Smart Home Door Lock Alarm System

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Abstract The future is the Internet of things (IoT) that will transform the real-world objects into intelligent virtual objects. The Internet of things (IoT) aims to gather everything under a common infrastructure, giving us to manage and control things around us and keeping us informed of the state of the things. The main objective of this paper is to provide an overview of the Internet of things based on the example of a smart door. A smart door lock is a combination of a traditional door lock and the futuristic technology of the IoT system. With the help of the IoT system, the door lock can be controlled from anywhere with many features such as voice command, heat sensor, ultrasonic, humidity, push and email notification and alarms. This smart door lock with IoT offers mobile application that allows the user to lock and unlock the doors by clicking an icon.

Keywords Smart home · IoT · Blynk · NodeMCU

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1 Introduction

Malaysia has been experiencing accelerated urbanization which is often associated with increasing crimes in cities. Crime in housing area has become a trend; according to the statistics, the crime index in Malaysia showed an increase and which about 90% of crimes in Malaysia are property crimes, which mainly occur around the housing areas. To prevent the house crimes from skyrocketing, the usage of IoT systems to improve the house security with the assistance of smart home systems is suggested (Soh 2012).

In early 2000, most of the international airports around the world have implemented the IoT system to invent the smart gate by recognizing the people faces, ages and gender to avoid illegal immigrants. Besides, in 2016, a RFID system has been introduced in the most highway's toll system in Malaysia (Lieshout et al. 2007).

So, by using this idea concept, the system of IoT can be implemented in residential areas for every house to avoid gate breaches. The idea is that the house owner will get a notification by a specific application in the smartphone using Blynk application even wherever they are when someone tries to open the gate or door without the permission of the owner. As for design, the circuit was set up using specific component. The simulation was set up according to the controller that was used to run the coding and circuit. Once the circuit has been designed on the breadboard, the code programming that has been created needs to be running using Blynk and the program was performed (Media's et al. 2019).

The main problems that this project attempts to solve are to get a notification for an open door. There must be a reliable system to help users especially a house or a building owner to get notified for an open door. Even if they are away from home or building, the system will automatically send a notification to the phone. Most people are usually very busy, especially with routine jobs. So, they are very difficult to monitor house surveillance and the safety.

The main objective of this project is to study and develop a security monitoring notification system that is used for security and notification systems. The purpose of this system is to increase security by designing a system which is efficient, low cost and can be implemented in home and office security systems. Furthermore, developing a security system gives security in home and office persistently (Anitha 2017).

2 Literature

The Internet of things (IoT) technology has become an evolution in the technology industry which gives a lot of potential benefits toward the community. The basic idea of the IoT was to connect any device with physical substance to the Internet. Then, the Web of things (WoT) is able to connect sensors with the Web and translate it into useful data and information (Theekakul et al. 2010).

The authors proposed a smart home using the IoT application that has combinations of the systems which were related to a portable electronic device. For instance, cloud computing and wireless sensor nodes are used and give an authority to the user to control home appliances such as door locks.

Furthermore, the IoT communication protocol is suitable for any application (Fauadi et al. 2020). The IoT application in a smart home system needs to be low cost since it uses Android application to transmit the information to the cloud. This system removes the use of personal computer (PC) which give such a big impact to the public since nowadays people preference change as technology grows. People prefer portable technology, especially youngsters. This proves that the uses of the IoT can give effectiveness toward the smart home system.

According to Mittal et al. (2017), the procedure of smart home system is using Bluetooth and Ethernet. The Bluetooth connection between the Arduino software and a smartphone has increased the possibility of short-range wireless communication that is commonly used in indoor environments while the Ethernet module is applied to the Arduino board or NodeMCU.

Besides, Media's et al. (2019) had designed a system based on the Blynk software which can be controlled and monitored by any portable device such as smartphones using Wi-Fi. All the sensors were connected to the Internet via NodeMCU.

Plus, Mahindar et al. (2018) state that the application of the Blynk app helps their project of a smart home system and increases the security level with the help of Wi-Fi which connects NodeMCU to the Blynk app. Then, the Blynk app translates the data from the sensors. This gives benefits such as detection of any unfavorable incident so that people can take early precautions.

3 Methodology

The circuit was designed according to a schematic diagram that was created. The ESP8266 Wi-Fi module and all the electronic components were attached to the breadboard.

The piezo buzzer (see Fig. 1) was connected to D5 and D2 on the ESP8266. It is used to generate basic beeps and tones when the door is opened by someone else and will be notified to the owner.

The push button as shown in Fig. 2 was connected to the piezo buzzer pin D5 and ESP8266 D2 from pin 3V3. It is for the open-closed system for the door when it is been pressed or depressed to open or close by someone that used the door.

The resistor as shown in see Fig. 3 was connected to the ground (GND). It is to delimit the electric current, voltage division, heat generation, matching and loading circuits, control gain and fix time constants.

Fig. 1 Piezo buzzer

Fig. 2 Push button

Fig. 3 Resistor

4 Process Flow

The sensor detects an opened or closed door. Next, the sensor sends data to the processing unit ESP8266. The ESP8266 interprets the data and sends data to Blynk. The user receives a notification on the smartphone informing that the door is closed or opened. Figure 4 shows the process flow.

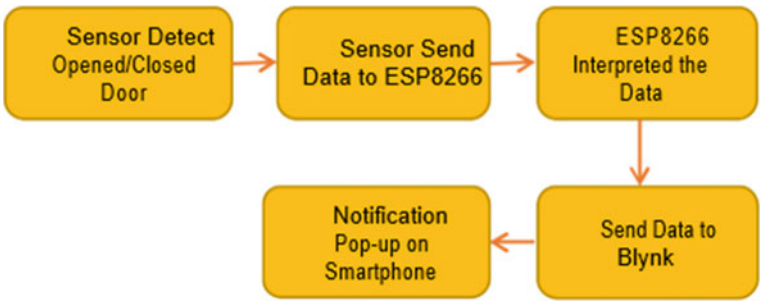

Fig. 4 Process flow

5 Result and Discussion

The system will be implemented at the main door where the user is notified every time the door is opened via an app on the user's smartphone. The system works when the door is closed and the button, which is embedded in the door frame, is pressed. When the door is opened, the piezo buzzer will also sound to inform the potential intruder that the owner of the premises has been alerted and provided thus acting as a deterrent for the intruder. Figure 5 shows the location of push button switch was placed.

When the door is opened, the button is depressed thus sending the user a notification through an app that informs the user that the door is opened. Figure 6 shows the condition of push button when the door closes, and Fig. 7 is the push button condition when the door opened.

5.1 Prototype of the Project

In this section, the information on the prototype of the door operation embedded with sensors and circuit is shared. Figure 8 shows a prototype when the door is closed. The sensor shown in Fig. 9 is for the configuration when the door is opened. Figure 10 shows circuit connection of the prototype door. A buzzer is attached so that the people staying in the house not just get a notification from the phone but also hear an alarm from the buzzer.

Fig. 5 Example on placing/ locating push button to door

Fig. 6 Button when the door is closed

Fig. 7 Button when the door is opened

Fig. 8 Prototype of a closed door

Fig. 9 Prototype of an opened door

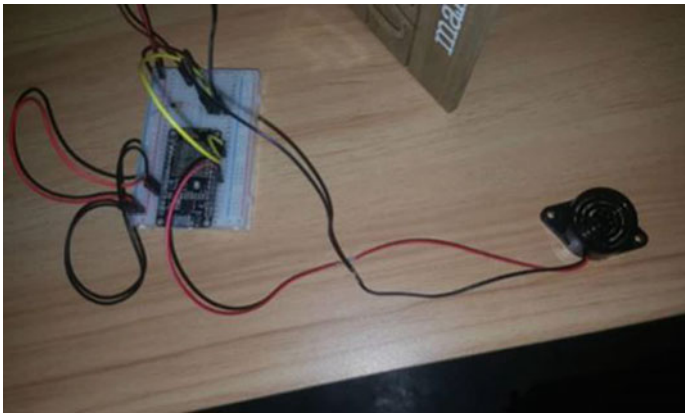

Fig. 10 Circuit assembly using ESP8266

5.2 System Circuit

This section shares the simple connection of developing a smart home door lock system. A push button was connected to the ESP8266. This push button acts as input for the system. The information from the push button will be sent to the processing unit. The output of this circuit is the piezo buzzer. The buzzer will be triggered when the push button is released signaling that there is a breach from the main door. Figure 11 shows the complete circuit for the door lock system.

5.3 Output from Arduino and Blynk

The result from the assembly to the prototype can be observed from two applications or software. The first software used to validate the accuracy of the smart home door lock system is the Arduino software. From Fig. 12, the reading in serial monitor display as "1," which signify that the door is closed. When the door is opened, number "0" and "Door Opened!!!" will be displayed on the Arduino's serial monitor.

The next output which was used to validate the functionality of the smart home door lock system is explained in the following. Two icons were placed in the Blynk application as shown in Fig. 13. When the door was opened, a notification was received from the smartphones.

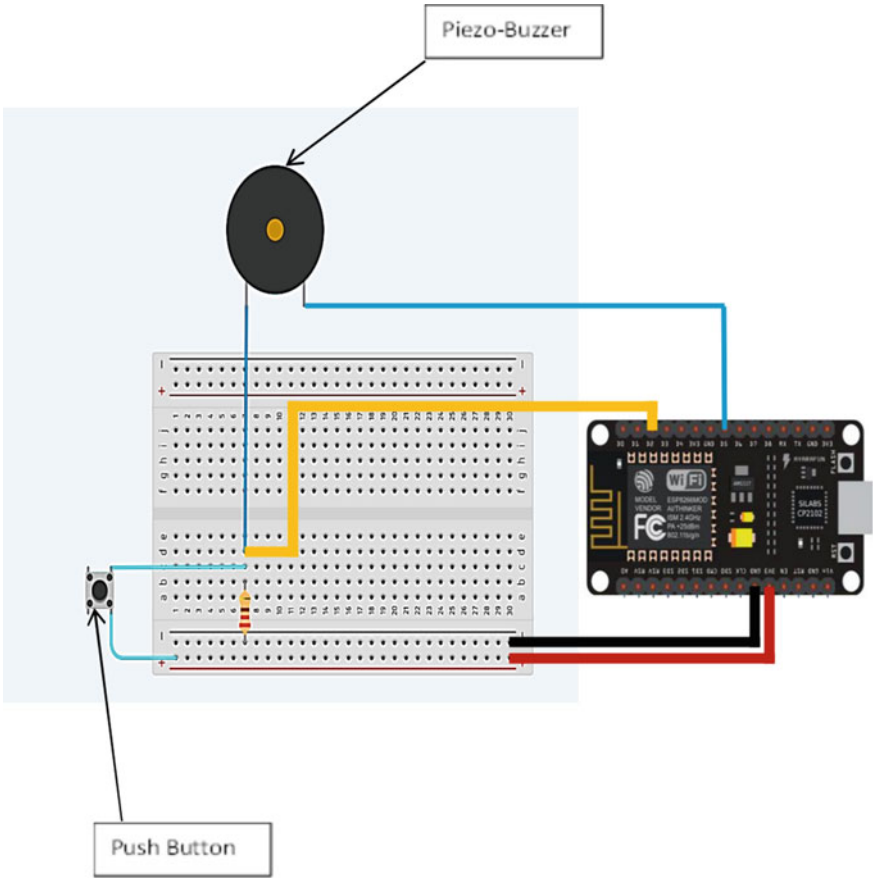

Fig. 11 System circuit

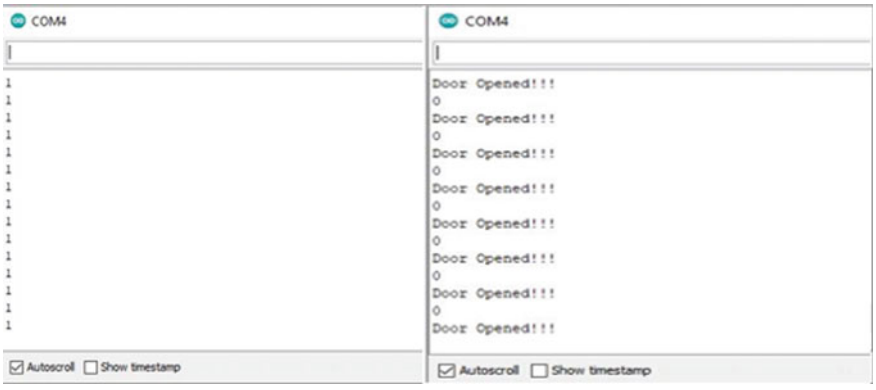

Fig. 12 Serial monitor reading

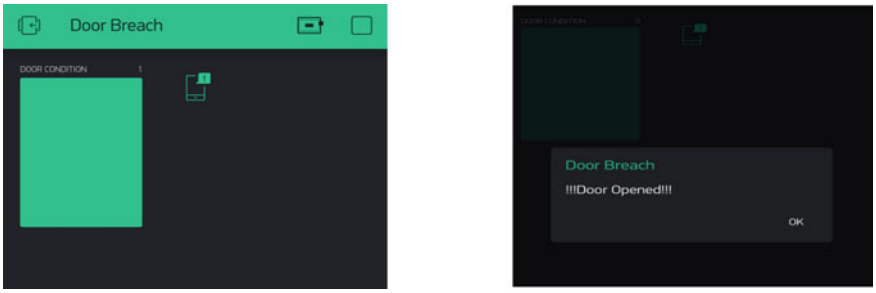

Fig. 13 Blynk interface output

6 Conclusions

In summary, the Internet of things is a revolution in technology which gives a huge impact to the industries and affects every field of life since things that seemed impossible in the past are now available. The smart door alarm project is the implementation of the IoT. This project of the smart door alarm focuses on developing a good security monitoring notification system, and it is purposely designed to increase the security. This project of the smart door alarm is mainly based on the idea of trivial issue faced by the society when a person has some obstacles to keep proper maintenance of a house specifically on the door lock and it could lead to serious consequences because of that particular action.

This innovation connects any tangible or physical possible objects (which in this case is the door) to the Internet to make the door system being controlled using portable electronic devices such as a smartphone. The smart door alarm was designed with a secured accessibility because it has safety measures on database control to prevent any unauthorized person to access the door system since the notification that pops up on phone screen helps in overall safety such as identification of a person and authority checked-up.

Plus, throughout this project, we have learnt the uses of the IoT in real-life scenarios. In addition, the study of topics that have been taught which is combination of basic components has been implied for this related project to testing out whether these project outcomes align with our objective. This innovation also uses the Blynk software to get the notification that occurs on the screen as the results and program coding are shown above.

The smart door alarm brings a lot of benefits to the user after taking everything into account. For instance, a person could take an action faster if there is a suspicious unlocked door. The costs also would not override the benefits. It makes life easier and simple as our standard of living increases day by day.

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