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Design of A Tool to Counter Objects with A Pear Sensor as A Fan and Light Controller Based on An Rtc Based on An ATmega 8535 Microcontroller

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ABSTRACT

The need for a sense of comfort is one that is very important in human life. Likewise with comfort in a room, especially in the comfort of the office, especially in the boardroom, on campus. The purpose of the design and manufacture of the PIR sensor is as a controller and counter the man when it went into a room, the fan in the living room with a temperature above normal. Hopefully, by the automation system controls the fan and lights in the room temperature can be maintained to keep the temperature stable, and live according to the light intensity of the light that has been programmed.

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1. INTRODUCTION

As one of the developing technologies is technology in the field of temperature measurement. Temperature measuring devices are very much needed in certain things. For example, in a storage warehouse it is very important to pay attention to the temperature of the warehouse room to store goods properly, in a computer server room a certain temperature is also needed so that the server also works well, as well as a temperature in a certain room, the temperature must be considered and still many more applications.

Previous research using a PIR sensor as a detector has been carried out to design a microcontroller-based automatic door opening and closing system.[1]In addition, the PIR sensor has also been used as a detector for microcontroller-based room security[2]use the alarm as a warning tone.

Departing from this the author wants to make a fan and lamp rotational speed controller using the ATmega 8535 Microcontroller as the control center. The sensors used are Passive Infra Red (PIR) Sensors, LCD as Viewers, PSA, LM35, PWM (Pulse Width Modulation), RTC (Real Time Clock). The results show the ATmega 8535 Microcontroller has a temperature sensor input, this sensor will detects the temperature in the room and displays it on the LCD. To detect the temperature in a room we use a fan that functions as a cooler by working to remove excess heat in a room,[3]In this case the fan will adjust the number of people in a room.[4]So the fan rotates automatically and the number of people will affect the fan rotation speed.[4]

The aims and objectives of this research are: 1. To find out the control system and performance of the PIR and LM 35 sensors. 2. To find out the pulse width of the pwm to the fan speed. The benefits of this discussion are: 1. Simplify work in field control, especially control of the fan (DC) and capable. 2. Expected could Becomes ingredient consideration for further research. 3. Enrich scientific knowledge in the field of human resources, especially control, motivation, and performance.

2. RESEARCH METHOD

2.1 Block Diagramat Design

The diagram is a statement of the sequential relationship of one or more components that have their own work unit, and each component block affects the other components.[5]Block diagrams are one of the simplest ways to explain the workings of a system.[6]With block diagrams we can analyze how the circuit works and design hardware that will be made in general.

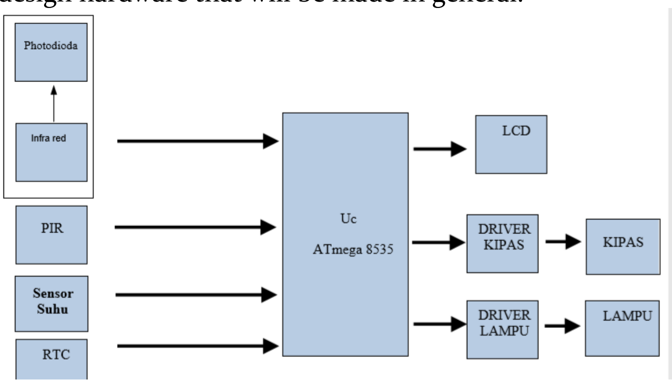

Figure 1. Block Diagram

2.2 Flowchart / FlowchartFlowchart / Flowchart

Description of the flowchart in the picture:

1. In the flowchart 3.8, this flowchat starts with a start, then the pir sensor detects is anyone entering? , when someone comes in, turn on the fan with PWM and increase the fan speed, then add one value to the display.
2. When the photodiode sensor detects the absence of people? Or org out, reduce fan speed with PWM, then decrease 1 value on display
3. AndImmediately, the LM 35 temperature sensor reads the temperature from the room, whether the temperature in the room is too cold or too hot, when it is too cold, the fan is turned off and vice versa.
4. At the same time when the tool is turned on, the RTC also works by turning on the intensity of the light and immediately when the clock shows the morning, reduce the intensity of the light, on the contrary when it shows at night, increase the light intensity by reading the value of the RTC.
5. If the clock does not show night, then re-read the RTC value

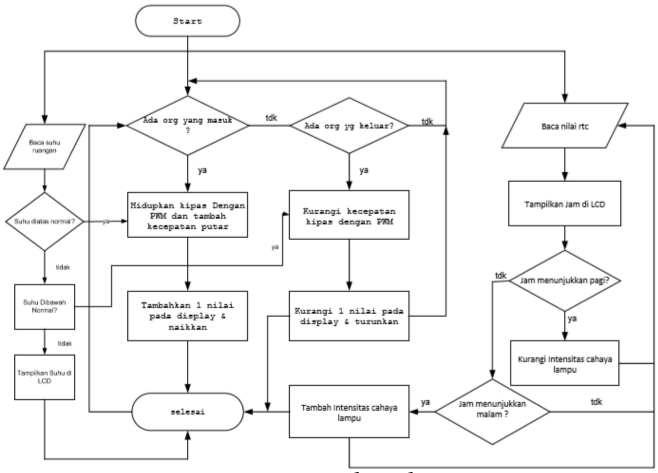

Figure 2. Flowchart

3. RESULT AND DISCUSSION

3.1 ATMega8535a . Microcontroller Circuit Testing

To find out whether the microcontroller circuit is working properly, then a test is carried out.[7]The test in this section is done by providing a simple program on the microcontroller.[8]

3.2 PIR sensor measurement

The PIR sensor works with a high-low system and produces an output of 5 volts. This sensor detects changes in temperature in the environment around the sensor and specifically on the human body and detects it with the following distance:

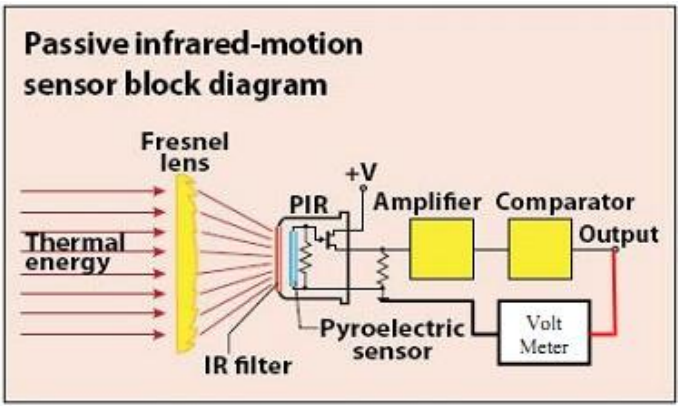

Figure 3. PIR sensor image

Table 1. Measurement of PIR Sensor

DISTANCE (Cm)	RESPONSE (V)
5	4.99
10	4.99
20	4.99
50	4.99
100	4.99
200	4.99

DISTANCE (Cm)	RESPONSE (V)
300	4.99
400	4.99
500	0

Based on table 4.1. according to the measurement point, the input voltage is generated according to the initial input from the regulator, so that the output voltage is as expected, while in low voltage conditions it becomes 0 at a maximum distance of 500 cm the sensor does not respond.

3.2 2x16 . LCD Interfacing LCD Testing

This section only consists of a 2 x 16 character dot matrix LCD that functions as a display of measurement results and displays of some information. The LCD is connected directly to Port 0 of the microcontroller which functions to send the processed data to be displayed in alphabetical and numeric form on the LCD.[9]

The character display on the LCD is controlled by the EN, RS and RW pins: The EN line is called Enable.[10]This line is used to tell the LCD that you are sending data. To send data to the LCD, through the EN program, a logic low "0" and set (high) must be made on the other two control lines, RS and RW.[11]The RW line is the Read/Write control line. When RW is logic low (0), then the information on the data bus will be written on the LCD screen.[12]When RW has a high logic "1", the program will read the memory from the LCD. Whereas in general applications the RW pin is always given a logic low (0).[12]

3.3 LM35 . Sensor Testing

To measure and control the temperature, LM35 is used which is the change in voltage generated by the sensor which is the input for the ADC which will be converted into digital data.[13]The process of converting the input voltage from the sensor into digital data is carried out in the same way as previously described.[13]

Testing on this part of the ADC circuit can be done by connecting the built-in ADC circuit to the microcontroller.[14]Furthermore, the microcontroller circuit is connected to the LCD. The microcontroller is filled with a program to read the values in the ADC circuit, then the reading results are displayed on the LCD display.[15]

4.5. DS-1307 . RTC circuit testing

Testing the RTC DS-1307 circuit is done by giving the command to retrieve data from the RTC DS1307 with I2C data line communication through the microcontroller.[16]Here is the program listing:

```
#include <mega8535.h> #include <delay.h> #include <alcd.h> #include <stdio.h> #include <i2c.h>
#include <ds1307.h> void main(void)
{
i2c_init();
// DS1307 Real Time Clock initialization
// Square wave output on pin SQW/OUT: Off
// SQW/OUT pin state: 0
 rtc_init(0,0,0);
rtc_set_time(12,30.00); //function for setting up RTC DS-1307 for the first time
while(1)
{
rtc_get_time(&h,&m,&s);

`           lcd_gotoxy(0,0);
```

```
sprintf(buf,"Time :%02u:%02u:%02u",h,m,s); lcd_puts(buf);
}
}
```

The above program has a function to set the time on the DS-1307 and then repeatedly retrieve data from the DS-1307 in real time. To test the results of the program that has been made whether it works, the microcontroller is connected to a 16 x 2 LCD. The following circuit his.

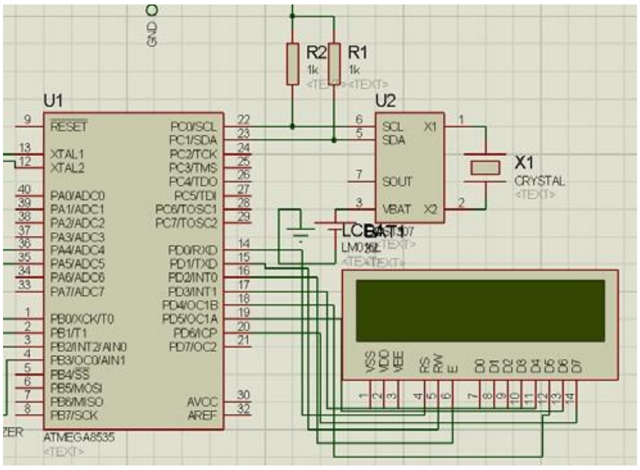

Figure 4. Testing the DS-1307 . RTC circuit

After the program is entered into the microcontroller and executed, then the time appears on the LCD according to the time entered into the program the first time, which is 12.30.00 hours, so it can be said that the microcircuit with RTC DS-1307 can function properly.

4.1. Fan Circuit Test

In this simulation, the fan uses a 12 volt dc fan, so that the microcontroller as a fan speed controller does not experience a current load because controlling the fan requires a 12 volt dc voltage while the micro can only issue PWM values in the 0-5 V range, so a driver IC such as L293 is needed. to handle it,[17]The L293 driver IC has the ability to drive a dc motor up to 2A and a maximum voltage of 20 Volts. The Enable pin connected from the micro timer output to the l293 ic can control fan rotational speed variations with pwm.[18]

Table 2. Fan Circuit Test

No	OCR pwm value	Fan voltage (volts)
1	5	0.7
2	10	0.723
3	20	1,281
4	30	1,782
5	40	2,271
6	50	2.78
7	60	3.22
8	70	3.68
9	80	4.11
10	90	4.54
11	100	4.94
12	110	5.38
13	120	5.76

No	OCR pwm value	Fan voltage (volts)
14	130	6.18
15	140	6.57
16	150	6.93
17	160	7.31
18	170	7.67
19	180	8.03
20	190	8.38
21	200	8.73
22	210	9.07
23	220	9.40
24	230	9.73
25	240	10.08
26	250	10.38
27	255	10,40

4.2. Led Circuit Testing

In this research, the software used to control the brightness/intensity of the leds is made in c language using the pwm facility on the microcontroller, the PWM output from the micro is connected to IC 293 so that the micro is not burdened. The LED used has a maximum voltage of 3.3 Volts, therefore, the PWM value given is not up to the maximum, because in the maximum condition (5 Volts), the LED will exceed the voltage and will break.

Table 3. Led Circuit Testing

No	OCR pwm value	led voltage(volts)
1	5	0.1
2	10	0.244
3	20	0.47
4	30	0.700
5	40	0.926
6	50	1.03
7	60	1.38
8	70	1.6
9	80	1.81
10	90	2.05
11	100	2.2
12	110	2.4
13	120	2,713
14	130	2.93
15	140	3.16
16	145	3,276

4.3 Overall System Test

Overall system testing is done by combining all the equipment into an integrated system.[19]The goal is to find out that the designed circuit has worked as expected, then current is given through the power supply circuit[19], the output of the power supply in the form of a voltage of 5 volts is forwarded to the minimum system circuit, sensor and output. The measurement data and graphs can be seen in the table below. In this data, there is a difference between the data obtained from the values listed and the data generated by the tool.

Table 4. Overall System Test

No	Pear Detection	Photodiode detection	Number of people	Fan Vout (volts)	fan status	O'clock	Vout led (volts)	led status
1	Detected	Not detected	1	0.7	Not rotating	13.00	0	dead
2	Detected	Not detected	2	1,281	Not turn	14.00	0	dead
3	Detected	Not detected	3	1,782	Not rotating	15.00	0	dead
4	Detected	Not detected	4	2,271	Not rotating	16.00	0	dead
5	Detected	Not detected	6	3.22	slow	17.00	0	dead
6	Detected	Not detected	7	3.68	slow	17.30	1.5	Very dim
7	Detected	Not detected	10	4.54	slow	17.40	1.7	dim
8	Detected	Not detected	11	4.94	slow	18.00	1.8	dim
9	Not detected	detected	10	4.54	slow	18.15	1.9	Kinda bright
10	Detected	Not detected	11	4.94	slow	18.30	2.0	Kinda bright
11	Detected	Not detected	12	5.38	slow	18.40	2.3	Kinda bright
12	Detected	Not detected	13	5.76	medium	18.50	2.8	bright
13	Not detected	detected	12	5.38	medium	19.00	2.8	bright
14	Detected	Not detected	13	5.76	medium	20.00	2.8	bright
15	Detected	Not detected	15	6.57	medium	00.00	2.8	bright
16	Detected	Not detected	16	6.93	medium	03.00	2.8	bright
17	Detected	Not detected	17	7.31	medium	04.00	2.8	bright
18	Detected	Not detected	19	8.03	high	05.00	2.8	bright
19	Detected	Not detected	20	8.38	high	05.15	2.8	bright
20	Detected	Not detected	21	8.73	high	05.30	2.3	Kinda bright
21	Not Detected	detected	20	8.38	high	05.45	2.1	Rather bright
22	Detected	Not detected	21	8.73	high	06.00	1.8	dim
23	Detected	Not detected	22	9.07	high	06.15	1.6	dim
24	Detected	Not detected	23	9.40	high	06.30	1.4	dim
25	Detected	Not detected	24	10.08	high	06.40	1.2	Very dim
26	Detected	Not detected	26	10.38	high	06.50	1.1	Very dim
27	Detected	Not detected	27	10,40	high	07.00	0.7	dead

4. CONCLUSION

Conclusion: 1. This system works when someone enters a room, the fan will turn on and the more people who enter the room, the fan will spin faster. 2. The working principle of this PWM, if the pulse width is given, the fan will spin faster and if the pulse width is smaller then the fan will spin slower. Suggestions: 1. Because this tool is still only a prototype, the author hopes that in the future this tool can be developed to be even more efficient. 2. It is better to replace the photodiode with PIR because the PIR sensor can only detect the temperature of the human body so that objects such as plastic or any item that cannot emit the same temperature as the human body temperature, are not detected by PIR.

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REFERENCES

[1] SN Wahid and E. Suprayitno, “ENGINEERING AUTOMATIC SLIKE DOORS USING PASSIVE INFRA RED (PIR) SENSORS,” J. Qua Tek., vol. 10, no. 1, pp. 47–61, 2020.
[2] R. Rahman and M. Ruslan, “Silent alarm system model based on passive infrared sensor,” Progressive J. Ilm. Comput., vol. 15, no. 2, pp. 97–102, 2020.
[3] M. Ardianto, “SPLIT WALL TYPE OF IoT-BASED AIR CONDITIONER (AC) MONITORING SYSTEM.” Muhammadiyah University of Gresik, 2021.
[4] N. Nadila and IKD Nuryana, "Design of a Prototype of Temperature and Humidity Control System Based on Esp8266 Microcontroller," J. Manaj. Inform., vol. 11, no. 1, 2020.
[5] AVL Tobing, HHL Toruan, and YG Simanjuntak, “DESIGNING AND BUILDING A DOOR SECURITY SYSTEM WITH FACE RECOGNITION BASED ON RASPBERRY,” Pros. conf. Nas. soc. eng. Polmed 2021, vol. 2, no. 1, pp. 79–88, 2021.
[6] Z. Aras, A. Asril, and N. Gusniati, “APPLICATION OF RADIO FREQUENCY IDENTIFICATION (RFID) IN STUDENT PRESENCE SYSTEM AT UNIVERSITY OF DHARMAS INDONESIA BASED ON MICROCONTROLLER,” Simtika, vol. 4, no. 1, pp. 5–8, 2021.
[7] Y. Rahmanto, A. Rifaini, S. Samsugi, and SD Riskiono, “Water pH Monitoring System in Aquaponics Using Arduino UNO Microcontroller,” J. Teknol. and Sis. Embedded, vol. 1, no. 1, pp. 23–28, 2020.
[8] MI Hafidhin, A. Saputra, Y. Rahmanto, and S. Samsugi, “Drinking Salted Fish Using Arduino UNO Microcontroller,” J. Tek. Dan Sis. Comput., vol. 1, no. 2, pp. 59–66, 2020.
[9] M. Hutabarat, RM Siburian, and J. Sinaga, "DESIGN OF WIND SPEED AND DIRECTION DETECTOR BASED ON ATmega 8535 MICROCONTROLLER USING INFRARED SENSOR," J. Teknol. UDA ENERGY J. Tek. ELECTRO, vol. 10, no. 1, pp. 49–59, 2021.
[10] M. Sugiantoro, "MAKING OF HEIGHT MEASURING EQUIPMENT USING ULTRASONIC SENSOR." NSC Polytechnic Surabaya, 2020.
[11] MR Efendi and M. Narji, "APPLICATION OF SIMULATION OF SOIL MOISTURE DETECTION MEASUREMENTS USING ARDUINO UNO MICROCONTROLLER DEVICES," JSI (Journal of Information Systems) Univ. Suryadarma, vol. 7, no. 2, pp. 21–34, 2020.
[12] H. Sirait and M. Sakban, “EMPOWERMENT OF ROBOTIC SYSTEMS FOR DETECTION OF HUMAN HEART RATE,” J. Bisantara Inform., vol. 5, no. 1, p. 16, 2021.
[13] S. Sutrisno, “Design and Manufacture of Temperature Sensors,” J. Teknol. inf. theory. Concept, and Implementation, vol. 2, no. 1, pp. 40–48.
[14] D. Santi and JV Morin, “Design of an IOT-based Air Quality Parameter Monitoring System (Temperature, CO, LPG and Dust), J. Nat., vol. 17, no. 2, pp. 120–130, 2021.
[15] T. Zega, "DESIGN AND CONSTRUCTION OF DIGITAL SCALES ON AUTOMATIC RICE THREADING MACHINE BASED ON MICROCONTROLLER," Kumpul. Scientific Works. Mhs. Fac. science and technology, vol. 1, no. 1, p. 209, 2021.
[16] F. Andriansyah, "TA: Design of Back Angle Measuring Tool to Facilitate Rula Calculation Using MPU-6050." Stikom Surabaya Institute of Business and Informatics, 2020.
[17] ES Edy Supriyadi, “EdyS Research Report”.

[18] V. Yolanda, "Design of an Automatic Clothes Dryer Prototype Based on Arduino Uno R3." 2021.
[19] IKW Gunawan, A. Nurkholis, A. Sucipto, and A. Afifudin, "Arduino-based rice grain moisture monitoring system," J. Tek. Dan Sis. Comput., vol. 1, no. 1, pp. 1–7, 2020.