Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Development of Smart Motorcycle Starter with Safety and Tracking System

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Bachelor of Electronics Engineering Technology with Honours

2021

Development of Smart Motorcycle Starter with Safety and Tracking System

MUHAMAD AFIQ BIN FUAD

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

Faculty of Electrical and Electronic Engineering Technology

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I declare that this project report entitled “Development of Smart Motorcycle Starter with Safety and Tracking” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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DEDICATION

I dedicate this bachelor degree project to God Almighty my creator, my strong pillar, my source of inspiration, wisdom, knowledge and understanding. He has been the source of my strength throughout this course and on His wings only have I soared. I also dedicate this work to my father, Fuad bin Ramin and my mother, Haslinda binti Haron who has encouraged me all the way and whose encouragement has made sure that I give it all it takes to finish that which I have started. Not forgetting to all my lecturers and my friends, who never tired of giving me guidance and advice that has been very beneficial to me in completing this project.

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ABSTRACT

Vehicle theft is a common occurrence nowadays. Labeled as a peaceful country, but in reality, it is not so quiet because a number of people in society continue to commit this crime without our knowledge. Theft of motorcycles was the most common type of theft in the country. Although the number of vehicle theft cases is reducing every year, according to statistics from the Vehicle Theft Reduction Council Malaysia Berhad (VTREC), the motorcycle remains the most common vehicle stolen. A smart motorcycle startup project with security and tracking was built to address this issue. The project is propose to increase motorcycle safety by making it easier to start the engine and allowing the motorcycle owner to easily track the location of his motorcycle at any time, even if no theft occurs. The Arduino Mega is used as a microcontroller in this project to control the system's inputs and outputs. An RFID tag is a type of identification system that uses a small radio frequency device to identify the motorcycle so that it may be started once the key is placed. The SIM808 GSM/GPS module is used to locate the motorcycle, regardless of whether it has been stolen or not. If someone tries to steal a motorcycle, a piezoelectric transducer is utilised in conjunction with a burglar alarm. This means that if the piezoelectric transducer detects a vibration or force against the motorcycle's actual structure, the alarm will be activated. Based on result, the proposed system will make it difficult for thieves to steal motorcycles as well as make it easier for motorcycle users to track the location of their motorcycles no matter where they are. This project is easy to use and user-friendly as it introduced a better improvement to vehicle security system.

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ABSTRAK

Pada masa kini, kes kecurian kenderaan bukanlah perkara baru. Dilabel sebagai negara yang damai, tetapi pada hakikatnya tidak begitu damai kerana ada sebilangan masyarakat yang tidak bertanggungjawab masih melakukan jenayah ini demi kepuasan hidup mereka. Motosikal adalah kenderaan dengan kadar kes kecurian tertinggi di Malaysia. Menurut data statistik oleh Majlis Pengurangan Kecurian Kenderaan Malaysia Berhad (VTREC), walaupun kes kecurian kenderaan ini semakin berkurang setiap tahun, tetapi motosikal tersebut masih dicatatkan sebagai kes kecurian tertinggi. Untuk mengurangkan kes ini, projek pemula motosikal pintar dengan keselamatan dan sistem penjejakan dilaksanakan. Projek ini dicadangkan untuk meningkatkan keselamatan motosikal, mudah menghidupkan enjin motosikal dan pemilik motosikal mudah mengetahui lokasi motosikalnya pada bila-bila masa walaupun kecurian tidak berlaku. Projek ini menggunakan Arduino Mega sebagai mikropengawal untuk mengawal input dan output sistem. Tag RFID adalah sistem ID yang menggunakan alat frekuensi radio kecil untuk tujuan pengenalpastian sehingga enjin motosikal dapat dimulakan setelah kunci motosikal dimasukkan. Modul SIM808 GSM / GPS digunakan untuk mengetahui lokasi motosikal sama ada kecurian berlaku atau tidak. Penggunaan transduser piezoelektrik yang digunakan bersama dengan penggera pencuri jika seseorang cuba mencuri motosikal. Ini bermaksud bahawa apabila terdapat getaran atau hentakan terhadap fizikal motosikal, transduser piezoelektrik akan bertindak balas maka penggera akan diaktifkan. Berdasarkan keputusan, sistem yang dicadangkan ini akan menyukarkan pencuri untuk mencuri motosikal selain memudahkan pengguna motosikal mengesan lokasi motosikal mereka tidak kira di mana mereka berada. Projek ini mudah digunakan dan mesra pengguna kerana peningkatan sistem keselamatan kenderaan yang lebih baik.

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LIST OF SYMBOLS

%	-	Percentage
>	-	Greater than
°	-	Angle degree
kph	-	Kilometer Per Hour
dbm	-	Decibel-milliwatts
MHz	-	Mega Hertz
dBi	-	Decibel Relative to Isotrope

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LIST OF ABBREVIATIONS

V	-	Voltage
A	-	Ampere
GPS	-	Global Positioning System
GSM	-	Global System for Mobile Communication
IoT	-	Internet of Things
LED	-	Light Emitting Diode
LCD	-	Liquid Crystal Display
SMS	-	Short Message Service
ID	-	Identity Document
VIP	-	Very Important Person
URL	-	Uniform Resource Locators
RFID	-	Radio Frequency Identification
DIY	-	Do It Yourself
SOS	-	Save Our Souls / Save Our Ship
Wi-Fi	-	Wireless Fidelity
DC	-	Direct Current

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CHAPTER 1

INTRODUCTION

1.1 Background

According to Pew Research Center estimates, 83 percent of Malaysian households own a motorcycle, making it the country's second most common mode of transportation. The lower cost of owning a motorcycle has always been the primary motivator for many Malaysians to purchase motorcycles compared to four-wheelers. Additionally, the use of these motorcycles is also able to escape traffic congestion. Similar with the technological advances available on motorcycles, it will definitely encourage more people to own motorcycles compared to four-wheeled vehicles. These circumstances, however, have resulted in a rise in motorcycle theft incidents across the country.

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There are two situations that can lead to a motorcycle theft. The first is the owner of the motorcycle's own carelessness. They didn't take this crime seriously until they failed to install any safety equipment on the motorcycle. As a result, motorcycles can be stolen without being detected. The use of disk lock alone does not guarantee 100% safety on the motorcycle. The use of the best and most expensive disk lock will make it difficult for thieves to steal a motorcycle in a short period of time. However, there is still a chance that a motorcycle will be stolen. Similarly, relying solely on the remote alarm does not ensure the motorcycle's safety for an extended period of time. Therefore, this project is being executed in order to create a more efficient motorcycle security system in order to lower the rate of motorcycle theft in the country.

1.2 Problem Statement

The development technologies on motorcycle always improving every year. The production of advanced technologies on motorcycle such as electronic fuel injection, electronic rider assistance, pneumatic tires, Multi-Cylinder engine, Anti-Lock Brake System and brake disc have given high efficiency and performance on motorcycles. However, these premium grade and popular motorcycle has also led towards the increase in theft cases in the country because the thieves like the technologies that have been incorporated into the motorcycle. This situation stems from the weakness of the safety system that exists on the motorcycle itself. The use of a motorcycle lock alone is not enough because thieves can steal a motorcycle without the knowledge of the motorcycle owner. Thieves will do anything as possible to break the lock of the motorcycle. They are able to have a duplicate key created by themselves, or a duplicate key from the store. Therefore, with the absence of additional tools or additional keys such as ID number to start the motorcycle engine will give opportunity for thieves to steal motorcycles easily. At the same time, when a motorcycle is successfully stolen, no warning alarm is triggered and finally, the motorcycle owner will find it difficult to track down his or her lost motorcycle. Thus, based on all the problem statements mentioned above, the absence of effective security equipment can lead to an increase in theft cases in the community.

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1.3 Project Objective

The objective of this smart motorcycle starter with safety and tracking system is to minimize the rate of theft cases in community.

a) The main purpose of this project is to provide extra security to motorcycles.

b) To develop a new method to turn on motorcycle engine and in the same time it can increase motorcycle safety.

c) To develop a system to track down the loss of motorcycle.

1.4 Scope of Project

The scope of this project are as follows:

a) A smart motorcycle starter with a safety and tracking system adds an additional level of security by alerting the owner if the motorcycle is stolen. It will be good to have a burglar alarm that works similarly to a car burglar alarm. If a motorcycle theft incident or any act that may cause the motorcycle to be out of its original position occurs near him/her, the piezoelectric transducer (shock sensor) will play a vital role. The burglar alarm is activated when the shock sensor is triggered, and the motorcycle owner is notified. At the same time, the location of the motorcycle is sent to the owner by SMS. If the motorcycle owner is too far away from his or her motorcycle, an SMS with the location of the motorcycle can be sent to his or her smartphone.

b) Smart motorcycle starter with safety and tracking system, as well as the ability to start the motorcycle engine using an ID card. Because the main key is insufficient, an additional key (an ID card) is required. An ID card is utilized since making a duplicate key is difficult. Because this ID card has its own code or information stored in memory, this is the case. As a result,

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using an ID card to start a motorcycle engine is not only innovative, but it may also increase motorcycle safety.

c) Lastly, this system will be able to send the location of the motorcycle to its owner via smartphone. SIM808 GSM/GPS will be used to send the location of the motorcycle to its owner. After the burglar alarm is activated, the motorcycle owner will be notified of the location. Even if the theft does not occur, the user can still easily track the location of his or her motorcycle at any time by request the location of motorcycle from SIM808 GSM/GPS module.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

A literature review is a synopsis of a thesis's previous analysis. The goal of a literature review is to communicate what information and ideas have been produced on a certain topic, as well as the strengths and limitations of each. Prior to beginning this study, a literature review was undertaken to gather information on the technology available and the approaches utilized by other researchers working on the same topic throughout the world at the same time. This chapter will provide the project, which will include a detailed explanation of the best way for designing a smart motorcycle starter with a safety and tracking system.

2.2 Structure of Smart Motorcycle Starter with Safety and Tracking System

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2.2.1 Global System for Mobile Communication (GSM)

According to [2], the Global System for Mobile Communications (GSM) is a protocol standard for second-generation (2G) digital cellular networks, which are utilized by mobile devices such as phones and tablets. GSM (Global System for Mobile Communication) is a second-generation (2G) digital cellular network used by mobile phones. This network replaces the analogue cellular network of the first generation (1G). The available frequency bands are 850 MHz, 900 MHz, 1800 MHz, and 1900 MHz. The proposed system is aimed at Malaysia, an Asian country where the majority of Asian countries use the 900 MHz or 1800 MHz bands. The GSM network can be used anywhere on the world as long as the country supports the

relevant frequency range. GSM employs Time Division Several Access (TDMA) technology, which divides a signal into various time slots to allow multiple users to utilize the same frequency channel.

Figure 2.1: GSM Module

Based on Figure 2.1 above, the 3dBi GSM Module is small, light, and sensitive. If you're constructing anything like a DIY phone, the antenna juts out from its base with a stick-on back so you can attach it to an enclosure. It has a tiny uFL connector on the end, which is ideal for the 1946, but it can also be used on the 850/900/1800/1900/2100 bands. [5].

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2.2.2 Global Positioning System (GPS)

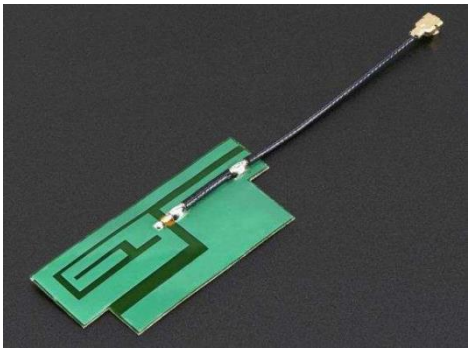

Figure 2.2: GPS Antenna

The GPS (Global Positioning System) is a satellite-based navigation system with at least 24 satellites. With no subscription fees or setup charges, GPS works in any weather condition, anywhere in the world, 24 hours a day. GPS receivers are made up

of an antenna that is set to the frequencies transmitted by the satellites and monitored by the channels, receiver-processors, and a very stable clock (often a crystal oscillator) [11]. According to reference [2,] GPS is a system that allows users to get an accurate position on the Earth at any time and from any location, depending on the weather at that moment. Latitude, longitude, and altitude are the parameters that GPS may collect. Angles ranging from 0º to 90º are used to measure latitude (North or South). The angle will be positive when the point is at the North Pole from the equator, and negative when it is at the South Pole. Negative angles will be found in regions that are lower than the equator, and vice versa. Meanwhile, the longitude ranges from 0 to 180 degrees. The positive and negative angles, like latitude, denote different regions on the Earth. However, the East and West regions determine the angle of latitude. The east will have a positive angle, whereas the west will have a negative value. As a result, both latitude and longitude are required in order to monitor a specific position

2.2.3 RFID Module

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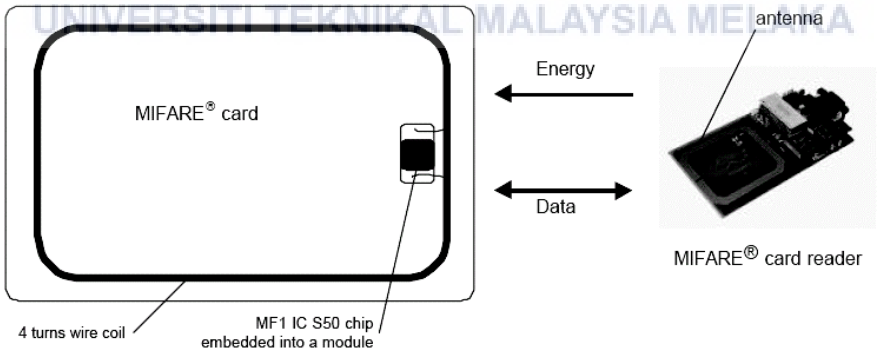

Figure 2.3: Diagram of RFID Module

Radio-frequency identification (RFID) uses electromagnetic fields to recognize and track tags attached to objects, as shown in Figure 2.3. A radio transponder, a radio receiver, and a transmitter make up an RFID system. The tag