RFID BASED AIRPORT LUGGAGE SECURITY SYSTEM

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DEDICATION

I dedicate this report to my beloved parents, supportive supervisor, classmate and people who have guide me. Without their support and understanding the completion of this report may not have been possible.

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ABSTRACT

RFID include the use of radio waves to identify people and objects automatically by allocating tags on them. Compare to others system such as barcode technology, RFID is withstand handling, easy to use and flexible. In this project, RFID application as airport luggage security system was studied. 125 kHz RFID reader and tags were chosen to implement this project. Microsoft Office Access 2007 is used to build the database system and implement the Graphic User Interface (GUI) using Visual Basic software. Next for the system installation, the reader is linked to the computer via USB cable. The passenger with specific or registered tag can access the system will be acknowledge passenger either they are authorize to enter the system or not. From this project, it is proved that RFID has a very good potential in any future electronic applications.

ABSTRAK

RFID menggunakan gelombang radio untuk mengenalpasti seseorang atau objek secara automatik melalui tag yang diletakkan bersamanya. Jika dibandingkan dengan system lain seperti teknologi barcode, RFID adalah lebih tahan lasak, mudah dan fleksibel. Di dalam projek ini, aplikasi RFID digunakan sebagai pengenalpastian dan pendaftaran sesebuah kereta. Pembaca RFID dan tag RFID berfrekuensi 125kHz telah dipilih untuk perlaksanaan projek ini. Microsoft Office Access 2007 digunakan untuk membina satu sistem pangkalan data dan pengantaramuka pengguna bergrafik (GUI) yang menggunakan Visual Basic. Untuk menjadi system yang lengkap, pembaca RFID ini akan dihubungkan terus dengan komputer melalui kabel USB. Penumpang yang mempunyai tag berdaftar boleh melalui sistem ini dengan memberitahu penumpang tentang status mereka sama ada mereka boleh melalui sistem tersebut atau tidak. Projek ini telah membuktikan bahawa RFID mempunyai keupayaan yang bagus untuk sebarang aplikasi elektonik yang lain kelak.

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CHAPTER I

INTRODUCTION

"Airport Luggage Security System using Radio-frequency identification (RFID)" is designed and develops to assists the needs of today where a lot of luggage has been lost at the airport. It is a very useful device and able to be used at the airport as a security concern in order to maintain their quality and performance. This chapter will summarily discuss the project background, objectives, scope and the problem statement and last but not least project methodology.

1.1 Project Background

RFID include the use of radio waves to identify people and objects automatically by allocating tags on them. Compare to others system such as barcode technology, RFID is withstand handling, easy to use and flexible. In this project, 125 kHz RFID reader and tags were chosen instead of high frequency RFID because of budget constraint in order to implement this project. The development of Airport Luggage Security System using Radio-frequency identification (RFID) is an electronic device installed on the check out door at the airport to make sure the passenger is check out with their luggage respectively. The main objective for this project is used for security purposed and to avoid luggage lost including mishandling, stolen, left and

left with intention such as crime purpose. This project will use an RFID as airport luggage security system to trace an authorized person with their luggage. RFID tags will be provided to all passengers and their detail will be key in to the system. RFID reader will read the unique RFID number from the RFID tags.

1.2 Problem Statement

Nowadays, airports are overcrowded, passenger might be issues with the luggage lost and the lost including mishandling, stolen, airport system, left and left with intention such as crime purpose. The cost generate by luggage loss are very high for both the airlines and the airports.

In this project, Radio Frequency Identification (RFID) technology has been implement and it has become well-known technology for many type of security or item's identification system. By using RFID, it will help the system to work faster, convenient and effective for other user that using this system.

1.3 Project Objectives

The main objective for this project is to design and develop a system by using RFID technology for airport luggage security system in order to prevent and avoid luggage lost including mishandling, stolen, left and left with intention such as crime purpose. It means that by using RFID system, registered user is automatically identified by the system and will be registered in the system every time registered user enters or leaves the system.

1.4 Scope Project

This project involves with study the RFID based airport luggage security system. RFID is a fast and reliable means of identifying just about any material object. Primarily, the two main components involved in RFID system are the RFID tags and RFID reader. RFID tags that used in this project is passive type with frequency of 13.56Mhz.The maximum read distance about 1.5meters but with a constraints of budget, RFID 125 kHz tag and reader are used and it is affordable for this project. This project will focus on RFID interface and RFID hardware. RFID interface will be programmed by using visual basic programming to trace the passenger and luggage is authorized or unauthorized. This system will use Microsoft access as a database to insert all the details of passenger and their luggage. RFID will interact with the database and come out with the output either the passenger and luggage is authorized or unauthorized.

1.5 Project Methodology

Several methodologies have been proposed in order to achieve the objectives. Literature review about this project is done by gathering information from internet, journal, article, and books in order to get knowledge. In the beginning, there is some research to understand about the project. Then, the methodologies proceed with gathering material phase for database storage system, materials for RFID hardware and material for computer software. Next is software development phase which is to develop database, user interface and integrate interface and database software. Follow by implementation and integration phase finally is to test the project and analyze the results. At the end of the project, the student will learn successfully to develop RFID based airport luggage security system. Finally, the report has been prepared.

CHAPTER II

LITERATURE REVIEW

Literature review about this project is done by gathering information from internet, journal, article, and books in order to get knowledge. Literature review is necessary before started the project and the researches regarding the project are significant in understanding the concept of the overall project. This chapter discusses about Radio Frequency Identification (RFID).

2.1 History of RFID

RFID tags have been around a lot longer than most people think. In 1946, a man named Leon Theremin created a device for the Soviet Union that retransmitted radio waves with audio information. This was created for espionage purposes. This might not be used for identification but it is credited as being the predecessor to RFID.

In 1973, the first real beginning of RFID technology can be identified. Mario Cardullo created a passive radio transponder with memory. It consisted of a transponder with 16 bits of memory. The goal of this device was to take tolls electronically. The patent that Cardullo received was for the use of sound and light as transmission mediums. The device was proposed to investors as a way to accomplish transportation, banking, security, and medical problems.

The demonstration of the device was performed at the Los Alamos Scientific Laboratory in 1973 by Steven Depp, Alfred Koelle, and Robert Freyman. This device used 12 bit tags. The first patent that is associated with our modern day RFID technology belongs to Charles Walton. He received in 1983.

2.2 Introduction to RFID

RFID (Radio Frequency Identification) is a technology which is used to identify or detect an object. The communication is between a reader (interrogator) and a transponder (tag). There are two types of tags which is active tag or passive tag. Diagram of RFID system is shows in Figure 2.1. When the tag enters the reader reading field, the tag will be activated by the electromagnetic wave from the reader. The passive tag converts the electromagnetic field to power up its internal circuits. Then the circuit in the tag will modulate the waves and transmit back the stored information. After that, the reader will decode the data and send it to CPU for processing. [2]

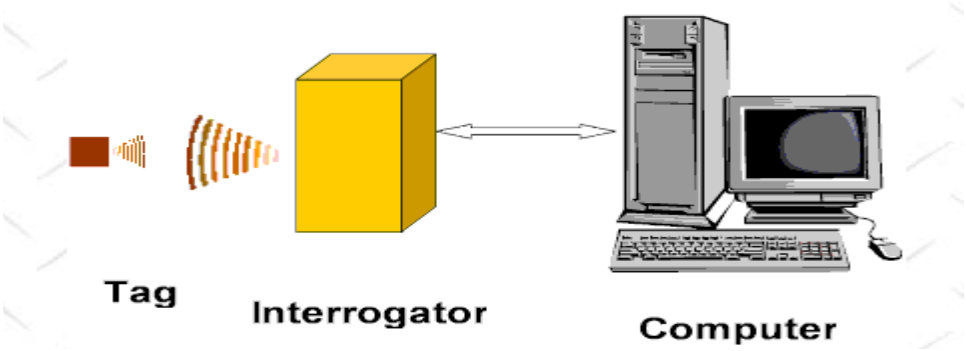

Figure 2.1 Diagram of RFID system

RFID system is consist of two components:

• The transponder, which is located on the object to be identified.

• The interrogator or reader is a device to scan the tags which may be a read or write/read device that depending upon the design and the technology used.

A reader typically contains a radio frequency module (transmitter and receiver), a control unit and a coupling element to the transponder. In addition, many readers are fitted with an additional interface (RS 232, RS 485, etc) to enable them to forward the data received to another system (PC, robot control system, etc).

RFID system has effective characteristic in identification system compared to others technology. Table shows the advantages of RFID system by comparing some system parameters.

Table 2.1: Comparison between RFID systems with others technology systems

System parameter	Barcode	OCR	Voice reorganization	Biometry	Smart card	RFID System
Typical data quality/byte	1-100	1-100	-	-	16-64k	16-64k
Data density	low	low	High	high	Very high	Very high
Machine readability	Good	Good	expensive	expensive	Good	Good
Influence of dirt/damp	Very high	Very high	-	-	possible	No influence
Influence of covering	Total failure	Total failure	-	possible	-	No influence
Influence of direction and position	low	low	-	-	unidirectional	No influence
Degradation/ wear	limited	limited	-	-	contact	No influence
Operating cost/reading electronics	Very low	medium	Very high	Very high	low	medium
Operating cost	low	low	none	none	medium	none
Unauthorized copying/modification	slight	slight	possible	impossible	impossible	impossible
Reading speed	Low – 4s	Low – 4s	Very low >5s	Very low >5-10s	Low – 4s	Very fast

2.4 Type of RFID Tag and Its Frequencies

This part will discussed about specification of RFID tags.

2.3.1 Type of RFID Tag

The tags communicate to a RFID reader via radio frequency. There are many types of RFID tags. These types are :

- Passive tags
- Semi passive tags
- Active tags

Below are details of each type of RFID tags.

2.3.2 Passive

No internal source of power is needed. The minute the electrical current induced in the antenna by the incoming radio frequency signal provides just enough power for the CMOS integrated circuit in the tag to power up and transmits a response. The antenna has to be designed to both collect powers from incoming signal and also to transmit the outbound backscatter signal. The response of the RFID tag is not just an ID number the tag can contain non-volatile EEPROM for storing data.

2.3.3 Semi Passive

Everything is similar to passive tags except for the addition of a smaller size battery. This battery allows the tag IC to be constantly powered which removes the need of an aerial to be designed to collect power from the incoming signal. As semi passive tag is pre-energized, they can be read more reliably in this more difficult environment.

2.3.4 Active

Active tag has their own internal power source which is used to power any ICs that generate the outgoing signal. They are more reliable (fewer errors) due to the ability for active tag to conduct a session with a reader. Because of their onboard power supply also transmit at higher power level than passive tags, allowing them to be more effective in "RF challenged" environments such as water, metal or at longer distances.[11] A battery can live up to 10 years and have practical ranges of hundred of meters. Types of tags that were used in the RFID system are ISO card, clamshell card and also soft label.[11] Figure 2.2 shows the example of clamshell card. The typical reading distance for this card is 15cm to 90 cm but still depending on the reader, the one sending electromagnetic wave to energize the RFID tag.

Figure 2.2 Clamshell RFID tag

Table 2.2: Comparison between active RFID and passive RFID

	Active RFID	Passive RFID
Tag power source	internal to tag	energy transfer from the reader via RF
Tag battery	yes	no
Availability of tag power	continuous	only within field of reader
Required signal strength from reader to tag	very low	very high(must power the tag)
Available signal strength from tag to reader	high	very low
Communication strength	long range(100m or more)	short range (up to 10m)
sensor capability	ability to continuously	ability to read and transfer