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DESIGN OF A HOME SECURITY SYSTEM BASED ON PIR SENSOR AND A FIRE SYSTEM BASED ON LM35 TEMPERATURE SENSOR

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ABSTRAK

Sistem keamanan rumah telah dikembangkan sesuai perkembangan zaman, dengan memanfaatkan piranti sensor. Penelitian ini bertujuan untuk mengembangkan sistem kemanan rumah berbasis Sensor Passive Infrared Receiver (PIR) dan sistem kebakaran berbasis Sensor suhu LM35. Sensor PIR pada sistem keamanan mendeteksi pancaran gelombang infrared dari pergerakan manusia dengan jangkauan maksimal 5 meter pada area setengah lingkaran di depan sensor. Sedangkan sensor suhu LM35 mendeteksi perubahan suhu ruangan. Kedua sensor dihubungkan dan dioperasikan dengan Arduino Uno. Apabila sensor PIR mendeteksi pergerakan dalam ruangan, buzzer sebagai notifikasi menyala. Perubahan suhu ruangan dideteksi melalui sensor suhu LM35 dan mengirimkan sinyal berupa notifikasi buzzer. Sistem keamanan rumah berfungsi dengan baik ditunjukkan dengan buzzer menyala apabila terdapat pergerakan. Sedangkan sistem kebakaran menyala saat terjadi perubahan suhu di atas 32℃.

Kata kunci: Sensor Passive Infrared Receiver; Sensor suhu LM35; Sistem keamanan, Sistem kebakaran.

ABSTRACT

Home security systems have been developed in accordance with the times, by utilizing sensor devices. This study aims to develop a home security system based on Passive Infrared Receiver (PIR) Sensor and a fire system based on LM35 temperature sensor. The PIR sensor in the security system detects infrared wave emissions from human movement with a maximum range of 5 meters in a semicircular area in front of the sensor. While the LM35 temperature sensor detects changes in room temperature. Both sensors are connected and operated with Arduino Uno. If the PIR sensor detects movement in the room, the buzzer as a notification lights up. Changes in room temperature are detected through the LM35 temperature sensor and send a signal in the form of a buzzer notification. The home security system functions

properly as indicated by the buzzer turning on when there is movement. While the fire system turns on when there is a temperature change above 32℃.

Keywords: *Fire System; Passive Infrared Receiver Sensor; LM35 Temperature Sensor; Security System.*

INTRODUCTION

Security is an important thing for life. For those who often travel out of town, home security is a top priority [1]. The high crime rate in cases of theft in empty houses, makes people need a solution for home security [2]. Home security for some people still uses conventional methods such as using door locks and so on. Door locks like this are prone to being broken into because they only use conventional mechanical systems. Along with the times, various developments in the field of technology are designed to provide security and even protect assets owned. The design of technology using sensor devices is very much needed. Sensors are tools used to change or convert physical quantities into analog quantities so that they can be read by an electronic circuit [1]. One sensor that can function in home security from theft is a PIR sensor that can detect motion [3]. The PIR sensor is an infrared-based sensor that does not emit IR LEDs but only responds to energy from passive infrared rays emitted by every object that has a hot temperature such as humans [1]. Objects that emit heat mean emitting infrared radiation. This radiation is utilized by the detector and processed as input or input and forwarded to the next component. When a heat source passes through the sensor, the sensor will activate the first cell and the second cell will produce a wave with a frequency of 0.2 Hz-5 Hz [4]. PIR sensors are made of crystal materials that generate electrical loads when exposed to heat and infrared signal emissions. Changes in the intensity of infrared signal emissions cause changes in the electrical load on the sensor [5].

Home security, apart from theft, requires home security from fire disasters [6]. In addition to a security system with a PIR sensor, a fire sensor is needed in the house to prevent fire disasters that can spread. One of the sensors for detecting fires is the LM35 temperature sensor. The LM35 temperature sensor has higher accuracy than other temperature sensors and is easy to design [6]. The fire system is assembled using the LM35 temperature sensor, an electronic component that functions to convert temperature into electrical quantities in the form of voltage. This sensor has a low impedance output and high linearity [7]. The fire system has been widely developed by companies and marketed widely to the public. The company offers this system at a high price. Therefore, it is necessary to develop a home security system and fire system at an affordable and efficient price. Research on home security systems using sensors has been widely conducted, such as Dewanto (2013) who designed a security system using ATMega8535 as a microcontroller that processes input and gives commands to the system [8]. Unlike previous research, in designing this system the data processor uses Arduino Uno. Meanwhile, Waworundeng's research (2017) designed a security system with output in the form of Blynk application notifications on smartphones and must be connected to the internet [9]. In this study, a security device was developed using a PIR sensor and an LM35

temperature sensor using Arduino with notification in the form of an alarm to the homeowner.

METHODS

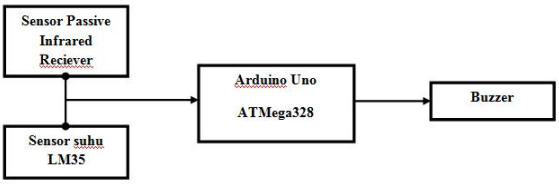

Figure 1. tool making diagram

The tools and materials used in this study are PIR infrared sensors, LM35 temperature sensors, Arduino uno ATMega328, and buzzers. Figure 1 is a system block diagram showing the relationship between Arduino Uno as the control center and other components. In this security system, the PIR sensor will receive infrared reflections emitted by the human body or animals. Human movement will be detected by the PIR sensor and send data to be processed on the Arduino. If movement is detected, the buzzer as a notification sign will light up.

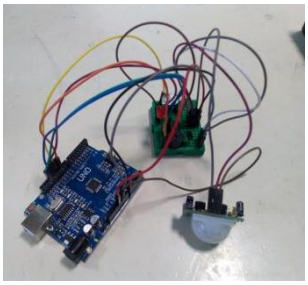

Figure 2. A series of security and fire system tools

The fire system uses an LM35 sensor that detects room temperature. The Arduino has been designed to process temperatures above 32℃ and forward commands for the buzzer to sound. The Arduino device circuit with the PIR sensor and LM35 temperature sensor is as shown in Figure 2.

RESULTS AND DISCUSSIONS

Home security systems are designed to reduce crimes such as theft. This system utilizes a Passive Infrared Receiver (PIR) sensor to detect human wave emissions (infrared rays) and human movement in the room. The sensor is connected to the Arduino Uno to process the data. Furthermore, the command from the Arduino will be forwarded to the Buzzer. The condition that allows the buzzer to be ON is when there is human movement. When there is no movement, the buzzer remains OFF even though there are humans in the room. Table 1 is the result of the PIR sensor test.

Table 1. PIR sensor testing

Sensor	Buzzer	LED	Keterangan
Security	ON	ON	There is movement in the room
Security	OFF	OFF	There is no movement in the room
Security	ON	ON	Movement distance 1 meter
Security	ON	ON	Movement distance 2 meter
Security	ON	ON	Movement distance 3 meter
Security	ON	ON	Movement distance 4 meter
Security	ON	ON	Movement distance 5 meter
Security	OFF	OFF	Movement distance 5,1 meter
Security	OFF	OFF	Objects moving in front of the sensor

Figure 3. PIR sensor testing

The PIR sensor works well when there is human movement passing through the sensor area with a range of 0-5 meters in a semicircular area (180°) in front of the sensor. More than five meters the sensor cannot detect movement and the buzzer is OFF. The buzzer response time is relatively long, which is around 3-5 seconds. This is a weakness of the tool when applied to the house because the delay in detecting and notification is relatively long. However, for the development of this tool, it has worked well, such as being able to distinguish between object movement and human movement. When an object is moved in front of the sensor, the sensor does not send a signal with the buzzer remaining OFF. In addition to security, a fire detector also

needs to be installed in a house. This system prevents fires by detecting changes in room temperature and detecting fire in the room. The LM35 temperature sensor is connected to the Arduino Uno and the buzzer as a notification. The LM35 temperature sensor can detect temperatures with a wide range. Notifications are turned on when the sensor has detected a temperature above 32℃. Table 2 is the result of testing the LM35 temperature sensor.

Table 2. LM35 temperature sensor testing

Sensor	Buzzer	LED	Keterangan
fire	ON	ON	Temperature 37℃ Fire burning in the room
fire	ON	ON	Temperature 35℃
fire	ON	ON	Temperature 34℃
fire	ON	ON	Temperature 33℃
fire	OFF	OFF	Temperature 31℃
fire	OFF	OFF	Temperature 30℃
fire	OFF	OFF	Temperature 29℃

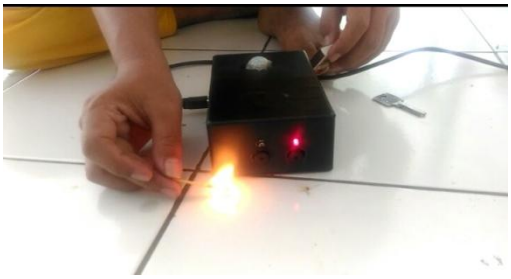

Figure 4. LM35 temperature sensor testing

This tool can be used well as a fire detector. When the fire source is turned on in the room, the sensor detects a temperature increase of 37℃. Then the data is processed and the buzzer is ON as a notification for the homeowner. The ability of the system on the temperature sensor to process data is relatively fast, as evidenced by the detection and alarm delay of only two seconds.

This tool can be installed on the ceiling of the room with a maximum height of five meters. Placing it on the ceiling of the room provides a wider range for the sensor to detect movement. The tool should be placed in a strategic place with the possibility of crime. The security system and fire system are assembled in one tool so that cost efficiency and dual function are obtained.

CONCLUSION AND RECOMENDATION

Based on the manufacture and testing of the tool, this tool can be used well as a security system and fire system. The home security system can use a Passive Infrared Receiver (PIR) sensor which is used as a sensor in detecting human movement indoors. This sensor can detect at a maximum distance of 5 meters from the sensor location point in a semicircular area (180°). The sensor is connected to the Arduino Uno as a data processing base and can then activate the buzzer as a notification to the homeowner if a crime occurs in the house (theft). This tool can function well, as shown by being able to distinguish between human movement and object movement. The fire system uses the LM35 temperature sensor as its main component. The sensor can detect room temperature well. Sensor data is received by Arduino Uno. If the sensor detects a temperature greater than 32℃, the buzzer turns on as a notification of a fire in the house.

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