UNIVERSITI TEKNIKAL MALAYSIA MELAKA

RFID BASED DOOR ACCESS SYSTEM

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Robotic and Automation) with Honours

By

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK :RFID BASED DOOR ACCESSS

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Robotic and Automation) with Honours. The member of the supervisory committee is as follow:

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ABSTRACT

Door is key way to access space or area. Reason to use the door was to improve security level for that area. In keeping with technological development for this time, way to access door also increasingly grows aimed to improve efficiency, security and reduce cost. Among technology that used and more commonly used is RFID, Radio Frequency Identification. RFID is technology which uses radio frequency aimed to identify and track. RFID owns a few important equipments which are tag, antenna and tag reader. Tag can be read from several centimeters and also can be read from afar until several meters depend to the radio frequency type used. Tag is vital because it keep all information of object that will in trace where all the information will keep in the memory. RFID reader is tool used by radio waves to connect RFID to one readable signal form by middleware software. RFID tag's reader use antennas to communicate with RFID chip. Reader's need vary depending in consumption purposes, and almost all purpose will need various forms readers to make. Each high technology system commonly will be having supervision system to make system that more efficient. For this project the supervision system will use Microsoft Access 2008 to build database and Visual Basic 2008 to make programmed for RFID tag. Both programs will be consolidated to aim for surveillance to access that door.

ABSTRAK

Pintu merupakan adalah cara utama untuk mengakses sesuatu ruang atau kawasan. Antara sebab pintu di gunakan adalah untuk meningkatkan tahap keselamatan bagi kawasan tersebut. Selaras dengan perkembangan teknologi bagi zaman ini, cara untuk mengakses pintu juga semakin berkembang bagi bertujuan meningkatkan kecekapan, keselamatan dan megurangkan kos. Antara teknologi yg digunakan dan semakin luas digunakan adalah RFID iaitu radio frequency identification. RFID adalah teknologi yang menggunakan frekuensi radio bertujuan untuk pengenalpastian dan jejak. RFID mempunyai beberapa peralatan penting iaitu tag, antenna dan pembaca tag. Tag boleh di baca daripada beberapa centimetermeter dan juga boley dibaca dari jauh sehingga beberapa meter bergantung pada jenis frekuensi radio yang digunakan. Tag adalah amat penting kerana ia menyimpan semua maklumat tentang objek yg akan di jejaki di mana semua maklumat itu akan di simpan di dalam memory. Pembaca RFID adalah alat yang digunakan oleh gelombang radio bagi menyambungkan RFID kepada satu bentuk isyarat yang boleh dibaca oleh perisian perisian tengah. Pembaca tag RFID menggunakan antena-antena untuk berkomunikasi dengan cip RFID. Keperluan pembaca berubah bergantung pada tujuan penggunaan, dan hampir semua tujuan akan memerlukan pelbagai bentuk pembaca-pembaca bagi menjadikan satu sistem berjaya. Setiap system yang berteknology tinggi akan mempunyai system pengawasan bagi membuatkan system tersebut lebih cekap. Bagi projek kali ini system pengawasannya menggunakan Microsoft Access 2008 bagi membina database dan Visual Basic 2008 bagi membuat program untuk RFID tag. Kedua-dua program ini akan digabungkan bagi bertujuan untuk pengawasan untuk mengakses pintu tersebut.

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RFID   -   Radio Frequency Identification

AIDC   -   Automated Identification and Data Capture

PC   -   Personal Computer

AVI   -   Automated Visual Inspection

EPC   -   Electronic Product Code

UHF   -   Ultra-High Frequency

UPC   -   Universal Product Code

RF   -   Radio Frequency

HF   -   High Frequency

LF   -   Low Frequency

VB   -   Visual Basic

CHAPTER 1

INTRODUCTION

This chapter presents the general ideas of the research. There are basically contain six main sections in this chapter, such as background, problem statement, research objectives, research scopes, importance of the research and structure of report.

1.1   Background

Door is a moveable barrier used to cover an opening. Doors are used widely and can be opened to give access and closed more or less securely using a combination of latches and locks. Doors are nearly universal in buildings of all kinds, allowing passage between the inside and outside, and between internal rooms. The doors also used to screen areas of a building for aesthetic purposes, keeping formal and utility areas separate.

Nowadays, RFID card keys became popular as a replacement for traditional access control mechanisms such as metallic keys and combination locks. RFID also called contactless smart cards that provided information about the user and offered a more personalized method of access control, while being inexpensive to produce and program.

1.2   Problem Statement

The conventional way to access the door such as using key can easily to duplicate or steal by thief. Keys cannot control when (time and days) personnel are valid. Keys do not provide with any information of when and where someone has gained access.

At some places there were using the door guard to observe the people who are in or out from the building. Guard can only be at one place at one time. Guard can be absent or late. Records can be inaccurate or difficult to read (who, when, where), if records are kept at all. A guard service is very expensive.

By the way to improve the security when accessing the door the changes has to be made. The method must be efficiently and cost effectively reducing and preventing crime as much as possible. It also can improve the quality of the living environment for residents by reducing all forms of anti-social behavior as much as possible. By employing modern technology to fight against crime to ensure residents benefit from the latest tools available in the fight against crime.

1.3   Project Objectives

The main objective is to design a RFID Door Access with monitoring system which supported by subsequent objectives as follows:

i.   To create a database using SQL language for door access monitoring system.
ii.   To create a program by using the Visual Basic 6for the door access application.
iii.   To construct the simple concept of a RFID door access system.

1.4 Scope

This project is aimed to develop a system to develop a model door access by using the RFID technology with the monitoring system. The monitoring system will be develop using Microsoft Access and must be able to monitor functions of the door access. The outcome of this project is stand-alone application to observe the status of the personnel that access to the specified door. In the project, there will consist with five doors, which only can be access by the certain position only. The monitoring system will observe the events that occur with the real time monitoring. The card will be programmed by using the Visual Basic.

1.5 Project Planning

The project planning is too identified and plans to achieve the objective with the punctual time planning. The good planning can make the project is in actual track. For a good time management planning, a Gantt chart is a suitable method in applying a guide for the project proceeds.

A Gantt chart is a type of bar chart that illustrates a project schedule. Gantt charts illustrate the start and finish dates of the terminal elements and summary elements of a project. Terminal elements and summary elements comprise the work breakdown structure of the project. The chart will show in Appendixes A and Appendixes B.

1.6   Structure of the Report

Chapter 1: Introduction

This chapter includes of background of RFID system, problem statement, research objectives, and research scopes, project planning and structure of report. All that an entire element becomes as an initial step before go through this research.

Chapter 2: Literature Review

Chapter two discusses about literature review related with RFID door access system such as definitions and description of the technology, history, benefits and drawbacks of RFID.

Chapter 3: Research Methodology

In chapter three consist of process flow chart that describes what have been done to complete this project. This chapter will also explain the way to achieve objectives of RFID door access with the monitoring system.

Chapter 4: Result and Analysis

This chapter includes the design of the system and will discuss the result and analysis to complete this research. Discussion has also details about the research have a potential to approach at the real situation. This chapter also contains the result and analysis of the research after model build up complete.

Chapter 5: Conclusion

This chapter contains summary of main findings and brief recommendation for further study.

CHAPTER 2

LITERATURE REVIEW

2.1   Introduction

In this age of rapid technological advancement, wireless communication is emerging as one of the more promising and useful forms of data transfer. It is getting more and more difficult to find a person who has never talked on a cell phone, listened to the radio, or even logged onto wireless internet. And one new technology that is on its way to becoming another common, everyday use of radio frequency (RF) communication is Radio Frequency Identification (RFID).

RFID is a technology that uses tiny computer chips smaller than a grain of sand to track items at a distance. RFID use radio waves to automatically identify people or objects. RFID technology belongs to a broader group of technologies known as Auto Identification (Auto-ID), (Brown.et al, 2007). There are several methods of identification such as magnetic strip, voice recognition, biometric, but the most common is bar codes.

There are different technologies and have different applications between RFID and bar codes. The big difference between the two is bar codes are line-of-sight technology. That is, a scanner has to scan the bar code to read it, which means people usually have to orient the bar code toward a scanner for it to be read. Radio frequency identification is different. It doesn't require line of sight. RFID tags can be read as long as they are within

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range of a reader. Bar codes have other shortcomings as well. If a label is ripped or soiled or has fallen off, there is no way to scan the item, and standard bar codes identify only the manufacturer and product, not the unique item. The bar code on one milk carton is the same as every other, making it impossible to identify which one might pass its expiration date first.

RFID is a technology that offers many more benefits compared to other identification technologies such as bar coding and magnetic stripe (Moroz.R, Nov 2004). The aim of most RFID systems is to increase efficiency, reduce data entry errors and free up staff to perform more value-added functions, such as providing customer service.

Because of this technology have lot of advantages, I would like to construct the RFID door access with a monitoring system is a system that implement the RFID concept to accessing the door in term of security factors and also have the monitoring system to monitor the system.

As we know, door is a movable barrier installed in the entry of a room or building to restrict access or provide visual privacy. They were constructed of stiles (vertical planks) and rails (horizontal planks) fastened together to support panels and occasionally equipped with locks and hinges.

Now we are in the 20th century, so, there were high technologies develop such as RFID that we can apply to the system such as door access to improving the security level. The System Monitor may be writing data directly into a database, allowing other processes to access the database. Normally, the System Monitor is a wrapper for whatever persistence mechanism is used, providing a consistent and 'safe' access interface for others to access the data.

2.1 Historical Development

Table 2.1 Historical Development (Bartneck, Klaas, Schoenherr, 2009 and Brown.M, and Patadia.S).

Year	Development
1897	Guglielmo Marconi invented the radio
1937	The U.S. Naval Research Laboratory (NRL) developed the Identification Friend-or-Foe (IFF) system that allowed friendly units such as Allied aircraft to be distinguished from enemy aircraft.
1939	IFF transponder invented in the United Kingdom used by the allies in World War II to identify aircraft as friend or foe.
1946	Leon Theremin invented an espionage tool for the Soviet Union which retransmitted incident radio waves with audio information. Sound waves vibrated a diaphragm which slightly altered the shape of the resonator, which modulated the reflected radio frequency. Even though this device was a passive covert listening device, not an identification tag, it is considered to be a predecessor of RFID technology.
1948	Harry Stockman released paper, titled "Communication by Means of Reflected Power" (Proceedings of the IRE, pp 1196–1204, October 1948). Stockman predicted that "…considerable research and development work has to be done before the remaining basic problems in reflected-power communication are solved, and before the field of useful applications is explored."
1950	Identification Friend-or-Foe (IFF) system became the basis for the world's air traffic control systems. Early uses of radio identification were generally limited to the military, research labs, and large commercial enterprises because of the high cost and large size of components.

1971	The initial device was passive, powered by the interrogating signal, and was demonstrated to the New York Port Authority and other potential users and consisted of a transponder with 16 bit memory for use as a toll device.
1973	Mario Cardullo's U.S. Patent 3,713,148 was the first true ancestor of modern RFID; a passive radio transponder with memory. The basic Cardullo patent covers the use of RF, sound and light as transmission media.
1973	A very early demonstration of reflected power (modulated backscatter) RFID tags, both passive and semi-passive, was performed by Steven Depp, Alfred Koelle, and Robert Freyman at the Los Alamos National Laboratory. The portable system operated at 915 MHz and used 12-bit tags.
1979	Animal tagging
1980	The more sophisticated RFID technologies were employed in applications ranging from identification of railroad cars in the United States to tracking farm animals in Europe. RFID systems were also used in wildlife studies to tag and track exotic or endangered species such as fish with minimal intrusion into their natural habitats.
1983	The first patent to be associated with the abbreviation RFID was granted to Charles Walton U.S. Patent 4,384,288.
1990	Electronic toll collection systems gained popularity on both sides of the Atlantic, with commercial implementations in Italy, France, Spain, Portugal, Norway, and in the United States in Dallas, New York, and New Jersey. These systems offered a more sophisticated form of access control because they also included a payment mechanism.

1990	RFID card keys became increasingly popular as a replacement for traditional access control mechanisms such as metallic keys and combination locks.
1991	Association of American Railroads standards
1994	All US railcars RFID enabled
1999	Massachusetts Institute Of Technology Auto-id center founded
2003	EPCglobal system Version 1.0
2005	Us Department Of Defense and Wall-Mart mandates
2006	Many international and industry organization start selling RFID equipment that followed the open standards.

RFID card keys became popular as a replacement for traditional access control mechanisms such as metallic keys and combination locks. RFID also called contactless smart cards that provided information about the user and offered a more personalized method of access control, while being inexpensive to produce and program. Table 2.2 below compares the most common methods of access control with that of RFID access control.

Table 2.2: Comparison of Various Access Control Methods

Access Control Method	Advantages	Disadvantages
Metallic Key	• Does not need electricity to function • Easy to use	• Can be copied easily • Lock can be picked • Susceptible to theft
Combination Lock	• Combination can be easily changed • No key to be lost or stolen	• More expensive than a key-lock • Vulnerable to eavesdropping
Punch Card	• Cannot be duplicated as easily as a metallic key	• Older technology with little flexibility
Magnetic Strip	• cannot be easily copied • Card readers widely available	• Prolonged use can damage card • Installation requires costly IT infrastructure
Smart Card	• Same card can also be used for applications other than access control (e.g. payment) • Provides more security than Magnetic Strip Cards	• More expensive than a Magnetic Strip Card
RFID	• All the Pros of Smart Cards • Requires no contact • Can be embedded in items other than cards and under the skin	• Can be more expensive than Smart Cards