DEVELOPMENT AND ANALYSIS OF LOW-COST SMART SECURITY AND TRACKING SYSTEM FOR MOTORCYCLE

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This report is submitted in partial fulfillment of the requirements for the degree of Bachelor of Electronic Engineering with Honours

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To my mother and father: “Thank you for supporting me till today even though when I’m not doing my best, the support and prayers that I get will never can I afford to repay until the Judgement Day.

ABSTRACT

This project is to develop a hardware and software for security and tracking system for motorcycle by using Arduino as the microcontroller to control any module that will be installed, how's the module works depend on the coding that will be uploaded onto the Arduino. Users have to use an android smartphone to pair their device to the Arduino to control the relay states which are "1" for "ON" and "0" for "OFF" for security purposes. GPS module will be installed on the Arduino for tracking purposes and its coordinate will be uploaded to the cloud server by using GPRS connectivity and can be accessed from the application on the Android smartphone for real-time tracking.

ABSTRAK

Projek ini adalah untuk membangunkan perkakasan dan perisian untuk keselamatan dan sistem pengesanan untuk motosikal dengan menggunakan Arduino sebagai mikropengawal untuk mengawal modul-modul yang akan dipasang, fungsi modul bergantung pada pengekodan yang akan dimuat naik ke Arduino. Pengguna perlu menggunakan telefon pintar android untuk menhubungkan peranti mereka kepada Arduino untuk mengawal keadaan relay iaitu "1" untuk "ON" dan "0" untuk "OFF" bagi tujuan keselamatan. Modul GPS akan dipasangkan pada Arduino untuk tujuan pengesanan dan koordinatnya akan dimuat naik ke server dengan menggunakan sambungan GPRS dan boleh diakses dari aplikasi pada telefon pintar Android untuk penjejakan masa nyata.

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LIST OF SYMBOLS AND ABBREVIATIONS

GPS	:	Global Positioning System
GPRS	:	General Packet Radio Service
GSM	:	Global System for Mobile communications
MAA	:	Malaysian Automotive Association
IDE	:	Integrated Development Environment
SMS	:	Short Message Service
ECM	:	Engine Control Module
OBD	:	On-board diagnostics
TCP	:	Transmission Control Protocol
IP	:	Internet Protocol
CPU	:	Central Processing Unit
API	:	Application Programming Interface
SoC	:	System-on-a-Chip
IC	:	Integrated Circuit
LCD	:	Liquid-crystal display
USB	:	Universal Serial Bus
PWM	:	Pulse Width Modulation
UART	:	Universal Asynchronous Receiver/Transmitter

ICSP	:	In-Circuit Serial Programming
SRAM	:	Static Random Access Memory
EEPROM	:	Electrically Erasable Programmable Read-Only Memory
PAN	:	Personal Area Network
RF	:	Radio Frequency
RAM	:	Random Access Memory
HTTP	:	HyperText Transfer Protocol
EGPRS	:	Enhanced Global System for Mobile communications
EDGE	:	Enhanced Data for Global Evolution

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CHAPTER 1

INTRODUCTION

1.1 Project Overview

Motorcycle is a vehicle that is commonly used by people as it is low-cost transportation and many people nowadays tend to use a motorcycle as their main transportation due to their low-maintenance, low-fuel consumption, and peoples who like to avoid heavy traffic. Even though the motorcycle is low-cost, it's still cost us about RM5000± for the new one if the motorcycle is being stolen. For motorcycle under 150cc which called as "kapchai" or "underbone", people commonly used cheap padlock as their additional security. These conventional security system does not efficient enough to prevent the motorcycle from being stolen as the padlock can be picked and break easily. Another method that theft

use is they just lift the motorcycle and put it in the van or truck because of the lightweight and can be lifted up only with just 2-3 manpower. Many motorcycles that being stolen somehow cannot be traced back as the theft will tear it down completely just by leaving the motorcycle frame behind as soon as they reach their hideout.

By doing this project, many additional security features can be added to the motorcycle thus improving the chance of recoverability by using nowadays technology available on the market right now. The idea comes from the Android smartphone tracking system which is called “Find My Device”, service provided by Google which helps to locate lost or stolen smartphone via its own application on Google Play Store or its website. It’s used GPS on the smartphone to get the coordinates and directly display it on Google Map. The enhancement of the security and tracking system will be done on Arduino and its modules which is Bluetooth, GPS module, GSM module, and accelerometer.

Arduino is a programmable microcontroller that will be used to control the modules. The user must use a smartphone to pair their device to the Arduino using Bluetooth modules so it can control the relay states, “1” for “ON” and “0” for “OFF”. Accelerometer will be added, this will allow the module to send the signals to Arduino and notify the user through the application if there any movement of the motorcycle especially if the motorcycle being taken away. GPS module will also be connected to the microcontroller in order to get coordinate of the device. Coordinates then will be upload to the cloud storage using GSM

connectivity and the location of the device then can be accessed through the application. Figure 1.1 shows the project overview.

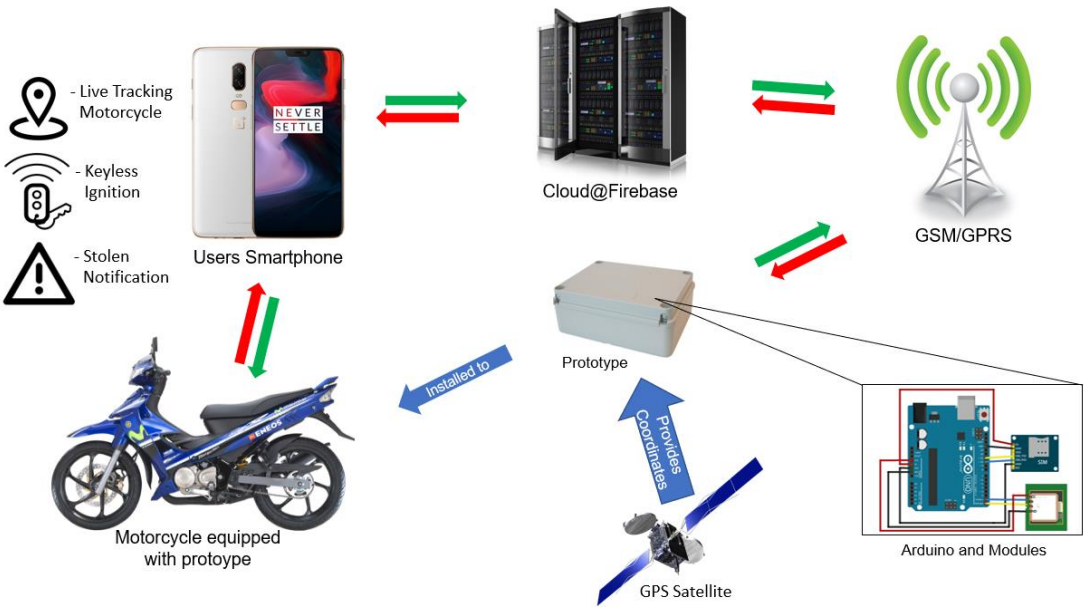

Figure 1.1: Project Overview

1.2 Objectives

To accomplish this project, several objectives need to be achieved. Below are the objectives.

- To design and develop low-cost smart security and tracking system device for motorcycle.
- To analyze and optimize the power consumption of prototype for prolonged usage.

1.3 Problem Statement

According to Malaysian Automotive Association (MAA) in an online article on 3rd October 2017 from Paultan.org by Duranni Sharom, about 12,933,042 motorcycles have been registered until 30th Jun 2017 [1]. Most of the people use motorcycle nowadays as their main transportation due to low-maintenance, low-fuel consumption or peoples who like to avoid traffics. The drawback of the low-cost motorcycle is it does not equip with the latest security features. Even though the price is quite affordable but it is still cost around RM5000± and it would be a hassle for someone to buy a new one if it got stolen. Nowadays technologies allow the user to equip their vehicle with GPS tracker but it's come with a cost as an example, Katsana Motorcycle Tracking system price about RM750. About 12,216 motorcycle being stolen till 2016 [2]. This project can help to prevent the motorcycle from being stolen by providing security which is Bluetooth keyless ignition, early notify the user if the motorcycle being taken and also provide tracking system by using GPS for worst case scenario.