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DEVELOPMENT OF IoT BASED HOME SECURITY SYSTEM

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DEVELOPMENT OF IoT BASED HOME SECURITY SYSTEM

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A project report submitted
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DEDICATION

To my beloved mother, Nur-al Huda Binti Hashim, and father, Amiruddin Bin Shaari,

and

To my supervisor Ts. Niza Binti Mohd Idris

ABSTRACT

With the rapid development of technologies, the Internet of Things (IoT) has been introduced to help users in everyday activities with the aid of the Internet. IoT can be applied to home security systems due to the increasing case of burglary. It's a necessity to enhance home security due to the rise of attempted break-ins. Nowadays, cheaper security systems do exist but they still lack performance. Besides that, some home security uses incompetent and inadequate tools. Lastly, the lack of demand and attention towards security systems due to the cost. For this project, three objectives need to be achieved. First, design a home security system that will display the time of the intrusion. Second, the study of the reaction time of the system to send a notification. Third, analyse the suitable distance for the PIR Sensor to optimise the system functionality. In this project, the idea of developing an IoT-based home security system is to reduce the number of home intrusions. This system will use components such as an Arduino Uno, Arduino ESPWiFi Shield, three PIR Sensors, Buzzer, and a Lamp. The Arduino Uno will be the microcontroller of the project. The Blynk application will be used as the IoT platform. The system connects to the Wi-Fi by using Arduino ESPWiFi Shield. Three PIR Sensors will be used to detect motions and each will be placed near three-door. Whenever one of the PIR Sensors detects the door opening, it will send a notification through the user's smartphone. Not only that, the Buzzer will produce sound and the outside Lamp will be turned on. For the outcomes of the project, the system can allow the user to know when the intrusion happened. Moreover, some experiments will be conducted to study the reaction time of the system to send a notification and to analyse the suitable distance for the PIR Sensor to optimise the system functionality. In a conclusion, this project can reduce the number of home intrusions with the aid of IoT.

ABSTRAK

Dengan perkembangan pesat teknologi, Internet of Things (IoT) telah diperkenalkan untuk membantu pengguna dalam aktiviti harian dengan bantuan Internet. IoT boleh digunakan pada sistem keselamatan rumah kerana kes pecah rumah yang semakin meningkat. Ia adalah satu keperluan untuk meningkatkan keselamatan rumah kerana peningkatan cubaan pecah masuk. Pada masa kini, sistem keselamatan yang lebih murah memang wujud tetapi mereka masih kurang prestasi. Selain itu, beberapa keselamatan rumah menggunakan alat yang tidak cekap dan tidak mencukupi. Akhir sekali, kekurangan permintaan dan perhatian terhadap sistem keselamatan kerana kos. Untuk projek ini, tiga objektif perlu dicapai. Pertama, reka bentuk sistem keselamatan rumah yang akan memaparkan masa pencerobohan. Kedua, kajian masa tindak balas sistem untuk menghantar pemberitahuan. Ketiga, menganalisis jarak yang sesuai untuk Sensor PIR untuk mengoptimumkan fungsi sistem. Dalam projek ini, idea membangunkan sistem keselamatan rumah berasaskan IoT adalah untuk mengurangkan bilangan pencerobohan rumah. Sistem ini akan menggunakan komponen seperti Arduino Uno, Arduino ESPWiFi Shield, tiga Sensor PIR, Buzzer dan Lampu. Arduino Uno akan menjadi pengawal mikro projek itu. Aplikasi Blynk akan digunakan sebagai platform IoT. Sistem bersambung ke Wi-Fi dengan menggunakan Arduino ESPWiFi Shield. Tiga Sensor PIR akan digunakan untuk mengesan gerakan dan setiap satu akan diletakkan berhampiran tiga pintu. Setiap kali salah satu Sensor PIR mengesan pembukaan pintu, ia akan menghantar pemberitahuan melalui telefon pintar pengguna. Bukan itu sahaja, Buzzer akan mengeluarkan bunyi dan Lampu luar akan dihidupkan. Untuk hasil projek, sistem boleh membenarkan pengguna mengetahui bila pencerobohan berlaku. Selain itu, beberapa eksperimen akan dijalankan untuk mengkaji masa tindak balas sistem untuk menghantar pemberitahuan dan untuk menganalisis jarak yang sesuai untuk Sensor PIR untuk mengoptimumkan fungsi sistem. Kesimpulannya, projek ini dapat mengurangkan bilangan pencerobohan rumah dengan bantuan IoT.

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LIST OF ABBREVIATIONS

IoT	-	Internet of Things
PIR	-	Passive Infrared
cm	-	Centimeter

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CHAPTER 1

INTRODUCTION

1.1 Background

Nowadays, the increasing case of burglary is harming society. This phenomenon leads people to want their homes to be secure from the intruder. Crime such as house breakage, theft, and home invasion can be seen on the news. These crimes happen when there’s no one at home. However, the risk of an intrusion happening when the occupants were at home is very alarming. The trespasser can effortlessly enter the house unnoticed by the occupants [1]. Thus, a home security system is needed to prevent the possibility of intrusion.

The home security system plays an important role these days, especially with the crime that has been on the news. In the earliest days, occupants secure homes by using locks and keys where nowadays seem very outdated. Now, the home security system has developed gradually to the next level [2]. There are many examples of a home security system that uses a sensor as one of the major components used to create a security system [3].

This project is a security system that can allow the user to monitor on their phone if there's an attempted break-in. The project consists of software and hardware. For the software, the student will use Arduino IDE to create the coding, Tinkercad to design the circuit, and Blynk App to develop to monitor interface. This project consists of an Arduino Uno as a microcontroller, an Arduino ESPWiFi Shield to provide a WiFi link to the Arduino board, a PIR Sensor for motion detection, and a Buzzer to provide an audio signal for the hardware.

The expected outcome is to design a system that will use IoT to notifying the user's smartphone when the PIR Sensor detects any intrusion through the door/window/sliding door. At the same time, a buzzer will produce a sound to scare the intruder away. Thus, this project can help to save a fortune along with many people's lives.

1.2 Problem Statement

Nowadays, the importance of home security is very vital. Thus, there are many types of home security system exist in the market and being used by a lot of people. However, several security systems are expensive and not everyone can afford them. Cheaper security systems do exist but they still lack in performance. For example, some home security systems don't have notification features that show where or when the intrusion happens. [3]. Besides that, some home security use incompetent and inadequate tools. For example, some home monitoring systems are mounted on the wall. When the homeowner is away from the house and there's a break-in, the homeowner won't know that there's an intrusion happening at his/her house . [4] . Finally, the lack of demand and attention towards security systems due to the cost. For further elaboration, some home security has an installation that is so complex and most expensive [5] .

1.3 Project Objective

- To design a home security system that will display the time of the intrusion
- To study the reaction time of the system to send a notification

- To analyse the suitable distance for the PIR Sensor to optimise the system functionality

1.4 Scope of Project

The scope of this project will cover the development of an IoT-based home security system that sends a notification to the user's smartphone when there's an intrusion happening at their home. The notification will come in a message form and vibrate the smartphone when one of the PIR Sensors is set at an appropriate distance to detect any of the door/window being open. This project will be using an application called Blynk App to receive the message when there's a potential break-in. Besides that, the system will be able to display the time of the intrusion. Other than that, the buzzer will produce sound and the lamp in the house will be turned on. From this situation, the user will be alert and take safety precautions. This project will contribute to improving home security at an affordable cost and an easy-to-operate system. Besides that, this system can function at industrial places, banks, etc. Furthermore, this system can benefit old residents and those living alone by notifying them about a possible intrusion. Finally, this project can allow the homeowner to take the necessary precaution when an intruder is trying to invade the house.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The literature review is a frame of textual content this is used to check the important factors of modern-day information for any associated records to enhance the know-how of the idea and positive terminology that is used inside the project. The sources are received from journals, books, and websites which give extra records on IoT programs in house security researches about constructing security features and notification system.

2.2 Overview

This chapter aims to find knowledge, important information, and any related thesis that are in line with the concept of ‘IoT Based Home Security System’. Furthermore, theoretical, methodical, and hypothetical researches about security as well as notification system using Arduino ESPWiFi Shield and IoT emphasize and analysed.

2.3 Review on IoT in security system

IoT (Internet of Things) refers to physical objects that can interface and share information among themselves in a network without the need for human interaction, according to a study conducted by [6]. This is regarded as the "Infrastructure of the Information Society," and it allows users to collect data from a variety of sources, including humans and machines. IoT refers to an object that has been assigned an IP address to allow data transmission over a network. Electronic devices, such as sensors and software, may be added to make an object part of the IoT system. IoT differs from the Internet in that it goes beyond Internet access by allowing ordinary artifacts with embedded circuits to interact and communicate with one another using existing Internet infrastructure [6].

During his speech at the Federal Communications Commission in 1985, Peter T Lewis discussed the idea of the Internet of Things (FCC). Since then, the Internet of Things has expanded dramatically, with more than 12 billion connected devices in use today, and analysts predict that number will rise to 50 billion by the end of 2020. IoT infrastructure has helped in the implementation of efficient decisions by delivering real-time data collection and analysis using accurate sensors and seamless connectivity. The Internet of Things has helped both producers and customers [6].

Manufacturers have gained experience in how their products are used and how they perform in the real world, and they have increased their revenue by providing value-added services that boost and extend the lifecycle of their products or offerings. Consumers, on the other hand, can combine and control several devices for a more personalised and advanced experience [6].

When it comes to home automation in Security, there's a lot to keep in mind. Home security is a key feature of home automation, and it's also one of the most important. Home security has undergone a significant transformation in recent years and is expected to continue to do so in the near future. Previously, home security structures were characterised as having an alarm system that could go off if anyone tried to break in, but a smart safe home can do much more. As a result, the main purpose is to create a device that will notify the owner of a possible break-in by sending a warning to their smartphones. Furthermore, the user may be able to monitor the alarm system remotely using a smartphone [6].

This system will allow users to track activity through their smartphones and secure their homes by installing the system at the doors or windows. Over the past few years, the number of devices that are connected to the Internet has increased dramatically. All internet-connected devices are part of the IoT infrastructure, which enables them to send and receive data from one another [6].

This highlights the importance of using existing infrastructure in the development of the proposed security framework. When a user isn't at home to take action, a device that involves buzzer sounds isn't useful. They need to know that their home is safe from intruders and criminals. As a result, this system aims to keep the owner up to date on the status of their home's security in real-time. When a possible break-in is detected, the built device alerts the user so that important steps can be taken [6].

2.4 Review on IoT platforms used in security system

2.4.1 Dweet

Figures 2.1 shows the dweet.io logo. Dweet is an IoT interface messaging service. It can send data from your computer to the cloud through a simple API called "Dweeting." The user will then view the data on a dashboard after collecting it. Dweet works well with freeboard.io, which is produced by the same company (Bug Labs) and offers a slick interface [7].