The Global System for Mobile Communications (GSM) for Wireless Home Security with Arduino and Web CAM

Abu Bakar Ibrahim, Che Zalina Zulkifli, Hafizul Fahri Hanafi and Fatikah Anis Zakaria

Abstract — This project presents the global Mobile Communication System (GSM) for Wireless Home Security with Arduino and Web CAM. This study aims to expand the use of Arduino and GSM as one of the tools of home security system. The second is to develop a relatively inexpensive and easy-to-use home security system. The third is to develop a security system with the concept of self-monitoring. The fourth is to make it easier for users to be more sensitive to their home condition by simply receiving SMS. The methodology that has been used in developing this project is the Engineering Design Process model. Generally, this model has 9 phases. Each phase found in this model can help the researcher ensure that the product developed can achieve the set objectives. Researchers have analyzed all data and can conclude that 70 percent of respondents agree that the system designed can reduce theft and improve home security features. Respondents also agreed that this system could be applied in real situations. In addition, all respondents agreed that the system is safe to use, with a total percentage of 86 percent agree and 14 percent strongly agree. The final result could illustrate that this developed system can provide benefits and benefits to users.

Index Terms — GSM, Home security, Arduino, Web CAM.

I. INTRODUCTION

Today, information and communication technology (ICT) is growing and evolving rapidly. Thus, other technologies also continue to evolve so that the systems developed can compete with the latest technology. Home security systems cannot be fully controlled by humans, but with the advent of the latest technology and microcontrollers, especially on the Internet of Things (IoT), it has given a new face to home monitoring and security systems. [1]. The Global System for Mobile communications (GSM) Wireless Home Security with Arduino and Web Cam is a home security system developed to reduce theft case and increase home security features. This system uses GSM module and Arduino board as main components. GSM or Global System Communication could send a short messaging system (SMS) to users in the event of something in their home. The use of webcam also helps the user to control the situation at home. An output makes the system one of the most effective techniques in securing the risk of home-breaking cases and making them different systems with existing home security systems [2], [3]. The choice of the component which is relevant to the purpose of the study is significant in ensuring that the developed system can benefit the users, in turn, can be used

as a home security system.

The main factor in developing this project is based on frequent problems where most of the existing home security systems use the system alarms only, and users cannot find out what has happened in their home until told by neighbors or authorities. In addition, this system also focused on the use of a less complex and easy circuit, so it is easy to install and easy to use by users. The cost used to develop this project is also reasonable in ensuring that it is affordable for the existing security system. Nevertheless, the use of Arduino and GSM software, as well as other electronic components, necessitates the user to have their skills in facilitating the user to use them [4].

II. LITERATURE REVIEW

Studies should be carried out to collect information, obtain and analyze the information needed to develop a quality system. This study is very important in implementing the project. This development process cannot be carried out correctly if the information and knowledge to develop the project is inadequate. Therefore, all the necessary information needed in project development needs to be identified and predefined. Various methods can be used to gather the information necessary, such as information from reading materials such as journals, web, and related books. Additionally, keep an eye on the home security system in the market where it covers the system's advantages and disadvantages. In addition, researchers can also obtain the desired information by interviewing users in Malaysia. All data received will go through the evaluation process and will be analyzed in the process of developing this system [5], [6].

A. Home Security System

Historically, home security systems have long been developed by Marie Van Brittan and her husband, Albert Brown of New York. In 1966, Marie Van Brittan and her husband, Albert, introduced an electronic security system to reduce crime rates at that time. With the knowledge available in the field of electronic engineering, they created a closed circuit camera (CCTV) system to monitor the residence [7]. As we all know that technology is changing so fast; every year, many designs and developments on home security systems are designed. The creators strive to produce security systems using the latest technologies such as Arduino, raspberry pi and sensors. Sensory home security systems and

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CAM webs require advanced technologies and methods that need to be connected wireless and ensure real-time operation and threat indicators [8]. The final output can be regarded in the development of the current home, where the idea of a good life has changed. At the same time, home security focuses on current technological trends that use digital, wireless, and the Internet of Things [9], [10]. Ordinarily, we have two types of home security systems widely used: web-based systems (WBS) and telephone-based systems (PBS). For phone-based control systems, it is performed by a global system for mobile communication networks. For this web-based system, it is done via the internet or wireless router.

B. Web-based Home Security System

Fig. 1 depicted a web-based system diagram. The web servers and home guards play an essential role in Web-based home security systems. The web server controls an interfaced website that recognizes users to control the system. Typically, real-time monitoring of home conditions is done through a web browser through a personal digital assistant (PDA), mobile phone and laptop used to access the internet. The laptop is connected to the internet via a local access network cable or local wireless access network (WLAN). In addition to that, the PDAs will be connected to the internet via WLAN [11].

Fig 1. Web-based System [11].

Mobile phones are connected to internet services provided by mobile service companies. When the sensor detects any movement, a warning message will be sent to the user through the website. To show that, the users can verify the alarm after watching the home situation through devices like cameras installed in their home. Despite this, the Web-based systems require high-cost devices such as laptops or PDAs. Monthly internet service makes this web-based system a high-cost system [12], [13].

C. Home Based Security Systems

Fig. 2 illustrates a telephone-based system where users can activate the home alarm when leaving home. When a person passes through the sensor range, for example, the alarm will be notified through the PSTN system on the door sensor. Finally, the next PSTN will call the alarm monitoring company involved or directly to the homeowner [15], [16].

Fig. 2. System-based PSTN [14].

III. DESIGN AND DEVELOPMENT

The Arduino IDE software was used to generate program codes for this home security system. The pins used for connecting between components and the Arduino board have been set in a program built using this software [17]. The researcher has influenced the pins used in accordance with the design of the system. Built-in program code is based on the programmer's purpose and objectives, where the programmer has been able to detect movement within the sensor area, is turned on. Next, GSM will send a short message to the user to alert the user. The following are the programs used to enable the system to function correctly [18]. Moreover, Fig. 3 depicted the circuit of project development using Arduino Board components like UNO, GSM, and sensor.

Fig 3. The Circuit of Project Development.

```
#include<SoftwareSerial.h>
SoftwareSerial mySerial(9,10);
int sensor=7; //The output of PIR sensor connected to pin 7
int buzzer=8; // buzzer connected at pin 8
int sensor_value; //variable to hold read sensor value
int sms_count=0;
void setup()
{
  pinMode(sensor,INPUT); // configuring pin 7 as Input
  pinMode(buzzer,OUTPUT); // configuring pin 8 as OUTPUT
  mySerial.begin(9600);
}
void loop()
{
  Check_Burglar(); // subroutine to check sensor status and activation
  of outputs
}
```

```
void Check_Burglar()
{
    sensor_value=digitalRead(sensor); //Reading sensor value from pin 7
    if(sensor_value==HIGH)// Checking if PIR sensor sends a HIGH signal to Arduino
    {
        digitalWrite(buzzer,HIGH);
        while(sms_count<2) //Number of SMS Alerts to be sent limited at 3
        {
            SendTextMessage(); //Function to send AT Commands to GSM module
        }
    }
    if (sensor_value==LOW)
    {
        digitalWrite(buzzer,LOW);
    }
    void SendTextMessage()
    {
        mySerial.println("AT+CMGF=1"); //To send SMS in Text Mode delay(1000);
        mySerial.println("AT+CMGS="+601162894715+"r"); // change to the phone number you using
        delay(1000);
        mySerial.println("movement detected");//the content of the message delay(200);
        mySerial.println((char)26);//the stopping character
        delay(1000);
        sms_count++;
    }
}
```

The process of designing a project is one of the essential elements to consider in ensuring that the design is in line with the system being developed so that the components used work well. Clearly, the researchers do a little bit of research to choose the appropriate design for placing the PIR sensor. Indeed, the researchers have decided to place the PIR sensor on the end of the house wall so that the sensor utilized will work properly [19], [20]. The diagram below shows the prototype design that the researcher has built.

IV. RESULT AND DISCUSSION

The system was developed to improve the home security features and to reduce the risk of home breaking. After informing the respondents, the researcher should seek feedback from the respondents concerning this home security system's effectiveness. Although, the researcher obliges to determine whether the developed system has achieved its objective or not. Moreover, the result explicates the percentage of respondents who agree with the significance of this system. Most respondents agree on this system's efficacy in improving home security features based on the data gathered. The data results are indisputable when 63 percent of respondents gave a 5 (strongly agree) scale to the subsequent statement while another 37 percent rated a 4 (strongly agree). In conclusion, the researcher can be inclined to think that the research objective has been accomplished following the respondents' large scale.

V. CONCLUSION

As technology advances today, the purpose of technology in everyday life is run-of-the-mill. Various benefits of technology have been applied in our daily lives to ensure the well-being of our lives. Therefore, the system is being developed using today's technologies such as sensors and GSM modules, and mobile phones to decrease Malaysia's home breakage rates. With this system, it allows users to monitor home security from time to time throughout their absence. In conclusion, the developed home security system certainly benefits and benefits consumers. The system also enhances home security features, and the consumer can afford

it at a lower cost compared to existing security systems on the market. As well, the home breakdown rate could be also be reduced with this home security system.

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