UNIVERSITI TEKNIKAL MALAYSIA MELAKA

SECRET COMPARTMENT TECHNOLOGY

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor‟s Degree in Electronics Engineering Technology (Industrial Electronics) (Hons.)

by

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FACULTY OF ENGINEERING TECHNOLOGY

2015

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: Secret Compartment Technology

SESI PENGAJIAN: **2014/15 Semester 1**

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DECLARATION

I hereby, declared this report entitled "Secret Compartment Technology" is the results of my own research except as cited in references.

Signature   :   …………………………………………..

Author"s Name   :   YANG NURHIDAYAH ASNIDA BINTI

                                NORIZAN

Date   :   …………………………………………

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology (Industrial Electronics) (Hons.). The member of the supervisory is as follow:

…………………………….
(Project Supervisor)

ABSTRAK

Tujuan projek ini adalah untuk membangunkan satu sistem keselamatan untuk keselamatan barangan berharga yang menggunakan pengawal mikro sebagai fungsi utama reka bentuk. Objektif utama projek ini ialah untuk mereka bentuk sistem kawalan keselamatan oleh pengawal mikro berdasarkan pengesanan sensor. Ia termasuk untuk membangunkan prototaip „ruang rahsia" bagi kotak display yang berfungsi secara automatik apabila terdapat pengesanan dua jenis sensor iaitu sensor getaran dan sensor infra merah. Selain itu, sebuah program juga dibentuk bagi menggabungkan bahagian-bahagian tertentu di dalam sistem ini. Operasi menggunakan pengawal mikro (PIC16F877A) yang disepadukan dengan litar lain yang terlibat seperti transistor geganti, bekalan kuasa, kunci magnetic dan pembunyi isyarat. Kesemua litar-litar ini digabungkan bagi menunjukkan bagaimana mikropengawal (PIC16F877A) beroperasi. Sistem ini berfungsi bagi menambahbaikkan sistem yang sedia ada sekarang.

ABSTRACT

The purpose of this project is to develop a security system for the safety of valuable merchandise at jewelry store that uses the microcontroller as a main function of design. The principle objective of this project was to design a safety system control by microcontroller based on the sensor detection. This project deals to develop a prototype of „secret compartment‟ display cases that function automatically when there is detection of two types of sensor which are vibration sensor and infrared sensor. Besides that, the interfacing program also had been developed for the integration part. The operation using microcontroller (PIC16F877A) that integrated with other circuits involved such as transistor drive relay, power supply, magnetic lock, and buzzer. All the circuits will be combining to demonstrate the operation of microcontroller (PIC16F877A). This system will make improvement before this.

DEDICATION

Dedicated to my parents, my siblings, friends and my entire beloved person.

ACKNOWLEDGEMENT

Bissmillahirrahmanirrahim,

Alhamdulillah. Thanks to Allah SWT, who with His willing giving me the opportunity to complete this Final Year Project Repot which is title Secret Compartment Technology.

Firstly, I would like to express my deepest thanks to, Mr. Tengku Mohd Faisal Bin Tengku Wook, my supervisor who had guided be a lot of task during this semesters session 2014/2015. I also want to thanks the lecturers and staffs of Faculty of Engineering Technology for their cooperation during I complete the final year report that had given valuable information, suggestions and guidance in the compilation and preparation this final year project report.

Deepest thanks and appreciation to my parents, Norizan Bin Md. Zin and Samsiah Binti Idris, family, and others for their cooperation, encouragement, constructive suggestion and full of support for the report completion, from the beginning till the end. Finally, thank you to all those involved directly and indirectly helping me out during my FYP which I can't state out every one of them. A special expression of gratitude is extended to everyone for their tolerance and patience in doing the project. I must admit that they had enriched me in many ways and words alone are not enough to express my gratitude.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

C	-	Celsius
CCTV	-	Close Circuit Television
Cm	-	Centimetre
GSM	-	Global System for Mobile Communication
GUI	-	Graphical User Interphase
Hz	-	Hertz
IR	-	Infrared
LDR	-	Light Dependent Resistor
LED	-	Light Emitting Diode
Mpa	-	Mega Pascal
NC	-	Normally Close
NO	-	Normally Open
PCB	-	Printed Circuit Board
PIC	-	Peripheral Integrated Circuit
psi	-	pounds per square inch
RMS	-	Root Means Square
SPDT	-	Single Pole Double Throw
V	-	Volts
Vs.	-	Versus
°	-	degree
μm	-	micrometre

CHAPTER 1
INTRODUCTION

This is one of the most important components of the report. It begins with a clear statement of what the project is about which the nature and scope of the project can be understood. It summarizes everything to achieve, provide a clear summary of the project's background, relevance and main contributions. This part explains the main objectives of the project as part of the introduction.

1.1   Project Introduction

Final year project is one of the most important aspects of engineering degree. Engineering is first and foremost the application of knowledge. However, the application must be carried out with judgment, to ensure that the resultant system is effective and efficient, and that it is of benefit which raises the issue of the ethical responsibilities of engineers. The final year project is one of the primary the mechanisms used by the university to provide us with an opportunity to gain experience in the practical, effective, efficient, and beneficial application of what we have been studying for the past several years.

Jewelry store always present set of challenge that need an efficient and effective security system. Theft is a broad crime category and theft in jewelry stores includes crimes such as distraction and sneak theft, grab and runs, smash and grabs, etc. The jewelry industry has always taken security seriously, recognizing the risks associated with high value goods and implementing measures to address those risks. For some retail jewelers knowing exactly what level of security is appropriate can be a challenge, this document aims to provide all jewelers with a tool to assess their existing security and implement an appropriate and robust system for protecting their staff, customers and businesses from today''s threats. In the event of robbery, this project is intended to solve the problem.

The goal of this project is to build a system that could make the plate inside the display cases to open about a few degrees (45°) when the magnetic lock is release and drop the valuable merchandise to the bottom of the display cases which is called the „Secret Compartment''. A few second later, the second magnetic lock will release the second plate to close the secret compartment. The third magnetic lock is then locked the plate. This project idea uses two types of sensor which are vibration sensor and infrared sensor. There are two conditions that will cause the plate to rotate. Firstly, due to hard crush that causes the display cases received strong vibration and detected by the vibration sensor. Secondly, movement of object detection such as robbers hand is detected by the infrared sensor inside the jewelry display cases. This is referring to robbery case using glass cutter. Alarm will ON until the reset button is pushed. The valuable merchandise remains secure in the display cases.

The following diagram shows the complete operation of the Secret Compartment Technology.
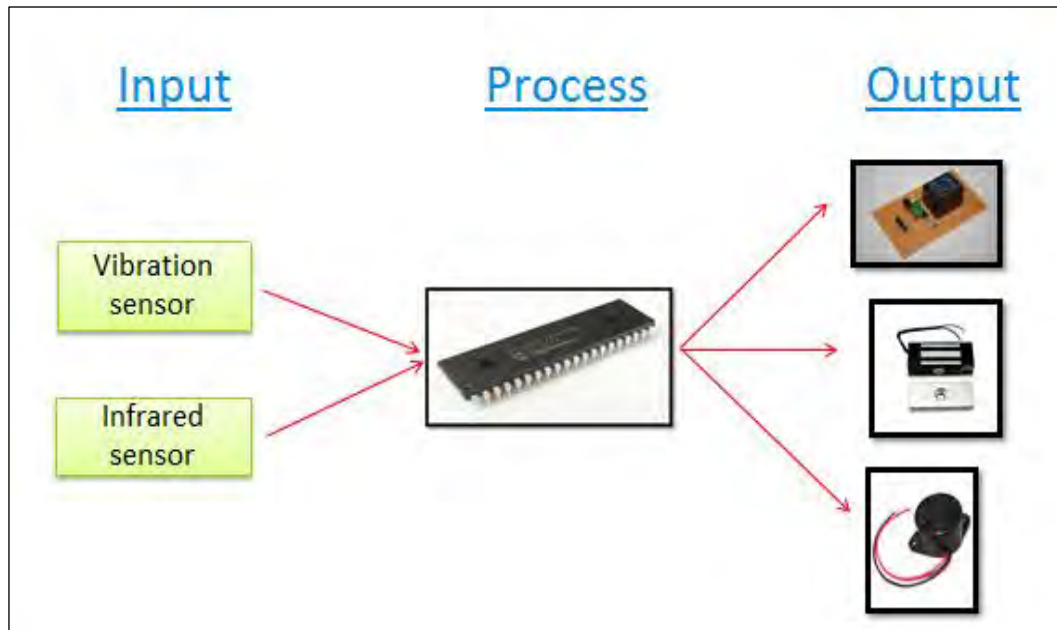
Figure 1.1: Process Flow of the Project

1.2   Project Objective

The objectives of this project are:

(i)   Can upgrade the security system and provide additional safety features.

(ii)   To provide new technology regarding safety prevention.

(iii)   To reduce loses of valuable merchandise.

This project is also aimed to improve the technique of prevention of valuable merchandise. In addition, it is develop to apply the structure of interfacing program in between to give a lot of advantages.

1.3   Problem Statement

Jewelry stores are high-profile targets for robbers. Retail jewelers are at the greatest risk. Jewelry display cases should remain locked except when an employee removes a piece to be shown. Unfortunately, this method still cannot deal with cases of robbery. Robbery often occurs because the poor of security system and CCTV is often thwarted by the thieves. There seems to be more instances where a large number of robbers go into the store and smash the display case and get out of there in 20 or 30 seconds rather than point a gun at a store owner. To overcome this problem, a new technology is create that can provides a smart system of security where the valuable merchandise remains safe and could thwart the cases of robbery.

1.4   Project Scope

This project work is discussed in terms of phase of vibration for vibration detection and distance of sensor location for object detection using two types of sensor. The sensors used are vibration sensor and infrared sensor that send signals to microcontroller to achieve hardware simplicity. Vibration detection is one of the feedback message signals for security system and same goes to object detection.

The instruction for PIC Microcontroller is writing using Flowcode5 Software. Proteus Software is also use to complete this project. There are a few component used to complete the project prototype such as power supply, drive relay, magnetic contact lock and buzzer. This project also contain of two circuits which are PIC circuit and transistor drive relay circuit.

The scope can be used as a guideline for me to conduct this project in order to complete this project in a time given and as in a plan from the earlier stage. Basically this project focused on:

(i)   Identify the component and material
(ii)   Designing and layout using software
(iii)   Constructing the circuit
(iv)   Testing and analyzing

1.5   Significance of Project

This project is an alternative to save the valuable merchandise especially for jewelry store. During the completion of this project I have apply a lot of knowledge in my electronic engineering study from early semester until the end of semester.

1.6   Methodology

„Secret Compartment Technology" is a project idea to evaluate the performance of the new design in terms of sensitivity and safety. Regarding this project the analysis is based on the phase of the vibration and distance between each sensor position used for the display cases. A prototype was built then the phase of the vibration was measured directly by following the equation suggested in the books and journals. This part explored considerations for taking a vibration measurement. Besides that, Proteus Software was required for the experiment to draw the circuit for the project. The circuit drawn in the Proteus Software was tested before the actual circuit was build.

The data of phase of the vibration and the distance of each infrared sensor used is analyzed and recorded to know which level of vibration and distance that can make the plate to open. In the actual project circuit, vibration sensor was used to detect the vibration while infrared sensor was used to detect movement of object. The vibration signal was then send to the microcontroller to activate the drive relay that will cause the plate in the prototype cases to open and ON the alarm. Somehow, part of the procedure design could interfere with the measurements. To overcome them, safety precaution was taken.

1.7   Report Structure

Chapter 1 introduced the project as a whole. The early and basic explanations were mentioned in this chapter. This chapter consisted of the project introduction and objectives, problem statements, scope of work, and the simplified methodology.

Chapter 2 is literature review. Past projects system were taken into consideration when completing this chapter. The ways those projects and researches had been done were compared with what this project. These comparisons were done to understand what this project is all about and where it stands.

Chapter 3 is methodology. It explained how this project came to be. This chapter explained the part most important of all, the flow this project. What had been researched and what needed to be done was explained in this chapter.
Chapter 4 concentrated on the result and discussion of this project. What had been done was explained in diagrams and written programs. The expected results also mentioned in this chapter.

Chapter 5 was the final chapter in this report. The conclusions and recommendations were placed in this chapter. In other words, the conclusion was the summary of what had been done throughout this project. After the project was done, recommendations were made and any expansions or upgrades that might be done in the future were suggested.

CHAPTER 2
LITERATURE REVIEW

A literature review offers an overview of the relevant and significant literature on a research area. It is limited to a particular problem, issue, description, summary and research studies to discuss. The purpose of this literature review is to distribute knowledge and ideas have been established on a topic and the strengths and weakness of this contribution.

2.1   Introduction

This chapter will introduce the literature review regarding terms such as Peripheral Interface Controller (PIC) PIC16F877A, vibration detection and movement detection. The main objective of this chapter is to provide a detailed explanation of the terms. The sources of the theory are from journal articles and websites that contain related theories. This chapter also will focus on the cases of robbery in jewelry store. Any self-respecting thief about his dream destination for the greatest robbery; jewelry stores and banks would definitely be among his top three options. Valuable merchandise such as gold and diamonds may be a woman's best friend. They are also close to the heart of a thief too.

This chapter will review some similar project and studies, the solutions of the project that related, overview on different approaches made by previous researchers, and make a comparison between my final year project and those similar projects. Hence, providing the best security for the merchandise is as much important as selling the best product. The very first option is security people to guard the area.

2.2   Evidence cases

There is lots of evidence regarding the robbery of jewelry store. Theft is a broad crime category defined as "the taking of property without force or fear." Theft in jewelry stores includes crimes such as distraction and sneak theft, grab and runs, smash and grabs, switches. The best way to prevent them is to store as much merchandise as possible in safes and vaults and protect glass doors and windows with physical barriers. The second kind takes much longer and the burglars can be caught if the alarm system is effective.

Karim H. Vellani (2010) did a crime analysis for Problem Solving Professionals in 25 small steps. According to him, threat level for robberies and burglaries is still high and not depend on whether no previous crime at a particular jewelry store. For instance, certain assets and business have higher inherent threat because of the element that attracts the crime. Consequently, there are certain types of assets that may be a crime magnet to the robbery case and the losses.

The security is an important aspect for the jewelry store. As we know, the case of a theft at jewelry store is a crime under the law. The case of burglary often occurs after business hours. This case is indicating by the alarm sound during the burglary process at the jewelry store. This information is based on cased entitle the Consequence of Refusing Consent to a Search or Seizure as described by Kenneth J. Melilli (2002).