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Automatic Fire Detector Using Arduino With Output Evacuation Route Via Short Message Service (SMS) And Warning Via Ringtones

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KEYWORDS

Arduino Uno, GSM Shield, Temperature Sensor LM35, SMS

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A B S T R A C T

In this modern era, the use of electricity is increasing and of course it is very prone to trigger fires. When there is a fire, many people are trapped and difficult to find an evacuation route if it is in a difficult range such as in a tall building. In this final project aims to provide fire warnings and display safe routes as evacuation routes. This fire detection device uses Arduino Uno as a controller and LM35 temperature sensor as a fire detector. GSM Shield is used to send SMS and make calls to the user. The working principle of this tool, by detecting the presence of a fire and the input of the heat temperature is processed when the conversion voltage is 350mV in accordance with the provisions of the fire status. The process is run by the program that has been uploaded to Arduino, after the process is run, then the output appears in the form of fire information and evacuation route with SMS and fire alerts with ringtones. There are 6 temperature sensors used, with 2 sensors installed on each floor. Each sensor that detects a fire, an SMS is sent with the specified status of each sensor and the safe route that must be passed. After the SMS is sent, the phone call comes to alert the user if they do not know of a fire or have not seen the incoming SMS.

INTRODUCTION

The numbers of fire cases in the modern era in towns even in the forest are so high. Fire handling that is hard because there is no early warning, so the fire getting bigger unwitting, not a little loss because the smoke, toxic gas, oxygen deficiency and burned. Other factors of loss, because malfunction of alarm, so need extra warning and difficult to find an evacuation route if in a difficult range such as inside a building.

The important factors to prevent the big fire are accuracy and speed to detection the fire. Therefore need to earlier warning by using technological progress currently. In addition, it is also necessary to quickly notify the safe route for evacuation to escape from fire.

This device has purpose to give earlier warning with Short Message Service (SMS) and phone call as media to inform evacuation route when fire occurs. This media is processed with Arduino Uno as the main control this device to produce fire information. The device can detect safe route and unsafe route from fire with temperature sensor. Fire information in this device are SMS by displaying safe route that can be pass and sound of ringtone as warning sign for phone user and building user.

The purpose of this research is to design and create a device that can give fire warning as early as possible and display safe route as evacuation route informed through SMS and phone call. User will get message containing the evacuation route and ringtone as warning if the user has not known there is a fire.

METHOD

The working principal of guide evacuation route and warning from fire device based Arduino Uno, need the block diagram as a guide to make this tool. In the block diagram between one block and another block interconnected as shown in Figure 1.

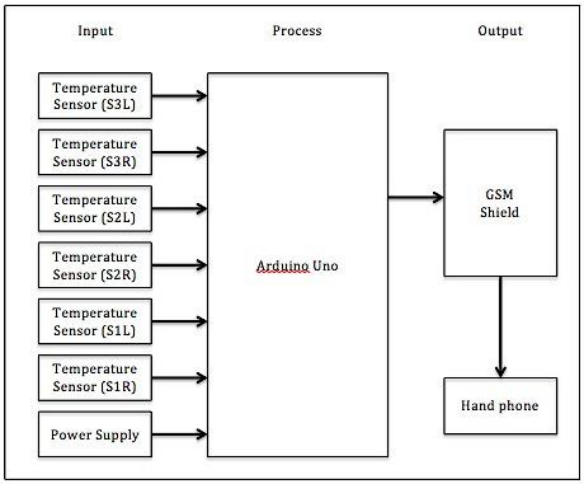

Figure 1. Block Diagram

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A. Block Input

In the block input consists of power supply is used to provide voltage to the entire circuit. The power supply used is a 12 volts adapter and used in arduino at 5 volts. Temperature sensor is used to detect fire with the specified temperature. This tool is designed with 6 temperature sensors LM35. Each floor is given 2 sensors. V_{out} is the output of sensor that has scale linear with measured temperature. Temperature sensor LM35 used to change the physical quantities of temperature into electrical voltage. The sensor has a parameter that every increase 1^{o}C, the output voltage rise 10mV. Temperature sensor is given input heat, then the reading occur in this block input.

B. Block Process

Input is inserted into the processor which is the main control of this tool is arduino. In the arduino, arduino program run. Arduino will process reading input from temperature sensors. The result of the input is from the voltage that goes into arduino.

C. Block Output

After the input is processed on arduino, there will be output from the process in the form of SMS and ringtone sounds as warning. Output SMS appears accordingly with conditions released by the temperature sensor. In the block output, there is GSM Shield. GSM in this tool is used to send SMS and call as ringing tone output. By sending SMS contained evacuation route according with condition that detected by temperature sensor.

D. Flowchart

This tool use Arduino Uno as a main control, Arduino run with program adapted with the tool. In Figure 2 is a plot on the Arduino program to run the tool`

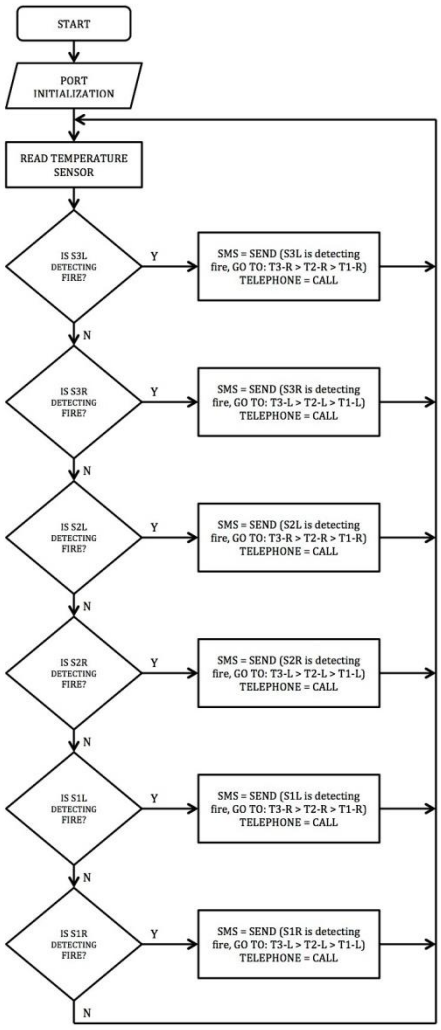

Figure 2. Flowchart

RESULTS AND DISCUSSION

In this section, result and analysis is done on hardware and software. In the following test was tested on the device and each program. The component parts were tested in the circuit:

1. Temperature sensor LM35 (S3L)
2. Temperature sensor LM35 (S3R)
3. Temperature sensor LM35 (S2L)
4. Temperature sensor LM35 (S2R)
5. Temperature sensor LM35 (S1L)
6. Temperature sensor LM35 (S1R)
7. GSM Shield

Temperature Sensor LM35 Result

Temperature sensor is tested with a heat source of coal mosquito coil. Sensor can work with a program that has been uploaded to the Arduino. Calculation to read values from the sensor and converted to Celsius. The value of the sensor will be multiplied by 500 in accordance with the given input is 5 volt. And sensor work with mV. Then the results are divided 1024.0 in accordance with the largest value issued on the analog pins. The results of the calculations can be seen on the serial monitor in Figure 3.

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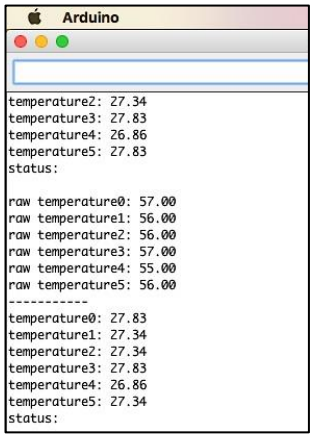

Figure 3. Serial Monitor Display

Testing Sensor LM35 (S3L) Result

The S3L sensor becomes a sensor on the 3rd floor on the left side of the building. In the serial monitor is shown temperature when S3L detect fire, the contents of the notification SMS, the SMS has been successfully sent is shown on "delivery S3L sms: done". The status will be "S3L is detecting fire". Then the SMS is sent to the mobile phone user. The following is an SMS display on the mobile phone that has been sent to its evacuation route.

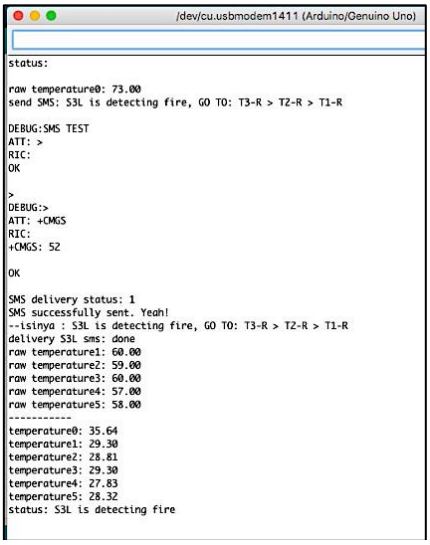

Figure 4. S3L Serial Monitor Display

Figure 5. S3L SMS Display

Temperature Sensor LM35 (S3R) Result

The S3R sensor becomes a sensor on the 3rd floor on the right side of the building. In the serial monitor is shown temperature when S3R detect fire, the contents of the notification SMS, the SMS has been successfully sent is shown on "delivery S3R sms: done". The status will be "S3R is detecting fire". Then the SMS is sent to the mobile phone user. The following is an SMS display on the mobile phone that has been sent to its evacuation route.

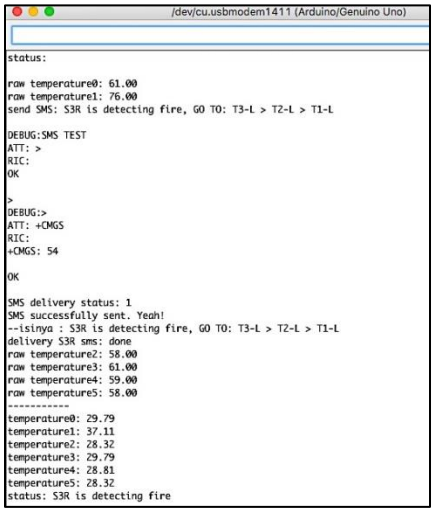

Figure 6. S3R Serial Monitor Display

Figure 7. S3R SMS Display

Temperature Sensor LM35 (S2L) Result

The S2L sensor becomes a sensor on the 2nd floor on the left side of the building. In the serial monitor is shown temperature when S2L detect fire, the contents of the notification SMS, the SMS has been successfully sent is shown on "delivery S2L sms: done". The status will be "S2L is detecting fire". Then the SMS is sent to the mobile phone user. The following is an SMS display on the mobile phone that has been sent to its evacuation route.

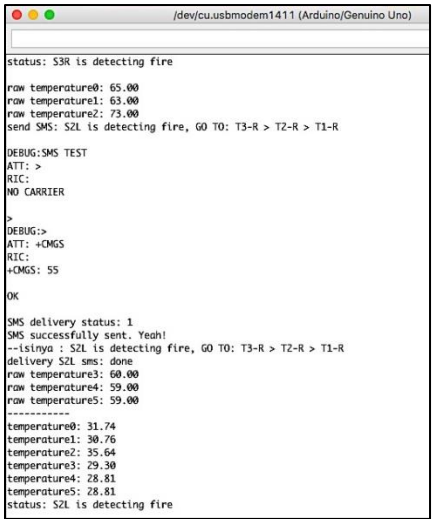

Figure 8. S2L Serial Monitor Display

Figure 9. S2L SMS Display

Temperature Sensor LM35 (S2R) Result

The S2R sensor becomes a sensor on the 2nd floor on the right side of the building. In the serial monitor is shown temperature when S2R detect fire, the contents of the notification SMS, the SMS has been successfully sent is shown on "delivery S2R sms: done". The status will be "S2R is detecting fire". Then the SMS is sent to the mobile phone user. The following is an SMS display on the mobile phone that has been sent to its evacuation route.

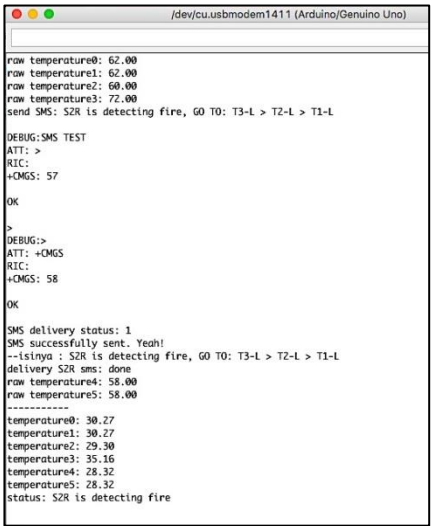

Figure 10. S2R Serial Monitor Display

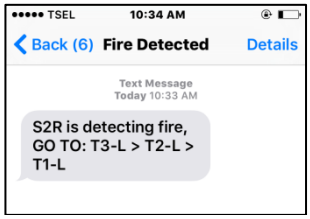

Figure 11. S2R SMS Display

Temperature Sensor LM35 (1L) Result

The S1L sensor becomes a sensor on the 1st floor on the left side of the building. In the serial monitor is shown temperature when S1L detect fire, the contents of the notification SMS, the SMS has been successfully sent is shown on "delivery S1L sms: done". The status will be "S1L is detecting fire". Then the SMS is sent to the mobile phone user. The following is an SMS display on the mobile phone that has been sent to its evacuation route.

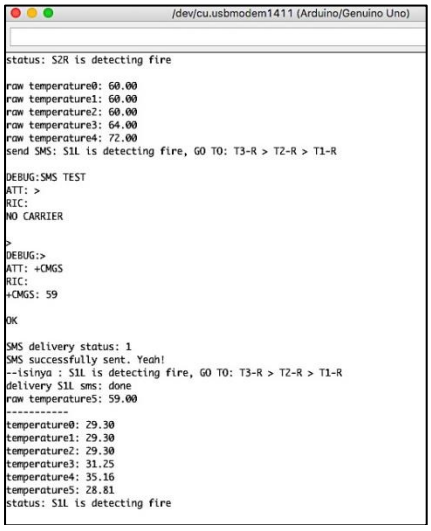

Figure 12. S1L Serial Monitor Display

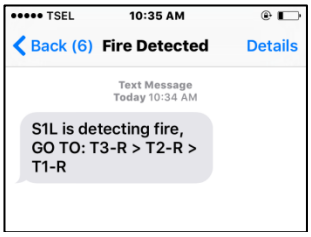

Figure 13. S1L SMS Display

Temperature Sensor LM35 (1R) Result

The S1R sensor becomes a sensor on the 1st floor on the right side of the building. In the serial monitor is shown temperature when S1R detect fire, the contents of the notification SMS, the SMS has been successfully sent is shown on "delivery S1R sms: done". The status will be "S1R is detecting fire". Then the SMS is sent to the mobile phone user. The following is an SMS display on the mobile phone that has been sent to its evacuation route.

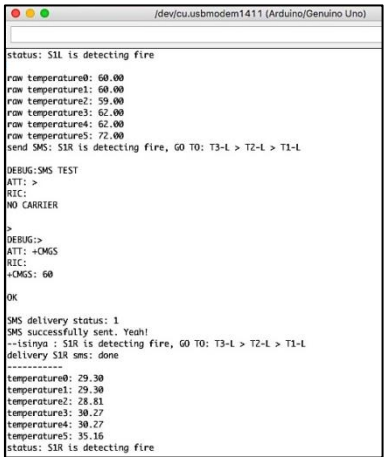

Figure 14. S1R Serial Monitor Display

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Figure 15. S1R SMS Display

GSM Shield Result

The SMS containing information and evacuation route guide sent to the destination number. The contents of the SMS also correspond to those specified. From the SMS display for mobile users and inside the building, the device is set as an information provider and direction guide if there is a fire to mobile users and building users. When a fire is detected on a building, the system then makes a telephone call as a ringtone output. After the SMS is sent, the tool will give a telephone call, as a warning if the user has not known there is an incoming SMS.

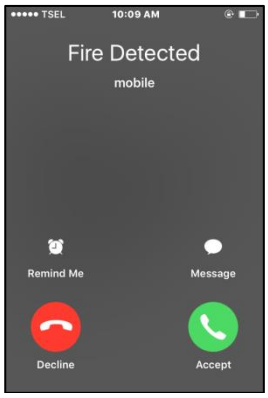

Figure 16. Call Display Results

In some tests, automatic evacuation route guide device works well as expected. There is delay in sending SMS due to the network provider or user in another call. But the problem is solved by dialing from the GSM Shield, as a warning to fires that must be immediately handled.

CONCLUSIONS

Based on the results of the testing and analysis of the design of automatic evacuation route guide from fire devices using temperature sensor LM35 with SMS as evacuation route display and ring tones as warning, it can be concluded that the tools can work well. When there is a fire and the temperature sensor detects a fire with a specified temperature if there is a fire temperature above 35ºC, then the tool works according to the specified safety status and route. After the fire information and evacuation route via SMS were sent, the telephone came as a fire warning sign for the user to see the information in the SMS.

ACKNOWLEDGMENT

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