Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF IOT BASED SMART INTRUDER PREVENTION SYSTEM WITH WEB SERVER USER INTERFACE APPLICATIONS

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Bachelor of Electronics Engineering Technology (Telecommunications) with Honours

2021

DEVELOPMENT OF IOT BASED SMART INTRUDER PREVENTION SYSTEM WITH WEB SERVER USER INTERFACE APPLICATIONS

KISHONTHEN KRISHNAN

A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electronics Engineering Technology (Telecommunications) with Honours

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APPROVAL

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DEDICATION

To my beloved mother, Mrs Mohanasundari, and father, Mr Krishnan,

and

my siblings.

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ABSTRACT

In today's world, security has become a major concern. Everyone wants their home, farm, belongings, and other valuables to be safe. Many inventions have been made to address this problem over the years. Closed-circuit television (CCTV) was one of the most well known invention. But are they really maintaining the level of security as we expected? CCTVs are less effective at preventing any unwanted incidents, and the major drawback is that we can only view the recordings after an incident has occurred. Furthermore, a simple working CCTV system would be very costly. On the other hand, a proper security device should be structured in such a way that it notifies the user while also assisting in the prevention of any undesirable scenarios. To begin, the camera will stream normally, however, whenever the PIR sensor detects movement, it will send a signal to the Raspberry PI, which will notify the user via the Telegram app, which also includes the Webpage link. After receiving the notification, the user can access the Webpage by logging in using their unique username and password. Then, users can view the camera's live video streaming on the webpage to confirm the alert, as well as use the user interface to scare the intruder (human or animal) and let them know they are being watched. This also helps the user to contact authorities for help right away.

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ABSTRAK

Di dunia sekarang, keselamatan menjadi perhatian utama. Semua orang mahu kediaman, ladang, barang, dan barang berharga mereka selamat. Pelbagai penemuan telah dibuat untuk mengatasi masalah ini selama bertahun-tahun. Televisyen litar tertutup (CCTV) adalah salah satu penemuan yang paling terkenal. Tetapi apakah mereka benar-benar menjaga tingkat keamanan seperti yang kita harapkan? CCTV kurang berkesan untuk mencegah kejadian yang tidak diingini, dan kelemahan utama adalah bahawa kita hanya dapat melihat rakaman setelah kejadian berlaku. Tambahan pula, sistem CCTV yang berfungsi dengan mudah akan sangat mahal. Sebaliknya, alat keselamatan yang betul harus disusun sedemikian rupa sehingga memberi tahu pengguna sambil membantu dalam pencegahan sebarang senario yang tidak diingini. Sebagai permulaan, kamera akan *streaming* secara normal, namun, setiap kali sensor PIR mengesan pergerakan, kamera akan mengirim isyarat ke Raspberry PI, yang akan memberitahu pengguna melalui aplikasi Telegram, yang juga termasuk pautan Halaman Web. Setelah menerima pemberitahuan, pengguna dapat mengakses Halaman Web dengan masuk menggunakan nama pengguna dan kata laluan mereka yang unik. Kemudian, pengguna dapat melihat penstriman video langsung kamera di halaman web untuk mengesahkan amaran, serta menggunakan antara muka pengguna untuk menakut-nakuti penceroboh (manusia atau haiwan) dan memberitahu mereka bahawa mereka sedang ditonton. Ini juga membantu pengguna untuk menghubungi pihak berkuasa untuk mendapatkan bantuan dengan segera.

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LIST OF SYMBOLS

δ - Voltage angle

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LIST OF ABBREVIATIONS

PIR	-	Passive Infrared Sensor
IoT	-	Internet of Things
GPIO	-	General Purpose Input and Output
CCTV	-	Closed-Circuit Television
WSGI	-	Web Server Gateway Interface
I/O	-	Input and output
API	-	Application Programming Interface
RDS	-	Remote Desktop Connection

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CHAPTER 1

INTRODUCTION

1.1 Background

‘Protection is not a principle, but an expedient’. *Benjamin Disraeli* has beautifully illustrated the importance of protection through his saying. All leading nations are spending tons of resources ad money on developing their countries security in all aspect of areas, be it from land to sky. Few countries are even working on Space Armies. But before going too far away, let us talk about a person’s daily security needs, and let us narrow it down to our country, Malaysia. Above all the security breaches or in other words, crime. Theft has been leading the way for very long time, in terms of the numbers. According to the statistics published by Department of Statistics Malaysia in 2019, 59.0% of violent crimes were robbery or theft. According to *Wikipedia*, taking another person's property or services without their permission or consent with the goal to deprive the lawful owner of it is referred to as theft. Burglary, looting, robbery, shoplifting are all crimes against property that are commonly referred to as theft.

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When we talk about theft, sometimes it is not only about losing our belongings, but at times during the process, unfortunately some unintended event occurs like, death. Every individual on this earth requires protection. It is the main reason security systems are being on demand right now. Ultimately, security system is essentially a method of securing anything through a system of interconnected components and devices. Property security systems, in this case, are networks of integrated electronic devices that operate together with a central control

panel to guard against intruders. Over the decades they are quite a number of security systems inventions has been made. But are these conventional security systems reliable? Even there are various security systems, rapid increase in robberies and

intrusion cases are still being visible. Traditional home security systems frequently require installation and detect intrusion based on the opening and closing of doors and windows. The rising number of theft and housebreaking crimes, particularly when individuals are not at home is almost unstoppable. This leads to demand of developing a system that may alert them if someone has attempted to break into their home and somehow magically the house owner could stop that from happening being far away from their house using just their smart devices. As much as technology rises, the number of modern criminals also rises drastically. The need for doubling up the security features along with the technology is a must to put on hold for the criminals, or at least until they come up with even better ideas. Earning to own something is tough process, after owning, protecting it is a stressful process, and end up losing it, is a dreadful situation to be in.

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1.2 Problem Statement

Even we have vast inventions to protect our property, intrusion and robberies are still being a major issue all over the world and the number of cases is increasing drastically year by year. This is due to lagging of conventional security system in terms of technology advancement and modern-day solution. One of the major issues in our current security system is that it is never meant to prevent or stop any intrusions and robberies.

Besides, an ordinary security system is far away from affordability. One of the major concerning things that we can see, is almost every household has a variety of electronic gadgets such as air conditioner, television, refrigerator and so on but when it comes to security system it has always earned a second thought. This clearly illustrates our security system is overpriced.

Moreover, a conventional CCTV system only has the ability of viewing the recordings of the clips only after an incident has happened which is clearly not the only thing that we want. Viewing an incident once it has occurred is good for nothing.

1.3 Project Objective

My objectives for the project are below:

- To design a security camera system that will notify the user if any intruders are detected (Human or Animals).

- To create a system that gives users access to a live video feed 24 hours a day. Allowing them to inspect the area where a security camera has been installed using any of their smart devices.

- To develop a Web Server where each registered user has their own user ID and password to login, and where they will be given a user interface application that allows them to scare an intruder simply by using their smart devices from anywhere.

- To create a high-quality security device that is affordable to everyone.

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1.4 Scope of Project

The camera will initially broadcast normally, but once the PIR sensor detects motion, it will send a signal to the Raspberry PI, which will notify the user via the Telegram application, which also includes a link to the webpage. After receiving the notification, the user may log in to the website using their given username and password. The user may then confirm the warning by viewing the camera's live video feed on the site, as well as scare the intruder (human or animal) and warn them that they are being watched. This also makes it easy for the property's owner to contact the appropriate authorities for urgent help.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter is about evaluation and integration of information found in previous researches completed in the similar field. The published information will be in a particular subject area or in a particular subject area within a certain time period. A literature review is an evaluative report of information found in the journals, articles or books related to the selected area of study. The review should describe, summarize, evaluate and clarify this literature. It should give a theoretical base for the research and help the authors determine the nature of their research.

2.2 Human Intrusion Detection

Detecting human in the form of video and a sequence of images is critical in a variety of real-world applications such as in visual monitoring, automatic driver assistance and more. Due to a variety of factors, detecting humans in the form of live feed is challenging. The result might not be accurate all the time as chances of errors to occur is high. This can be corrected by any proximity sensors which effectively boosts the power of this video monitoring application. Combining hardware with efficient machine learning techniques will achieve high efficiency and precision in remote surveillance.[1] One of the methods to overcome this issue is to install Passive Infrared Sensor (PIR).

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2.3 Application of Passive Infrared (PIR) sensors in security system

Passive Infrared Sensors (PIR) are commonly used in security homes and smart offices as a quick presence trigger for alarms and a secure counter for people. The majority of papers have concentrated on the design and implementation of such devices, but there has been no literature on identifying targets in an outdoor environment using PIR sensors.[2]

PIR sensors are made of pyroelectric components, and can generate an electric potential from a very slight temperature shift. A difference in charge may be produced by the heat variance of a person or animal from a distance of several feet. As a result, PIR sensors are well-suited in tracking moving targets. PIR sensors are also used by many security devices as a good intrusion warning and an accurate counter for targets that include not only humans but also cars, and other items. However, previous research has mostly focused on detecting targets, while we use PIR sensors to identify targets after they have been detected. In addition, our PIR nodes are not for use in a confined indoor space where the detection limit is a few meters. In an unattended wild land environment, they are used to locate targets more than 20 meters away [3].

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