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Automatic Fan and Light with Arduino Based LM35 Sensor

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Abstract—**Technology from time to time is growing rapidly in various sectors, so its development can make it easier for humans to solve problems in everyday life. Every individual has negligence whether intentional or unintentional. As a result, humans will bear the risk of negligence. The phenomenon that is often complained of due to negligence is the price of electricity payments which continues to increase due to a lack of discipline in using it. Therefore, to minimize human negligence, we have made an automatic fan with an LM35 sensor which we hope can overcome this problem. Based on the test results of the automatic fan adjustment tool, it was found that when the fan was not activated, the room temperature was in the range of 28°C to 29°C, while when the fan was activated, the room temperature also increased, but not significantly and the temperature was only in the range of 30.76°. C to 32.71°C.**

Keywords—Automatic fan, rtc ds3231, lm35

I. INTRODUCTION

Technology from time to time is growing rapidly in various sectors, so its development can make it easier for humans to solve problems in everyday life. Talking about humans, of course, every individual has negligence whether intentional or unintentional. As a result, humans will bear the risk of negligence. The phenomenon that is often complained of due to negligence is the price of electricity payments which continues to increase due to a lack of discipline in using it. One of the factors that can trigger an increase in the price of electricity payments is forgetting to turn off the fan after use.

In addition to the increase in the payment of electricity costs, the fan components will also be damaged quickly if the fan is not used with discipline. This will lead to high costs due to human negligence itself. Therefore, to minimize human negligence, we made an automatic fan with the LM35 sensor which we hope can overcome this problem.

In a study conducted by Rafika et all. in 2014 under the title Prototype, the design of an automatic system for reading room temperature using a fan output and an LM35 sensor based on an ATMEGA 16 microcontroller, explains the use of the LM35 sensor to obtain temperature data in the room which can then be displayed on the LCD. The microcontroller will regulate the operational schedule of the fan, starting with the room temperature has reached then the fan will start rotating. With the increase in the temperature in the room, it will be followed by the rotation of the fan. This innovation is needed as a solution to the problems faced at this time, namely the manual system when turning on and off the fan.

II. LITERATURE REVIEW

A. Automatic Fan

Fans are used to generate wind. Common functions are air conditioning, air freshener, ventilation (exhaust fan), and dryer (generally using heat-generating components). The fan functions to maintain the air temperature so that it does not exceed the set temperature limit. In general, the rooms still use the fan as a cooling device. The use of fans is needed to cool the room with the aim that students and lecturers become comfortable when teaching. A fan that continues to spin even though the room temperature is cold, such as when it rains will be able to increase school electricity costs in the end. To overcome these problems, and innovation in automatic fan technology is proposed. The fan will spin when the room temperature is above a certain temperature and will stop when the room temperature is below that temperature. The system will work automatically using Arduino UNO microcontroller technology which is integrated with the LM35 temperature sensor.

B. Arduino UNO

Arduino Uno is a microcontroller board based on ATmega328 (datasheet). It has 14 input pins from the digital output of which 6 input pins can be used as PWM outputs and 6 analog input pins, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

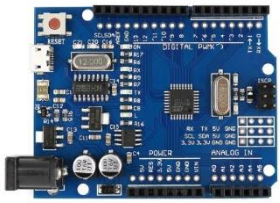

Figure 2. 1 Arduino Uno

C. Real Time Clock (RTC) DS3231

The RTC DS3231 module is a type of module that functions as an RTC (Real Time Clock) or digital timing as well as the addition of a temperature measuring feature that is packaged into 1 module. Highly Accurate RTC Manages All Timer Functions Real-Time Clock Counts Seconds,

Minutes, Hours, Date Month, Month, Day of the Week and Year, with Opposite Year Compensation Valid Up To 2100.

Figure 2. 2 RTC DS3231

D. LM35

The LM35 temperature sensor is an electronic component that has the function to convert the temperature scale into an electrical quantity in the form of voltage.

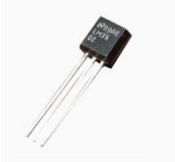

Figure 2. 3 LM35

E. LCD (Liquid Crystal Display)

LCD or Liquid Crystal Display is a display that uses liquid crystals whose operation uses a dot matrix, the use of LCD is not very small in designing a system using a microcontroller, LCD can be useful for showing a sensor result value, showing text, or showing menus. on the microcontroller software.

Figure 2. 4 LCD (Liquid Crystal Display)

F. Relay

Broadly speaking, the relay functions to control and distribute electricity. The use of the switch on the relay is as a means of generating electric current

Figure 2. 5 Relay

III. METHODOLOGY

The LM35 sensor is a sensor that detects the temperature where the output voltage is obtained from the temperature value which is converted into a voltage (the output voltage is directly proportional to the temperature). Figure 3. 1 shows a block diagram of the workflow circuit or the working principle of the fan and lamp automatically.

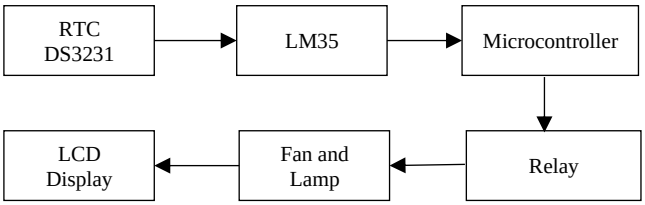

Figure 3. 1 Block Diagram

The block diagram of this system shows a process until this research is in accordance with its working principle. The DS3231 module will calculate the time in real-time (digital clock) which is determined if the time is right then the LM35 temperature sensor will detect the temperature in the room and if the indoor temperature reaches >24 C to 28 C then the relay will be active (ON) and the fan wind works. The fan stops working when the temperature is 24 C and the DS3231 module has reached the set time limit. The temperature can be seen on the LCD display.

In this study, it was divided into two stages, namely the stage of designing a circuit with such tools that the schematic circuit can be seen in Figure 3. 2. Next is the coding stage by inputting the coding into the microcontroller using the Arduino IDE software.

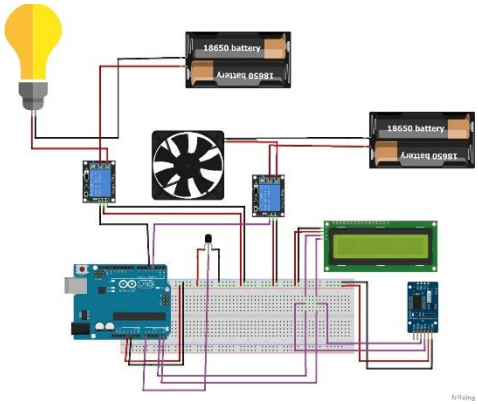

Figure 3. 2 Shematic Circuit

Sensor schematic circuit with Arduino as shown in Figure 3.1. The output pin on the LM35 sensor is connected to pin A0, while the two relay output pins are connected to pins 3 and 4, and the RTC pins of the DS3231 are connected the same as the LCD. The sensor working voltage of 5V is supplied from the Arduino board.

Table 3. 1 Wiring Tools

Arduino	LM35	Relay 1	Relay 2	RTC DS3231	LCD
GND	GND	GND	GND	GND	GND
5V	VCC	VCC	VCC	VCC	VCC
3	-	IN	-	-	-
4	-	-	IN	-	-
A0	OUT	-	-	-	-
A4	-	-	-	SDA	SDA
A5	-	-	-	SCL	SCL

From the schematic circuit that has been made and then implemented into a series by compiling the tools. Those who use used cardboard as a place or container that wraps the circuit to make it look neat and efficient, you can see a picture of a series of tools that looks inside and looks outside.

Figure 3. 3 Toolkit Inside

Figure 3. 4 Toolkit Outside

IV. Result and Discussion

The software needed to make the tool is the Arduino IDE, to write programs on the Arduino board using the Arduino IDE application.

The working principle of the tool to turn on the fan and lights automatically is as follows:

a) LM35

The LM35 sensor is used to measure the temperature in a room.

b) Relay

Relays are used to turn on and off lights and fans.

c) Microcontroller or Arduino

Arduino Uno is the controller of all the tools in the circuit from the command to turn on the lights and fan then display the results on the LCD screen.

d) RTC DS3231

Used as a timer when the lights and fans will be turned on according to the specified hour or time

The results of the test data obtained from testing fans and lights automatically with the LM35 and RTC DS3231 sensors according to the program that has been made as follows.

Table 4. 1 Test Data Results

No	Day	Sensor Condition LM35	Condition (Lamp and Fan)	LCD Display	Time Display
1	Saturday and Sunday	OFF	Lamp : Off Fan : Off	Off	Off
2	Monday until Friday	>27 ºC	Lamp : Off Fan : On	Fan On	10.00 AM - 15.00 PM
		<27 ºC	Lamp : On Fan : Off	Lamp On	
3	Monday until Friday	Off	Lamp : Off Fan : Off	Off	15.01 PM – 15.59 PM
4	Monday until Friday	Off	Lamp : On Fan : Off	Lamp On	16.00 PM – 18.30 PM
5.	Monday until Friday	Off	Lamp : Off Fan : Off	Off	Over 18.30 PM

From the results of the table above, it can be seen that there are differences in the results of data from the LM35 sensor, where the time and temperature display makes the lights and fans turn on automatically according to the commands in the program. So the data above shows the following results:

1. At 10:00 then the LM35 temperature sensor will detect the temperature in the room > 27 C then relay 1 will be active (ON) and the fan is on while the lights are off until 15:00, the temperature can be seen on the LCD
2. At 10:00 then the LM35 temperature sensor will detect the temperature in the room at <27 C then relay 2 will be active (ON) and the light is on while the fan is off until 15:00, the temperature can be seen on the LCD
3. From 15:01 to 15:59 the lights and fans will turn off
4. At 16:00 then relay 2 will be active (ON) and the light is on while the fan is off until 18:30.
5. At times above 18:30, the lights and fans will turn off.
6. On Saturday and Sunday the lights and fans will not turn on or off.
7. At times other than the specified hours, the fan and lights will not turn on or off.

Conclusion

Based on the results of testing the fan automatic adjustment tool, it can be concluded that when the fan is not activated, the room temperature is in the range of 28°C to 29°C, while when the fan is activated, the room temperature also increases, but not significantly and the temperature is only are in the range of 30.76°C to 32.71°C. So it can be concluded that the fan automatic adjustment tool is quite effective for cooling the room. The use of the RTC DS3231 can set the clock in real-time which is useful for scheduling fans and lights can work automatically according to a predetermined time. With the success of this tool, it is hoped that it can overcome the problem of human or individual negligence in the campus environment and can save on electricity payment costs

Acknowledgment

Our gratitude to all those who have contributed both materials and in the process of making this journal entitled "Automatic Fan and Light With Arduino Based Lm35 Sensor". We hope

that this journal can be accepted and useful for all in the future. We feel that in the preparation of this journal there are still many shortcomings. For that, we expect constructive criticism and suggestions from all parties for the perfection of this journal.

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