UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Development of Anti-Theft Door System for Lecturer's Room

Thesis submitted in accordance with the partial requirements of the
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Bachelor of Manufacturing Engineering (Robotics and Automation)

By

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DECLARATION

I hereby, declare this thesis entitled
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ABSTRACT

This project combined both hardware and software development to create a simple anti-theft door system for the lecturer's room. Basically, a PC interface system to control electromagnetic door was developed to be controlled using PC via serial or parallel port communication. Control program will be used to lock or unlock the door. The door is locked when electromagnetic door is energized and vice versa. For this project, the system will be used to lock or unlock the door via PC. User interface is equipped with the LOCK and UNLOCK button to control the door. The door is locked using electromagnetic device or any relevant mechanical system. Password is mandatory to get access into the main control panel of the system.

ABSTRAK

Dalam projek ini, pembangunan perisian dan juga perkakasan digabungkan untuk menghasilkan sistem anti pencuri untuk bilik pensyarah. Sistem antaramuka berkomputer untuk mengawal sistem elektromagnet yang digunakan untuk mengunci pintu telah dibangunkan. Sistem elektromagnet tersebut dikawal dengan menggunakan komputer dan bersambung kepada sistem kawalan melalui sambungan liang selari. Pintu boleh dikunci atau dibuka dengan menggunakan perisian kawalan yang telah dihasilkan. Pintu dikunci apabila elektromagnet diaktifkan, dan pintu dibuka apabila sistem elektromagnet tidak diaktifkan. Sistem antaramuka berkomputer dilengkapi dengan butang KUNCI dan juga BUKA untuk mengawal pintu bilik. Pintu dikunci dengan menggunakan alat mekanikal atau sistem elektromagnet mengikut kesesuaian. Hanya kata laluan yang betul sahaja yang boleh memberikan capaian kepada sistem kawalan antaramuka berkomputer.

DEDICATION

For my beloved Constacia and my family.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SIGN AND SYMBOLS

CCTV	-	Close Circuit Television
CO	-	Carbon Monoxide
COM	-	Communication port
DB-25	-	Connection cable for parallel port communication
GUI	-	Graphical User Interface
IBM	-	International Business Machine
LED	-	Light Emitting Diode
PC	-	Personal Computer
PIC	-	Programmable Integrated Controller
PIR	-	Passive Infra Red
RS-232	-	Recommended Standard 232
UART	-	Universal Asynchronous Receiver/Transmitter
VB	-	Visual Basic
XP	-	e**XP**erience (Microsoft Windows Operating System family)

CHAPTER 1

INTRODUCTION

1.1 Background

Anti-theft Security System for the Lecturer's Room was a title given to this project. In this project, a security system will be developed specifically for the lecturer's room. This anti-theft system will cover human identification and access control for the user, whether to lock or unlock the room door.

Integration of human identification with the system will be done in this project. This feature enables the user to accept or deny the visitor's request to enter the room. User can gain access and control to the system via IBM compatible PC.

The system's operating software will be developed in this project and need to be installed to control the system. Personal computer or laptop with Windows XP operating system is the recommended platform for this project.

A minimum attention was given in current development of security system which was designed specifically for the room. Most developers will focus on the major security system, which covers the entire unit of a building, area or civilian home.

The system usually have a high cost and complicated installation process which required more time, works, and cost to be invested. This project focus on development of security system specifically designs for the room.

Wireless camera will be used to build the prototype of the system. This camera will transmit the signal to the receiver and video will be displayed on television screen inside the room. This will give information for the user to make decision whether to keep the door lock, or unlock the room's door.

Basically, application and idea of security system can be found almost everywhere. However, design of every security system are different based on the security scope, application, and desired task to be performed by the respective security system.

Graphical User Interface (GUI) design is yet another element that will be taken into consideration in this project. The blue print of all interconnections between the hardware and controller will be developed and will be used to build the system. This will make it easier to build the system.

This idea of this project focuses mainly on human identification and integration of computer controlled door access security system. User can gain access to control the door, and have a full access to lock or unlock the door based on information provided by the video camera installed outside the room. The main purpose of the system is to avoid unauthorized access to the room.

Programming in this project will cover door control using PC. Software to control the door using PC, whether to lock or unlock the door will be created. Hardware will be connected directly to the PC parallel port. Proper configuration of hardware and software is very important to reduce false alarm. A lot of factors need to be considered to make this system really works as desired.

Conventional security system nowadays usually sends the signal for human being for further action to be taken. However, this technique is no longer efficient since the system was more likely to generate false alarm, which will be improved in this project. False alarm is the main issue of the existing security system nowadays, which is not good for both human being and the system.

In this project, LED (Light Emitting Diode) will be used to indicate that the door was locked or not. Toggle switch will be used to represent the human identification sensor. In actual system, actuator which can lock or unlock the door will be connected to the PC and relay will be used to enable the usage of PC to control any electrical equipment without damaging the PC main board with the high operating voltage.

Control signal which can turn external devices on or off can be connected directly to the computer and devices via parallel port or RS-232 communication cable.

1.2 Problem Statement

Lecturer's room door was not equipped with anti-theft system. Most people only take the whole home security system into account. This project focuses specifically on the room security system, and nothing to do with the home security system. This project is a simple version of security system, and the scope was not so big as well. Door security is the main element which will be taken into consideration.

Door security system is important nowadays. The whole building security system or civilian home security system is expensive. Most security systems available in the market nowadays are complicated, and installation of the system will cost another amount of money to be invested in order to have a good security system.

A variety of security devices for deterring, detecting, and identifying offenders or intruders can be found. However, very few provide a working relationship to a room.

An intrusion deterrent device which activates a water spraying system has been invented. A triggering mechanism for a tear-gas canister was introduced for the purpose of security and protection, but this idea did not have a working relationship to a room.

Security devices to identify the bank robbers using the spray gun to discharge a scent which can be detected by the dog have a working relationship to a room. Device was installed inside the room, mounted at the ceiling.

This project will implement a simple anti-theft security system for lecturer's room that has a clear relationship to a room to fulfill this void. This project will also demonstrate the idea of port programming and PC-based control system.

Usage of computer software to control security system was widely accepted, and only authorized person will have access to the system which determines the room security. This feature can avoid unauthorized person to take control of the system or gain access to the security system. This is very important to make sure that the system is secure.

1.3 Objectives of Project

This project was done in order to achieve some objectives at the end of the project timeline. Here is the list of this project objectives:

1. To develop programming and software using any available software to program the security system for the room door with auto-lock feature.
2. To demonstrate and apply the idea of computer port programming and PC-based control system.
3. To develop Graphical User Interface (GUI) which will be used by the user to manage and control the system.
4. To integrate the door system with personal computer using any available communication port.
5. To design and integrate hardware with electronic and electrical elements which will be used to simulate electromagnetic door system.

1.4 Scope of Project

This project will focus on programming to lock or unlock the door via PC. Port programming which enables interrupt process for the operating system can be used to control any external devices attached to the PC via serial or parallel port. Port programming and user interface design can be done using programming language such as Visual Basic 6.0, Delphi, Matlab, Visual C++, Java, or Borlant Turbo.

Both software and hardware for the system will be developed in this project. However the system will be developed using LEDs, solenoid, and some mechanical system to demonstrate the response of the output and input devices. Integration of hardware and software will be done in this project to create a simple PC-based control system.

Basically, the idea is to connect output device to the PC via serial or parallel port. Then, control software to control output device will be developed using any software development programming language. Software is used to activate the output device by a click of a button or simply hit the key on keyboard. Also, output device must be able to be turned off using keyboard or mouse click. The system can control up to 8 separate outputs individually.

For this project, the system will be used to lock or unlock the door via PC. User interface must have LOCK and UNLOCK button to control the door. The door may be locked using electromagnetic device or any relevant mechanical system. Password is mandatory to get access into the main control panel of the system.

CHAPTER 2

LITERATURE REVIEW

2.1 Definition and Architecture of Security System

Security is the condition of being protected against danger or loss. In the general sense, security is a concept similar to safety. The nuance between the two is an added emphasis on being protected from dangers that originate from outside. Individuals or actions that encroach upon the condition of protection are responsible for the breach of security. The word "security" in general usage is synonymous with "safety," but as a technical term "security" means that something not only *is secure* but that it *has been secured* [18].

It is very often true that people's perception of security is not directly related to actual security. For example, a fear of flying is much more common than a fear of driving; however, driving is generally a much more dangerous form of transport [18].

According to Marston, R. M., (1998) modern electronics security system range in complexity from simple electronic door-bell to ultra-sophisticated wireless burglar alarm system that comes complete with an array of passive infra-red (PIR) movement detectors and contact sensors plus full remote-control and sensor-monitoring facilities.

The idea of electronics-based security system has a wide range of application. They can be designed to be activated by physical contact or body proximity, or by variation in heat, light, or infrared radiation levels, or in voltage, current, resistance or some other electrical properties and parameters (Marston, 1998).

2.2 Door Security

Door security relates to prevention of door-related burglaries. Such break-ins take place in various forms, and in a number of locations; ranging from front, back and side doors to garage doors [19].

Solid wood door, panel doors (hollow and solid core), metal skinned wood-edged doors and metal edge-wrapped doors are the types of doors typically used in residential applications. Typically, door frames are solid wood. Residential doors also frequently contain wood.

Security tests by Consumer Reports Magazine in the 1990s found that many residential doors fail or delaminate when force is applied to them. Solid wood doors withstood more force than the very common metal skinned wood-edged doors used in newer construction [19].

The Chula Vista Residential Burglary Reduction Project there were the following findings: "From victim interviews, we learned that in 87% of the break-ins that occurred when intruders defeated locked doors with tools such as screwdrivers or crowbars, the burglars targeted "the one door that had no deadbolt lock."... not one burglar attempted to break a double-pane window during the course of successful or attempted burglary." (Page 3, The Chula Vista Residential Burglary Reduction Project – Summary).

2.3 Microcontroller and Assembly Language

Back to security system, Robert Gaffigan (1997) discussed in his book entitle Home Security Projects about the usage of microcontroller to design and develop a simple security system for a single home. He made it very clear that programming was required to design a good security system. The programming can be done in assembly language or high-level programming language.

High level programming language makes it easier for human being to write the code of program, comparing to the low level language.

Using only PIC Microcontroller or Programmable Integrated Controller, Robert Gaffigan (1997) was successfully designed a portable CO detector, pool alarm system, an early warning alarm system, and dog bark inhibitor system. He suggested that new user should start to learn programming using simulator. Programming using PIC to develop a security system required a good understanding of processor working principles.

Security system was created to produce a safe and sound environment for human being and personal properties. Security system mostly refers to electronic and computer controlled system which can monitor and scan any given area all the time automatically.

2.4 Home Security

The FBI reports that a home is burglarized in the U.S. every 15.4 seconds. Burglary is now considered to be the most serious threat a home can face. In most cases, burglars are looking for items that they can easily resell for cash. The most targeted items by burglars include laptop computers, guns, jewelry, DVD players and other similar small electronic items (Kelly, 2008).

Most burglaries occur during the day when homeowners are at work. Generally, burglars use a certain type of force when they break into a home; however, it only stands to reason that burglars target those homes with seem to offer the easiest amount of access [20].

In order to protect their property and possessions, more people are buying home surveillance systems. A home surveillance system protects against vandalism, burglary, and act as a deterrent to crime (Ryan Mcelhinny, 2008).

2.5 Drawback of Electronic Security System

However, usage of sophisticated electronic security system generates a lot of false alarm and this issue had become more serious, where burglar alarm warning was no longer treated as an emergency. This idea was very clear. Most convensional alarm system can only detect intruders and emergency but fail to eliminate the situation. At some point, the user have to reset the system manually.

Signal of emergency was then forwarded to the human being to handle. Most security system operates like this. The idea of security system which only notify human in case of emergency was totally outdated. However, early warning system can save a lot of life if it was applied to fight Tsunami in 2004 [6]. Security systems nowadays make use of wireless technology and robotic security system.

2.6 Implementation of PatrolBot

Security robot application was now getting more and more popular in the world of security system. **PatrolBot** developed by Mobile Robot Inc was now available to purchase, however with a very high price. This new technology has grabbed the interest of security enthusiasts to move forward into the wireless and robotics security system [22].

The origin of PatrolBot idea was generated from an old idea of using security guard to take care and of the building or any given areas. The potential of PatrolBot can reduce false alarm. PatrolBot can detect moving object, hazard environment, and easy to integrate with most security system. Artificial intelligent element enables PatrolBot to learn and understand the floor plan all by itself, without the need of human operator to program a complex code into the system [22].

The user only need to download the software into the system, with no additional programming required. This makes this robot very flexible and easy to use.