SHOPPING CART ANTI-THEFT SECURITY SYSTEM

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Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer
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Specially dedicated to

My beloved family, lecturers, supervisor and friends who have guided and inspired me through my journey in education. Also thanks to their support, beliefs and motivation.

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ABSTRACT

The objective of this project is to design Shopping Cart Anti-Theft Security System which is a design that will greatly reduce missing cart problem. The design will use three main components which are transmitter, receiver and also a pair of solenoid. This research also will cover on implementation and technique used in measuring distance of the signal transmitted between transmitter and receiver for activation or triggering the circuit. Transmitter will send a signal to the receiver, and whenever the signal from transmitter did not receive by receiver, it will activate trigger circuit which consists of relay, diode and transistor. Thus, solenoid will be pushed down to lock the wheel and prevent the cart from being push away from supermarket. Besides that, systems compartment also have been designed to ensure the circuit and other component in the system not affected by environmental factor.

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ABSTRAK

Cadangan projek ini adalah untuk mereka bentuk Sistem Keselamatan mencegah Kecurian Troli. Sistem Keselamatan mencegah Kecurian Troli adalah satu sistem yang akan mengurangkan masalah kecurian troli daripada berlaku. Reka bentuk sistem akan menggunakan tiga komponen utama iaitu pemancar, penerima dan juga sepasang solenoid. Kajian ini juga akan meliputi pelaksanaan dan penggunaan teknik dalam mengukur jarak isyarat yang dihantar daripada pemancar kepada penerima untuk mengaktifkan litar pencetus. Pemancar akan menghantar isyarat kepada penerima, dan apabila isyarat dari pemancar tidak di dapat di terima oleh penerima, ia akan mengaktifkan litar pencetus. Oleh itu, solenoid akan di tolak ke bawah untuk mengunci roda dan menghalang troli itu daripada ditolak keluar dari pasar raya. Selain itu, sistem ini juga telah direka untuk memastikan litar dan komponen lain dalam sistem tidak terjejas oleh faktor persekitaran.

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LIST OF ABBREVIATION

IC	-	Integrated Circuit
PCB	-	Printed Circuit Board
CAPS	-	Cart Anti-theft Protection System
TX	-	Transmitter
TV	-	Television
AM	-	Amplitude Modulation
FM	-	Frequency Modulation
RF	-	Radio Frequency
IC	-	Integrated Circuit
OOK	-	On Off Keying
ASK	-	Amplitude Shift Keying
CMOS	-	Complementary Metal Oxide Semiconductor
IR	-	Infrared
GND	-	Ground
FCC	-	Federal Communications Commission

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CHAPTER I

INTRODUCTION

This chapter will explain on the project background, objective of project, problem statement, scope of project, methodology and report structure.

1.1 Background Project

Shopping cart is a cart supplied by retail, shop or supermarket for customer use to carry their goods or merchandise around the supermarket up to the payment counter. Customer also used the shopping cart to carry their purchased goods to the car at the parking lot.

In many places around the world, customers are allowed to push their cart to the parking lot to carry their goods and need to return the cart back to the storage area. Sometimes, in order to make the customer return the cart back to the storage area, coin or token are used as locking mechanism. The customer will only get their token or coin back after they return the cart back to the storage area.

Nowadays, there are many type of shopping cart used. Most of them are made of metal or combination between plastic and metal. These carts come with many sizes,

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large cart to carry heavy goods or specialized carts design to carry a child in it. Customer also can use shopping basket if the goods they carry are in small and light size.

Shopping cart usually fitted with four wheels, but if one wheel is jammed, the cart will be difficult to move and handle. Thus, it had been designed that front wheel of the cart using swivel wheels, while the back wheels are fixed orientation. Sometimes, all the carts wheels are using swivel wheels.

According to a research by Supermarket Institute, a shopping cart is stolen every 90 seconds in United States. About 1.8 million shopping carts were missing from supermarket last year and $175 million used to replace the missing cart, according to the Washington-based Food Marketing Institute [5]. An additional $117 million used by the owner to hire extra workers to retrieve the missing cart [6].

1.2 Objectives Project

A simple security system that used coins or token had been developed to prevent the cart being placed outside supermarket area, but the system is proven not quite effective to prevent the missing cart problem.

Hence this project would like to enhance the simple security system by using transmitter, receiver and also solenoid. The project is known as Shopping Cart Anti-Theft Security System and the objectives of the project are:

i. To study the system that already in use or were used to overcome missing trolley problem.
ii. To improve and develop a system that can overcome missing trolley problem.
iii. To study the system that already exists.

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1.3 Problem Statement

Nowadays, we can see many cart were placed outside the premise or supermarket area. Sometimes, the workers are unable to gather the entire cart back. When the carts are abandoned far away from the premise area the owner also needs to hire extra workers to gather the cart, thus will increase the operating cost of the company. But, what if the workers are unable to get the cart back? The cart will be considered as missing.

The owner needs to buy a new cart in order to replace the missing one. A new cart nowadays is about RM1000 to RM1500 each respectively depending on material used so that the cart is able to withstand heavy usage from the customer. Thus it will increase the operating cost of the respective company. Although some shopping complex nowadays used token or coin to make the customer return the cart back, this method is proven not effective enough to solve the problems as from day to day, missing cart still being reporting around the world.

Therefore, taking action to reduce the missing cart problem from happening is most vital. In this case, prevention is a key to stop the missing cart problem. Thus, shopping cart anti-theft security system had been develop based on the observation and survey that has been done. Figure 1.1 and Figure 1.2 shows cart reported stolen or missing and being used for different proposed. A survey had been done in order to determine the number of missing cart in Mydin Mitc Melaka, Jusco Melaka and Giant Cheng. The result of the survey shows in Figure 1.3, Figure 1.4 and Figure 1.5.

Figure 1.1: Example of cart that unable to be gather back by workers

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Figure 1.2: Cart reported stolen or missing being used for different proposed

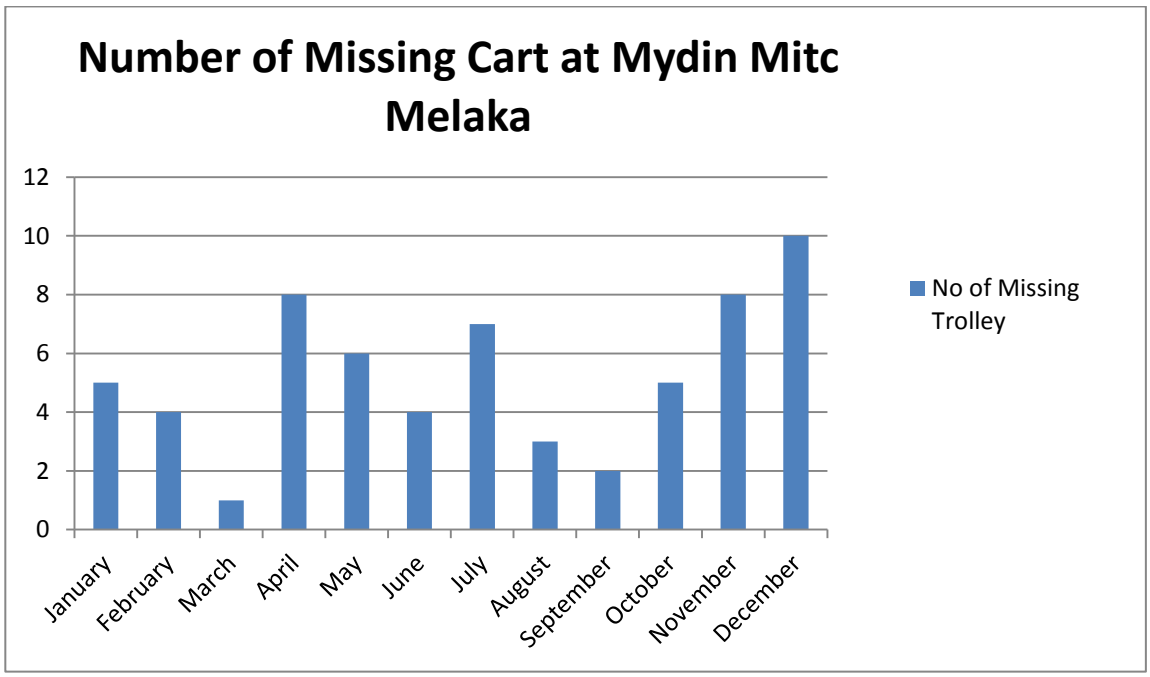

Figure 1.3: Graph shows number of missing cart in a year at Mydin Mall Melaka

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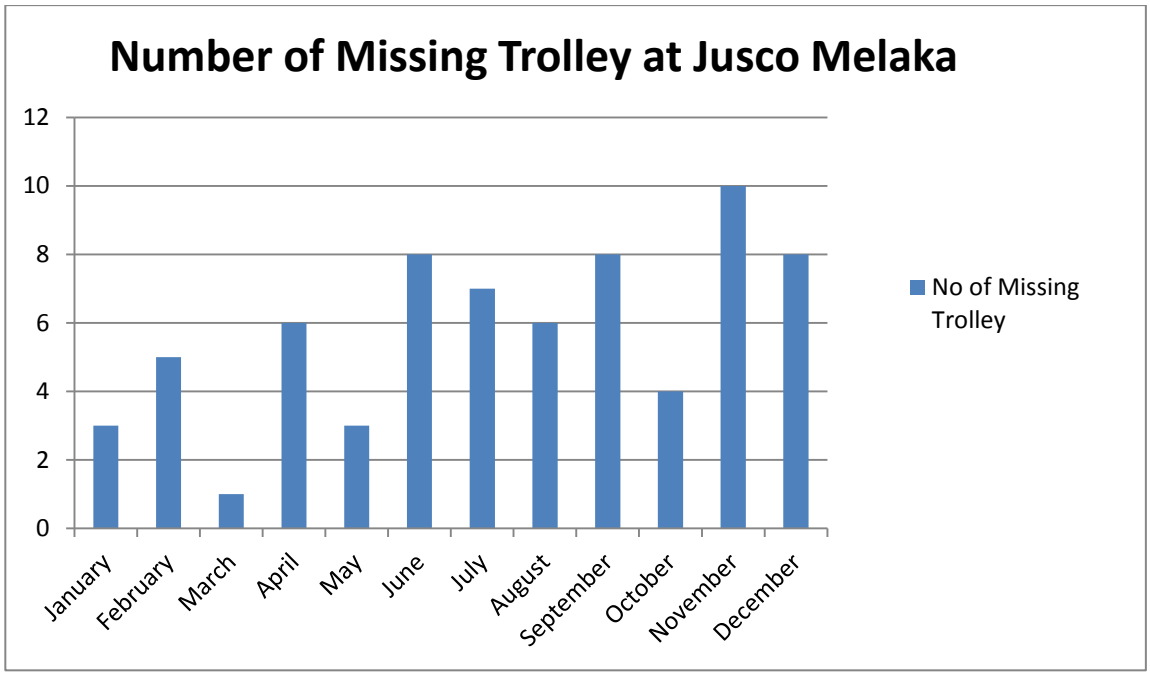

Figure 1.4: Graph shows number of missing cart in a year at Jusco Melaka

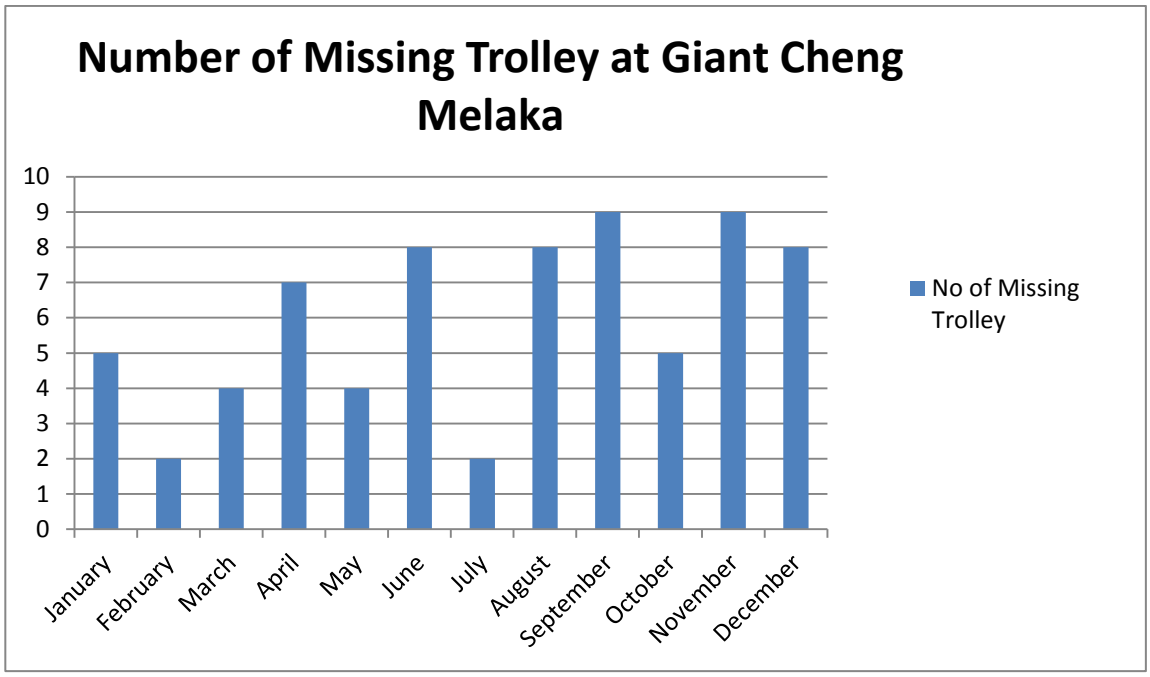

Figure 1.5: Graph shows number of missing cart in a year at Giant Cheng Melaka

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1.4 Scope of Project

In order to achieve the objective of this project, the work scope had been divided into three parts which are software, hardware and area covered. Before fabricate the circuit, the circuit that had been designed will be simulated using the suitable software. In this project, Proteus 7 Professional software had been used to simulate the circuit designed. Proteus 7 professional is a smart software tool which can be used extensively in a hardware design.

In hardware part, the circuit that has been designed will be fabricated. The circuit contains transmitter, receiver, solenoid and other components. The transmitter and receiver will be chosen based on the maximum distance it can be communicate with each other

For the area covered, an experiment will be conducted to determine the maximum radius which transmitter and receiver can communicate. The transmitter will be put at the center, thus the receiver can communicate with it.

1.5 Project Methodology

This project focuses more on case study and the project development based on interaction between transmitter and receiver. When there is no connection between transmitter and receiver, the solenoid will be push downed to lock the wheel. When the wheel is locked, the carts will be unable to move, thus preventing it from being pushed away from the premise or supermarket.

The project methodology shows the step by step taken in order to complete the project. The methodology includes the planning, the development of the design and the management of the project. The flowchart of project is shows on Figure 1.3.

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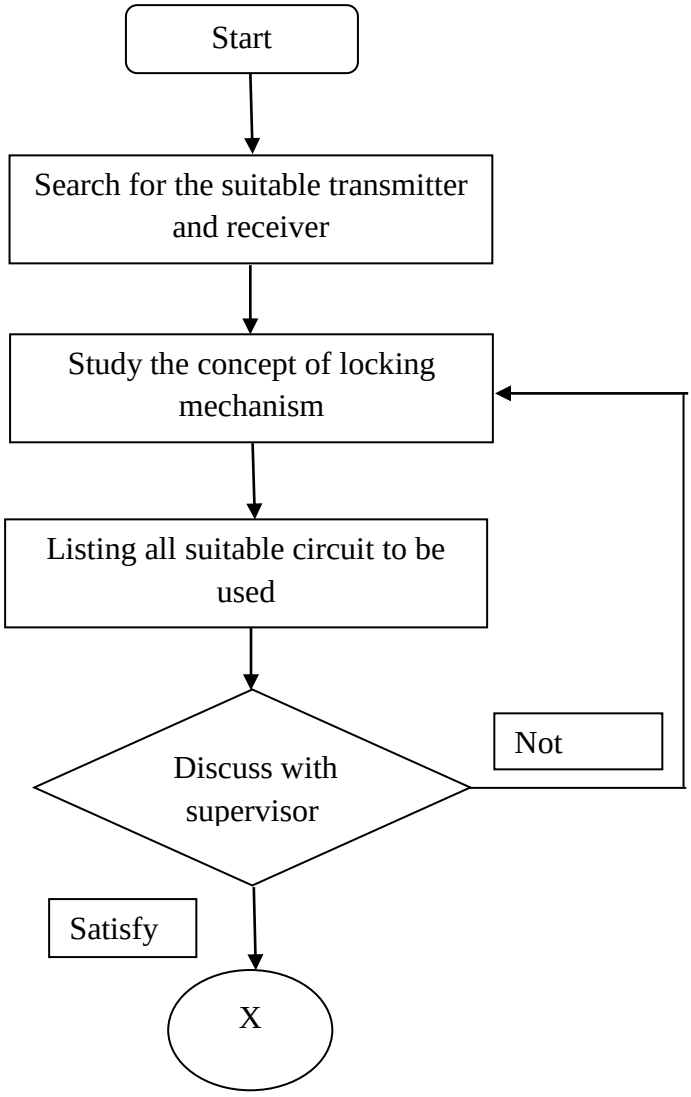
1.5.1 Flowchart Methodology



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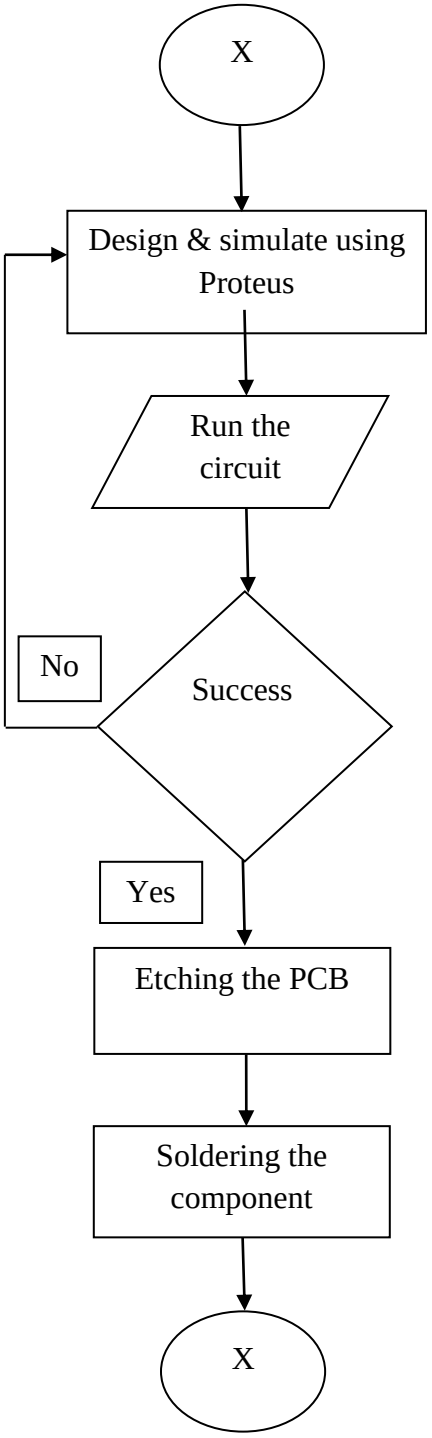

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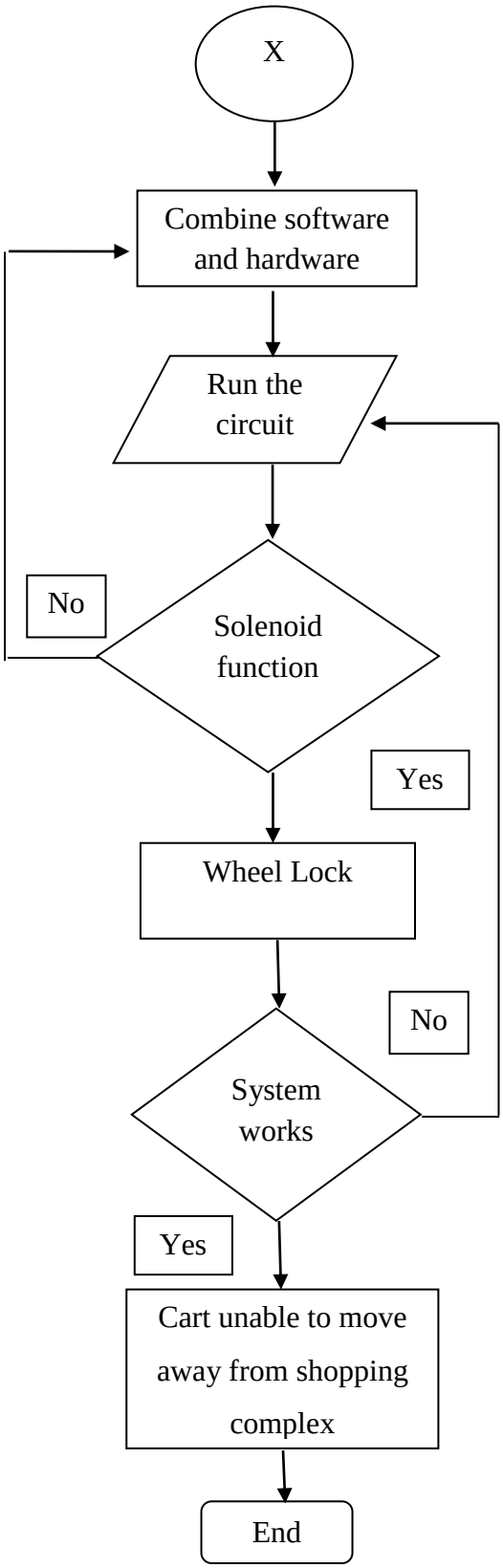

Figure 1.7: Flowchart of project.

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