SMART CONTENNA DELIVERY LOCALIZATION AT PORT USING RFID BASED

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For my beloved father and mother

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ABSTRACT

Radio Frequency Identification (RFID) is a contactless technology that was in higher demand on all sectors especially in supply chain management. In this project, "SMART CONTENNA DELIVERY LOCALIZATION AT PORT USING RFID BASED" was builds as a security system of a container entering and exiting the port warehouse. Currently, the procedure of container entering and exiting t of the port is done manually in which before a container going for transportation, bunch of document need to be prepared. In the document will contain all information of the container such as the product, company name and location need to be send. In order to reduce the workload and reduce the use of paper in the port, RFID technique was suggested. As the solution, each container will have unique ID number that will be attached at the back of the container. By scanning the ID card, all the information will be known such as the location address of the container during transportation. All the information from the ID card is initially from the RFID Database Handling System that will be filled by the administrator or the person in charge. The information also can be used as security purposed in the future since it consist of real date and time function. The RFID system will works as an RFID Tag is placed near the RFID scanner that will generate electromagnetic signal to power up the tag. When the reader is activated, the tag will transmit data to the display system such as PC or laptop. This system has been developed using Microsoft Visual Basic (VB) that offered graphical user interface (GUI) for the result display. The database support for this system is using Microsoft Access (MA). The purpose of this database is to be reference of any related stored data and information.

ABSTRAK

Radio Frequency Identification (RFID) adalah teknologi tanpa sentuh yang mendapat permintaan yang lebih tinggi di semua sektor terutamanya dalam pengurusan rantaian bekalan. Dalam projek ini, "SMART CONTENNA DELIVERY LOCALIZATION AT PORT USING RFID BASED" adalah di bina sebagai satu sistem keselamatan untuk kontena masuk dan keluar gudang pelabuhan. Teknologi sedia ada di pelabuhan masa kini masih di lakukan secara manual dimana beberapa dokumen penting perlu disediakan sebelum kontena dibenarkan untuk memasuki atau keluar daripada pelabuhan. Di dalam dokumen itu akan mengandungi semua maklumat penting sebuah kontena seperti produk , nama syarikat dan lokasi penghantaran. Untuk mengurangkan beban kerja dan mengurangkan penggunaan kertas di pelabuhan , teknik RFID telah dicadangkan . Sebagai penyelesaian, setiap kontena akan mempunyai nombor unik ID yang akan dilampirkan di belakang kontena. Kad ID yang ada akan di imbas mengguanakan alat peimbas dan semua maklumat akan diketahui seperti alamat lokasi kontena untuk proses pengangkutan. Semua maklumat dari kad ID akan diperolehi daripada RFID Database Handling System yang akan diisi oleh pentadbir atau orang yang bertanggungjawab. Maklumat ini juga boleh digunakan sebagai jaminan keselamatan pada masa akan datang kerana ia mempunyai system masa dan tarikh sebenar. Sistem RFID akan berfungsi apabila Tag RFID diletakkan berhampiran pengimbas RFID yang akan menjana isyarat elektromagnet untuk memberi kuasa kepada tag. Apabila pengimbas aktif, tag akan menghantar data kepada sistem paparan seperti PC atau komputer riba. Sistem ini telah dibina menggunakan Microsoft Visual Basic (VB) yang ditawarkan kepada pengguna grafik (GUI) untuk paparan. Pangkalan data untuk sistem ini menggunakan Microsoft Access (MA) dengan tujuan untuk di jadikan rujukan data dan maklumat yang disimpan.

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LIST OF ABBREVIATION

COM	-	Component object Model
GUI	-	Graphical User Interface
HF	-	High Frequency
ID	-	Identification
LAN	-	Local Area Network
MA	-	Microsoft Access
MySQL	-	Microsoft- Structured Query Language
OLE	-	Project Linking and Embedding
OLE-DB	-	Project Linking and Embedding for Database
RAD	-	Rapid Application Development
RF	-	Radio frequency
RFID	-	Radio-Frequency Identification
SQL	-	Structured Query Language
UHF	-	Ultra High Frequency
VB	-	Visual Basic
VHF	-	Very High Frequency

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CHAPTER 1

INTRODUCTION

1.1   Project Background

Global supply chains logistic are expected to be the largest and fastest growing application based on RFID. Currently, logistic system still used manual ways in recording data regarding the movement of container in and out of the port. However, some container might get lost or stolen. In addition, the containers also have probability to be misplaced during transportation or locating.

Therefore, in this project an RFID technique is proposed due to fact that this system can store all data in one database system by scanning the RFID Tag provided to each container. The development of this smart system will consists of RFID Tag and RFID Reader. Each tag will contain important data for each container and will be scanned during each movement of the container. More effective and efficient container management is expected to be developed using RFID technology. Traffic congestion at the port also can be managed properly.

There are three parts in RFID system. First part is the reader that act as scanning antenna, second part is a transceiver with a decoder to interpret data and the third part is a transponder which is the RFID tag. This system is developed using Microsoft Visual Basic 2010 that offered Graphical User Interface (GUI) for the

result display. For the database part, Microsoft Access is used to support all the data that can be used as reference of any stored data and information.

1.2   Objective of Project

The objectives of this project are to design and construct a database system which can store all information about the container. The development of this system can overcome the limitation of the man power in monitoring system.

Other objective of this system is to study about Radio Frequency Identification (RFID). Secondly to reduce workload for port worker by automatically stored information in database and finally to develop smart management system to improved container traffic.

Develop a system that can be used as a security system to observe any entrance and exit of container with a unique ID provided. Besides that, to develop GUI using VB that will integrate with RFID system to control and record entrance and exit of each container in the port.

1.3   Problem Statement

Global supply chains logistic are expected to be the largest and fastest growing application based on RFID. Through a year, it was not at all uncommon to encounter problems of tracking certain items as the items physically moved from one point to another. Some of the container might get lost, stolen or misplaced during the locating and transportation. Some of recorded data also cannot be find due to human error that forget to recorded the data since it has to be done manually.

Possible solution is to have incoming container with smart labels that can be automatically store in it placed. For transportation, container traffic congestion can be managed and reduced especially at entrance and exit of port storage. The log activities provided in this system will show the movement of each container. The solution of all problems can be solved by using the access control system that used RFID system.

1.4 Scope of project

The main purpose of this project is to develop a Smart Logistic System for Container using Radio Frequency Identification (RFID). There are two important scopes that will be covered in this project.

First scope is to choose the correct type and frequency of RFID tag and RFID reader. The tag will be read by an RFID reader and processed according to the application needed. In order to make the tag can be read by the reader, the RFID reader must use the same frequencies with RFID tag used.

Second scope is to design and implement the logistic system database using RFID that will be controlled by application software. RFID reader will be used to detect the RFID tag of each container that contains specific code. The code will be compared with the Microsoft Access Database and stored directly. In order to design GUI programming structure by using Microsoft Visual Basic for interface and display information between the RFID reader and RFID tag.

1.5   Thesis Outline

This thesis is a document that delivers the ideas generated and the concepts applied in this project. In chapter one contains the introduction of Smart Container Delivery Localization at Port using RFID Based. The introduction consists of project background, objectives, problems statement, scope and thesis outline.

Meanwhile, chapter two is the project literature review. In order to execute this project, literature review must be done to comprehend the whole system and to decide the best inputs, outputs and used devices. Data obtained from the journal, books, magazines and internet.

Chapter three describes the methodology of the project flow and its functional block diagram. It also discusses the method used for the project, such the software applied.

Chapter four consist of actual result and analysis of this project. It included all the main components together with the functionality and description applied in this project.

Lastly, chapter five is the project conclusion and recommendation. This chapter contains the achievement of the whole project and gave the recommendation for the future development of this project.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

The purpose of literature review is to explain the entire related topic with Radio Frequency Identification (RFID). It also includes the type of RFID and the software that will be used to create the system. The advantages of RFID and comparison between RFID and Bar Codes also will be an analysis.

2.2 History of RFID

During World War II [7], the British desired to be able to distinguish between their own returning craft and those of the enemy since the coast of occupied France was less than 25 miles away. The Germans, Japanese, Americans and British were all using radar which had been discovered in 1935 by Scottish physicist Sir Robert Alexander Watson-Watt to warn of approaching planes while the craft were still miles away. A system was developed whereby a transponder was placed on Allied Aircraft so that by giving the appropriate response to an interrogating signal, a "friendly" aircraft could automatically be distinguished from a "foe".

In the late 60″s or early 70″, the need for security and safety surrounding the user of nuclear materials drove further development of RFID tagging of equipment and personnel. Around 1977, the technology which had been developed in government labs for these applications was transferred to the public sector by Los Alamos Scientific Laboratories in which resulting in two companies forming to explore possible civilian uses [7].

Several applications were explored by these companies such as implementing RFID transponder in the back of the dairy cow to allow tracking of the animal″s ID and its temperature. Radio Frequency tagging has the advantages of longer read distance, ability to read through dirt, rain, snow, fog, oil and non-metallic objects [7].

The First RFID Patents Mario W. Cardullo claims to have received the first U.S. patent for an active RFID tag with rewritable memory on January 23, 1973. That same year, Charles Walton, a California entrepreneur, received a patent for a passive transponder used to unlock a door without a key. A card with an embedded transponder communicated a signal to a reader near the door. When the reader detected a valid identity number stored within the RFID tag, the reader unlocked the door. Walton licensed the technology to Schlage Lock of San Francisco, a lock maker, and other companies [7].

In the 1970s for example, RFID was already being used to identify railroad cars or automobile parts in paint shops. Shortly afterwards electronic article surveillance appeared, the first large-scale system of its kind on the market. Its main purpose was to guard against theft of goods and clothing. At the end of the 20th century use of RFID was continuously expanding, into toll systems, subway tickets, as implants for animal identification and as an electronic immobilizer. The technology became known to a wide public a few years ago when large supermarket concerns decided to document the delivery chain of their goods by means of RFID. Since then there have been many reports on RFID in the media, and its use has also frequently been the subject of controversy [7].

2.3   RFID System and Technology

According to Harvey Lehpamer in his book "RFID Design Principle" [4], Radio Frequency Identification (RFID) technology is an interesting substitute for old barcode system because of the substantial range, speed and unattended reading advantage afford by the RFID. It also has read/write ability and users can reveal the full worth and benefits of the expertise by taking advantage of the capability to add and change data on the tag in real time. Read/write RFID creates new application in the supply chain and helps accommodate changes in business, customer requirement and standards [16].

RFID (Radio Frequency Identification) technology consists of a system of tags and readers that can be used to identify and encode a variety of information. The tags are small silicon chips that contain a unique identifying code and may also contain some form of stored battery power and on-chip memory. An RFID reader is a unit that emanates radio signal at a precise frequency that causes the RFID tags to respond with their identifying code.

While RFID chips can be classified on the basis of several characteristics such as frequency, multi read capability, signal strength, and data storage, the primary distinction between RFID systems is based on the tag power source. Tags that either contain an onboard power source or are connected to an external power supply are called "Active" RFID tags while those tags that depend on the RFID reader for their power are called "Passive" RFID tags [16].

2.4   RFID Tag

The tag is the basic building block of RFID. Each tag consists of an antenna and a small silicon chip that contains a radio receiver, a radio modulator for sending a response back to the reader, control logic, some amount of memory and a power system. The power system can be completely powered by the incoming RF signal, in which case the tag is known as passive tag [4].

The tag also known as the transponder that holds data transmitted to the reader when the tag is interrogated by the reader. Usually chipless tag are more effective in application where simpler range of function is all that required. An RFID tag is a device that can store and transmit data to a reader in a contactless manner using radio waves. RFID Tag can be classified into two categories which is active and passive tag. A typical RFID tag consists of a microchip attached to a radio antenna mounted on a substrate.

The chip can store as much as 2 kilobytes of data. Then, the data stored will be retrieved by the reader. A typical reader is a device that has one or more antennas that emit radio waves and receive signals back from the tag. The reader then passes the information in digital form to a computer system. The concept of RFID technology is simple; firstly by placing transponder (RFID tag) which an antenna embedded in it on an item and then use a reader to read data off the microchip using radio waves. The reader passes the information to a computer, so that the data can be used according to the application [4].
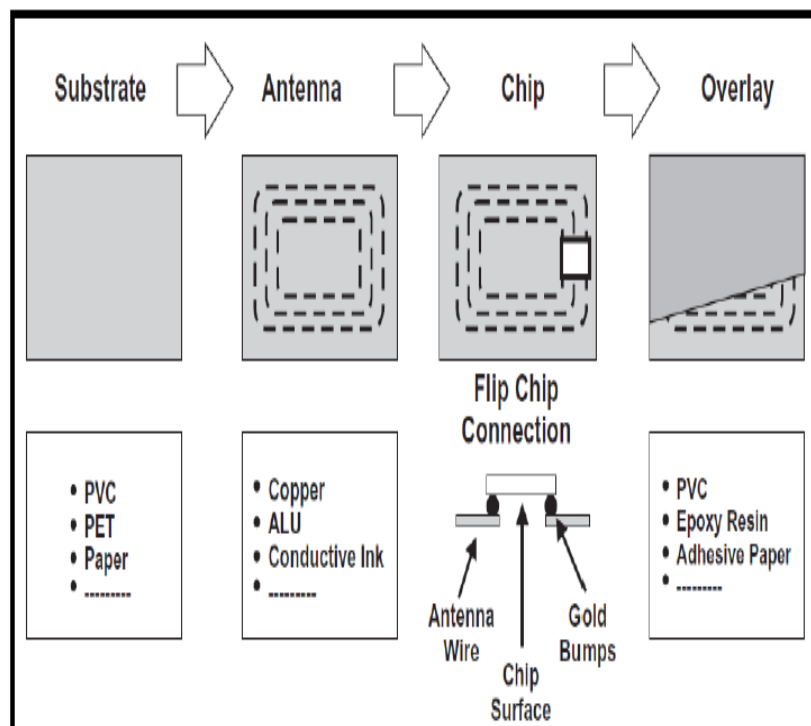

Figure 2.4: RFID Tag Component [4].