasing day by day. From literature review, it proved that the automated system had potential to reduce the cost, increase the productivity, availability, reliability and performance.

The demand on the automated system had attracted many researches to focus in the field of automatic control system. From previous research done by various researchers had showed the innovation of the Automatic Temperature Controlled Fan Using Thermistor [1], Automatic Fan Speed Control System Using Microcontroller [2], Design an Automatic Temperature Control System for Smart Electric Fan Using PIC [3], Fan Temperature Detection Using Microcontroller [6] and Automatic Room Temperature Controlled Fan Using Arduino Uno Microcontroller [9].

In fact, with the rapid change of computer and microchip technology had showed the research on automated system still progress and ongoing.

In this work, it is aim to design and develop the automated fan speed control system using relay module. The speed control is automated based on the temperature in the room. The concept of ON/OFF control system is implemented in this work.

II. ON/OFF CONTROL SYSTEM

An ON/OFF controller is the simplest form of feedback control. The output from the devices is simply from fully closed to fully open depending on the positioned of the controlled variable relative to the set point. This is as illustrated in Fig. 1.

The speed controller will turn ON when the temperature is exceeding the set point and turn it OFF when the desired temperature achieved.

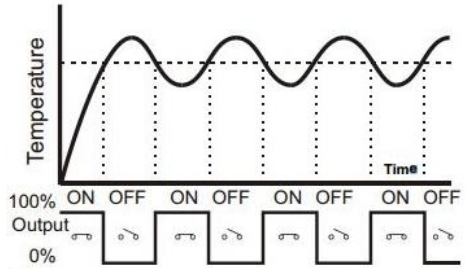


Fig. 1: Basic ON/OFF control system

III. METHODOLOGY

Theaccomplishment of this project is divided into two parts namely hardware and software development. The details are elaborated in the following sections.

A. Hardware Development

The block diagram of the system is as shown in Fig. 2.

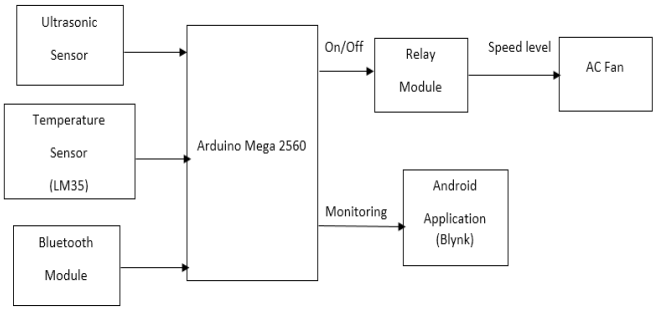


Fig. 2: Block Diagram of the system

As shown in Fig. 2, the hardware system comprise of Arduino Mega 2560, ultrasonic sensor, temperature sensor LM35, Relay module and AC fan.

The Arduino Mega 2560 is the main part in this project.It is a microcontroller board based on the

ATmega2560 which has 54 digital input/output pins, 16 analoginput, 4 UARTs, a 16MHz crystal oscillator a USB connection, a power jack and ICSP header.

Apart from that, the Ultrasonic Module Hc-SR04 is used in this project to detect the presence of the human in the room. The working principle of the module is as illustrated in Fig 3.

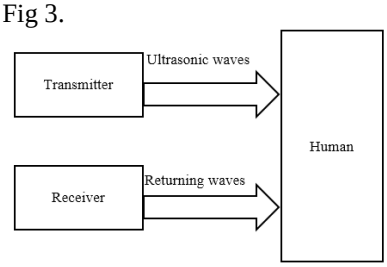


Fig. 3:Ultrasonic Sensor Working

The transmitter is to detect the time taken waves after the collision with the human and ready to send back the time taken waves to the receiver. The waves travel from transmitter and go back to the transmitter is the same distance. Hence, the distance between ultrasonic sensor and human is measure by formula [11]:

Distance = Speed x Time/2

Fig. 4 show the connection between the ultrasonic sensor and the Arduino Mega 2560.

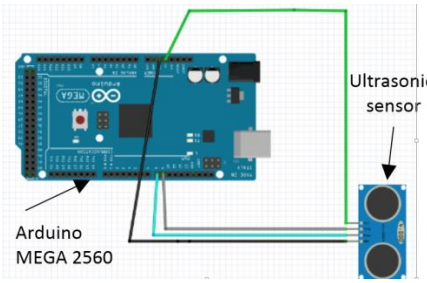


Fig. 4: Ultrasonic connection

The temperature sensor LM35 used in this project is to measure the room temperature. The LM35 can support to read a surrounding temperature from -50C to 60C. It is sufficient to read temperature in the room.. LM35 sensor was interfaced with the microcontroller to control the speed level on the fan. The temperature output from LM35 need to convert to unit Celsius °C by using this formula:

*Temperature Output in Celsius °C= Output value (LM35) * 0.48828125*

As shown in Fig. 5, the LM35 has 3 pin out which is Vs (supply voltage), Output and Ground. The LM35 required 5 V to work and measure the accurate room temperature.

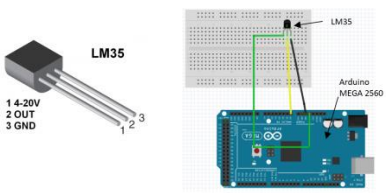


Fig. 5: LM35 pin-out and the connection

In this work, the 4 channel relay module is used as a function to trigger the speed level of the fan. However, only 3 output relay are used to control the speed level of the fan. The relay module required 5 V to operate. Fig. 6 shows the overall hardware system used in this project.

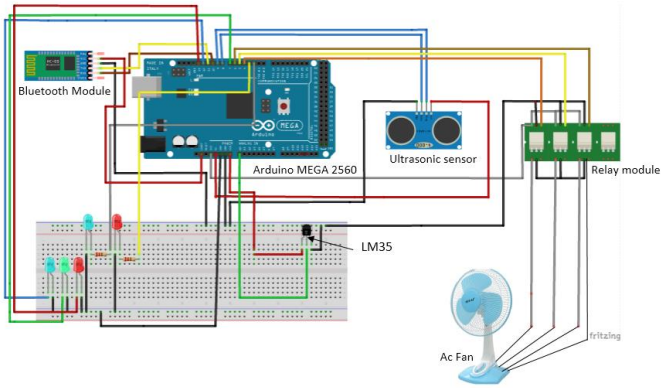


Fig. 6: Overall hardware system

B. Software Development

Fig. 7 shows the software development of the project.

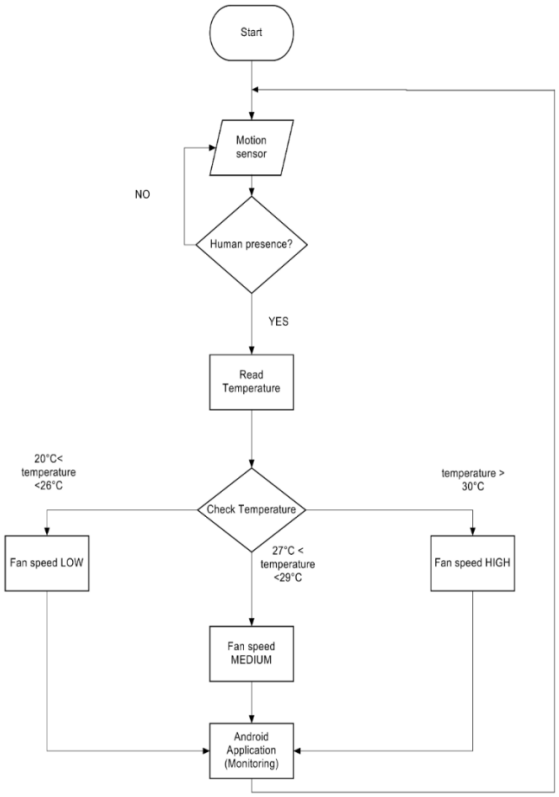


Fig. 7: Software development

The system is designed in such that the fan will automatically ON/OFF with appropriate speed when the conditions are met. There are two conditions namely the presence of human and the reading of the temperature in the room.

Table I shows the conditions setup used in this work. There are three types of speed known as Low, Medium and High that activated based on the detected temperature range. The system is only activated with the presence of human. The system is inactive without the presence of

human in the room eventhough the temperature exceeds the set point.

Table I: System conditions setup

Human Presence	Temperature Range (T)	Speed Control
Yes	20°C< T <26°C	Low
	27°C<T< 29°C	Medium
	T > 30°C	High

C. *System Performance Evaluation*

The system performance is evaluated in term of the functionality of the component used. The system setup is as shown in Fig. 8. The system performance is tested at room temperature from 25 until 33. The results are in a form of observation and measurement using appropriate tools.

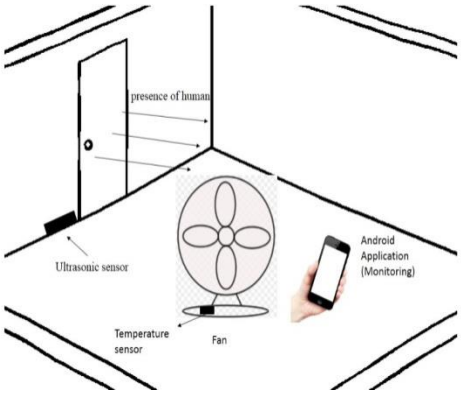
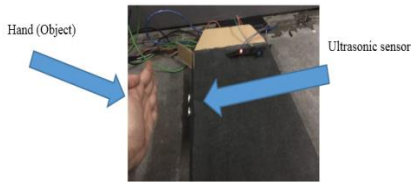


Fig.8: System Setup

IV. RESULT AND DISCUSSION

A. *Hardware Functionality*

The results presented in this section are basically based on the observation rather than measurement. The functionality of the ultrasonic sensor is as shown in Fig. 9.



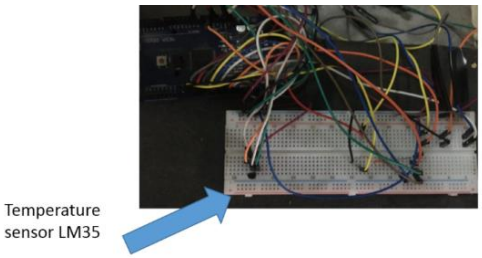
(a)

Blue led light up

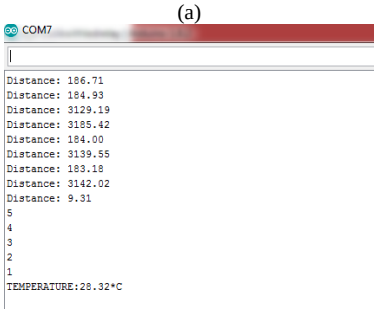
(b)

Fig. 9: Result for ultrasonic sensor functionality

The functionality of the LM35 is tested and observed. The result is as shown in Fig. 10.



(a)



(b)

(c)

Fig. 10: Result for LM35 functionality

The temperature reading from LM35 in Fig.10(b) is 28.32 °C and the reading temperature from temperature device in Fig.10 (c) is 28.6°C. The value between them is closed. It show that the LM35 is working fine.

B. *Software Functionality*

Table II shows the result to prove the system is functioning accordingly.

Table II: Result show the functioning of the system

Time	Number of person	Room temperature	Speed of the fan
8.00am-8.30am	0	26°C	NA

(a)

Time	Number of person	Temperature	Speed of the fan
8.35am-9.00am	2	27°C	1
9.05am-9.30am	4	28°C	2
9.35am-10.30am	6	28°C	2

(b)

It can be seen that the temperature only reach at 26°C and the fan not active when without presence of people. The speed of the fan changes accordingly when two conditions are met as shown in Table II (b).

V. CONCLUSION

As a conclusion, the system to control the fan speed has been developed. The AC fan has been modified to identify the current temperate and manipulate the speed of fan based on the temperature that had been collected from time to time. The analysis on the suitable speed based on varies temperature had been conducted and the result is used to improve the efficiency of the system performance.

For the future recommendation, this project can be better with control based on internet of things to improve the degree of user friendly.

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