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MOBILE RFID TRACKING SYSTEM: SOFTWARE ARCHITECTURE

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MOBILE RFID TRACKING SYSTEM: SOFTWARE ARCHITECTURE

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DEDICATION

Dedicated to my beloved parents who inspired me a lot..

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First of all, I would like to convey my very special thanks and gratitude to my supervisor, Miss Shafrida Binti Sahrani who has guided me throughout this final year project. Her valuable advices and her willingness to spare her precious time in guiding and assisting me have motivated me to work hard all way through this research.

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ABSTRAK

Projek ini menunjukkan rekabentuk sebuah Sistem Penjejak Mobil RFID. Projek ini direka untuk mengesan objek di kawasan yang luas contohnya kanak-kanak yang bergerak di sebuah bangunan Kejuruteraan Elektronik dengan menggunakan teknologi pengenalpastian frekuensi radio (RFID). Sistem ini menggunakan RFID boleh dibahagikan kepada dua bahagian; peranti keras dan bahagian perisian. Dalam projek ini, bahagian perisian sahaja yang diteliti dan dikembangkan. Perisian sistem boleh analogikan sebagai prosesor pusat dan bahagian peranti keras sebagai peranti yang dikawal. Awalan projek ini akan fokus pada pengembangan perisian menggunakan Visual Basic 6 yang menyediakan pengguna cara untuk berinteraksi dengan lebih baik terhadap sistem, mesra pengguna, keselesaan dan interaktif kepada pengguna. Pengguna juga mudah memantau kedudukan anak-anak mereka yang telah di 'tag' dalam kawasan yang besar dengan melaksanakan sebuah aplikasi yang menunjukkan kedudukan setiap masa, di mana-mana di kawasan liputan. Pada masa sekarang, banyak kes kehilangan anak yang berlaku setiap hari. Banyak inisiatif untuk mengelakkan masalah ini termasuk memasang kamera pengawas dan Sistem Posisi Global (GPS) di kawasan yang di khawatiri bermasalah. Malangnya, kamera pengawas mempunyai titik buta dan GPS tidak sesuai digunakan di kawasan tertutup tetapi RFID dapat lebih dipercayai kerana isyarat radio dapat menembusi pelbagai penghalang dan ia lebih murah berbanding kamera pengawas. Sebagai kesimpulan, sistem ini mempunyai potensi pasaran yang tinggi. Dari project ini, sistem telah sempurna dibangunkan yang terdiri daripada borang pendaftaran

tag RFID, rekabentuk antaramuka pengguna grafik (GUI), modul komunikasi (master), module komunikasi (slave) dan pangkalan data yang menjejak lokasi objek setiap minit.

ABSTRACT

This project presents the design of a Mobile RFID Tracking System. It is designed to track an object in wide area for example a moving children in Electronics Engineering's building using RFID technology. This system using radio frequency identification (RFID) can be divided to hardware and software part. In this study, only software part is being researched and developed. Software system can be analogy as a central processor and hardware part as controlled devices. This preliminary project will focus on software development using Visual Basic 6 that provides user with a way to interact with the system, user friendly, comfort and interactive for the users. Users can easily monitor the position of tagged children in a large distance by implementing an application that reveals the position of a children at anytime anywhere in the coverage area. Currently, many of children missing cases happened every day. A lot of initiative to prevent these problems including the installation of the surveillance camera and Global Positioning System (GPS) tracker in potential problem areas. However, the surveillance camera has it blind area that makes it useless to track the object in critical angle and GPS is ineffective indoors because buildings block GPS transmission but RFID is more reliable because radio signal can penetrate any obstructions and it is very cheap compared with surveillance camera and GPS. In conclusion, this system has the high market potential. From this project, the system has been successfully developed that contains RFID Tags Registry form, graphic user interface (GUI) design,

communication module (master), communication module (slave) and database that detect location of the object within each minutes.

TABLE OF CONTENTS

	Page
Dedication	ii
Acknowledgement	iii
Abstrak	iv
Abstract	vi
List of Tables	xi
List of Figures	xii
List of Abbreviation	xiii
Chapter 1 INTRODUCTION	1
1.1 Project Overview	1
1.2 Project Objectives	3
1.3 Project Approach	4
1.4 Expected Outcomes and Contributions	4
1.5 Project Outlines	4
Chapter 2 LITERATURE REVIEW	6
2.1 RFID Definition	6
2.2 RFID History	8
2.3 RFID Application	9
2.4 RFID Hardware Components	9
2.4.1 RFID Readers	9

2.4.2	RFID Tags	11
2.4.3	Antenna	14
2.5	RFID Frequency	15
2.5.1	Low Frequency (LF)	15
2.5.2	High Frequency (HF)	16
2.5.3	Very High Frequency (VHF)	16
2.5.4	Ultra High Frequency (UHF)	17
Chapter 3	METHODOLOGY	18
3.1	Waterfall Model	18
3.2	Planning Stage	19
3.2.1	Project Overview	20
3.2.2	Research Location	20
3.2.3	Expected Output	21
3.3	Analysis Stage	21
3.3.1	Information Gathering	21
3.3.2	Hardware Requirements	22
3.3.3	Software Requirements	23
3.3.4	Software Used	23
3.4	Design Stage	26
3.4.1	System Functional Requirements	27
3.4.2	Project Design	29
3.4.3	Graphical User Interface (GUI) Design	30
3.4.4	RFID Tags Registry Design	31
3.4.5	Communication Module Design	32

	3.4.6 Database Design	33
3.5	Implementation Stage	33
	3.5.1 Software Development	33
	3.5.2 Program Testing and Error Correction	34
	3.5.3 Future Development Planning	34
3.6	Operation and Management	34
Chapter 4	RESULTS, ANALYSIS AND DISCUSSIONS	35
4.1	System Design	35
	4.4.1 Hardware Design	35
	4.4.2 Hardware Requirements	36
	4.4.3 System Hardware Architecture	37
4.5	Interface Implementation	38
	4.5.1 Graphic User Interface (GUI)	39
	4.5.2 Communication Module (Master)	40
	4.5.3 Communication Module (Slave)	42
	4.5.4 Database	44
	4.5.5 RFID Tags Registry	45
4.6	Testing Method	46
	4.6.1 Hardware Testing	46
	4.6.2 Software Testing	46
Chapter 5	CONCLUSIONS & RECOMMENDATIONS	47
5.1	Conclusions	47
5.2	Problem Encountered	48
5.3	Recommendation for Future Research	49

REFERENCES	50
APPENDIX A	52
APPENDIX B	58

LIST OF TABLES

	Table	Page
1.1	RFID Operation Frequency Ranges and Related Applications	3

LIST OF FIGURES

	Figure	Page
2.1	A RFID System Transmitting Data	7
2.2	The Components of an Example Reader	10
2.3	Passive Tags	12
2.4	Active Tags	13
2.5	Semi-Active/Semi-Passive Tags	14
3.1	Waterfall Model of System Development Methodology	19
3.2	Main Screen of Visual Basic 6	25
3.3	Main Screen of Microsoft Excel 2007	26
3.4	System Flow Chart Diagram	29
3.5	GUI Prototype	31
3.6	RFID Tags Registry Form	32
4.1	System Architecture Block Diagram	36
4.2	Hardware Architecture	37
4.3	RFID Tracking System Distribution Part	38
4.4	GUI Window	39
4.5	Communication Module (Master) Activities	40
4.6	Communication Module (Master): Connection Status	42
4.7	Communication Module (Slave) Activities	42
4.8	Connection Status of Communication Module (Slave)	43
4.9	Database Main Screen	44
4.10	RFID Tags Registry Form	45

LIST OF ABBREVIATION

RF	-	Radio Frequency
RFID	-	Radio Frequency Identification
Auto ID	-	Auto Identification
GPS	-	Global Positioning System
LF	-	Low Frequency
HF	-	High Frequency
VHF	-	Very High Frequency
UHF	-	Ultra High Frequency
SHF	-	Super High Frequency
EAS	-	Electronic Article Surveillance
SDLC	-	System Development Life Cycle
UNIMAS	-	Universiti Malaysia Sarawak
VB6	-	Visual Basic 6
GUI	-	Graphic User Interface
RAD	-	Rapid Application Development
PC	-	Personal Computer
CPU	-	Central Processing Unit
LAN	-	Local Area Network
WLAN	-	Wireless Local Area Network
IP	-	Internet Protocol

CHAPTER 1

INTRODUCTION

This chapter will be an overview of the project where it consists of the project background and its objectives. Furthermore, the expected outcomes and contribution of the project will be explained, as well as the way of approaching.

1.1 Project Overview

Object tracking system is known throughout the world as the system is basically detects any particular or selected object. Different tracker system algorithm detect different object, this include the detection of handwriting, moving people, animals and the barcode number. Due to the growth of technology and the increasing camera and radio system for surveillance, the demand to improve the quality and accuracy for object tracking also increase.

In this study, software part is treated as a central processor and hardware part as controlled devices. Software such as user interface program provides user with a way to interact with the system and provide a user safety, user friendly, comfort and interactive.

Users can easily monitor of tagged children in large distance by implementing an application that reveals the position at anytime, anywhere in the coverage area using RFID technology.

In recent years, Radio Frequency Identification System (RFID) gained a great interest in industry and academic purpose. This interest has lead to the use of RFID technology in a variety of applications. RFID is a system that facilitates the tracking of objects using radio waves. Therefore, the range of objects identification using RFID includes virtually everything on this world. So, RFID is an example of Automatic Identification (Auto-ID) technology which physical object can identify automatically that same with other system like voice identification, bar code and biometric.

The basic architecture of an RFID system consists of tag that includes an antenna and chip, a reader equipped with antenna and a transceiver, and a workstation to host the Middleware and database.

There are several frequencies that are used for RFID. Table 1 shows the frequency range and the typical application for each range. The detection range could vary from few centimetres to 100 meters [1]. Systems such as Global Positioning System (GPS) are ineffective indoors because buildings block GPS transmissions. This work presents a study on RF based tracking system which is not limited range as IR. Installation and maintenance costs are convenient and the other advantage is that it is applicable in indoor environment.

Frequency Range	Description	Typical Applications
<135 KHz	Low Frequency (HF), Inductive coupling	Access Control
13.56 MHz	High Frequency (HF), Inductive coupling	Access Control, Library books
868-870 MHz 902-928 MHz	Ultra High Frequencies (UHF), Backscatter coupling	Supply chain coupling
2.40-2.43 GHz	Super High Frequency (SHF), Backscatter coupling	Asset tracking Highway toll tags, Vehicle tracking

Table 1.1: RFID Operation Frequency Ranges and Related Applications [1]

1.2 Project Objectives

This project aims to design and implement an RFID based reliable and efficient solution to track lost object in a wide area which is the object can be represented as children. The system allows user to monitor the position of tagged object in a large distance by implementing an application that reveals the position of an object at anytime anywhere in the coverage area.

1.3 Project Approach

In this project, the software architecture will be designed and simulation about tracking system will be done by using Visual Basic 6 software.

1.4 Expected Outcomes and Contributions

In the end of this project, the Mobile RFID Tracking System is able to track an object such as children in wide area.

1.5 Project Outlines

The project consists of five chapters which summarized as below:

Chapter 1 describes the RFID system. It also contains the project objective, project approaches, expected outcomes and contribution of the project, and also the project outlines.

Chapter 2 gives a better understanding about the RFID system especially on the history and the overall system itself. It also contains the benefits and the future direction of the system.

Chapter 3 discusses the method that is use to develop this research. It depicts the overall development framework of the project. It indicates the steps and procedures to accomplish the objectives of the system.

Chapter 4 discusses the chosen software to design and develop Mobile RFID Tracking System. It will discuss system implementation which comprises of database and interface. The result and analysis based on the project is presented in this chapter.

Chapter 5 summarizes the results obtained from overall analysis of the project. Apart from that, recommendations are proposed for further improvement of this project.

CHAPTER 2

LITERATURE REVIEW

This chapter explains the basic operation and components of Radio Frequency Identification (RFID). Besides that, this chapter includes explanation on what the frequency will be applied and how it works on RFID.

2.1 RFID Definition

RFID is stands for Radio Frequency Identification, generally used to describe a technology that can identify specific objects by using radio signals. This RFID communicating over the air at a certain frequency, like any other radio communication [2].

In RFID system, it consists of two components which are; one is the transponder or tag with an antenna and transceiver. This tag is located on the object to be identified. Another one component is the interrogator or reader that includes an antenna and a chip, which, depending upon the design and the technology used, may be a read or write/read device.

In a nutshell, RFID involves detecting and identifying a tagged object through the data transmits. A tag attached to the object that needs to identify. Unique identification data about this tagged object is stored on this tag. When tagged object is detected by RFID reader, the tag transmits signal to the reader via reader antenna. Then, the reader reads the data and it has capability to forward it over suitable communication channel, such as network or a serial connection to a host computer that has a software application running on a computer. Hence, the host ready to take action on reader such as sending an alert to the floor personnel, updating the location information of this object on the database, or ignoring the duplicate read [2]. Figure 2.1 shows the basics of how an RFID system works.

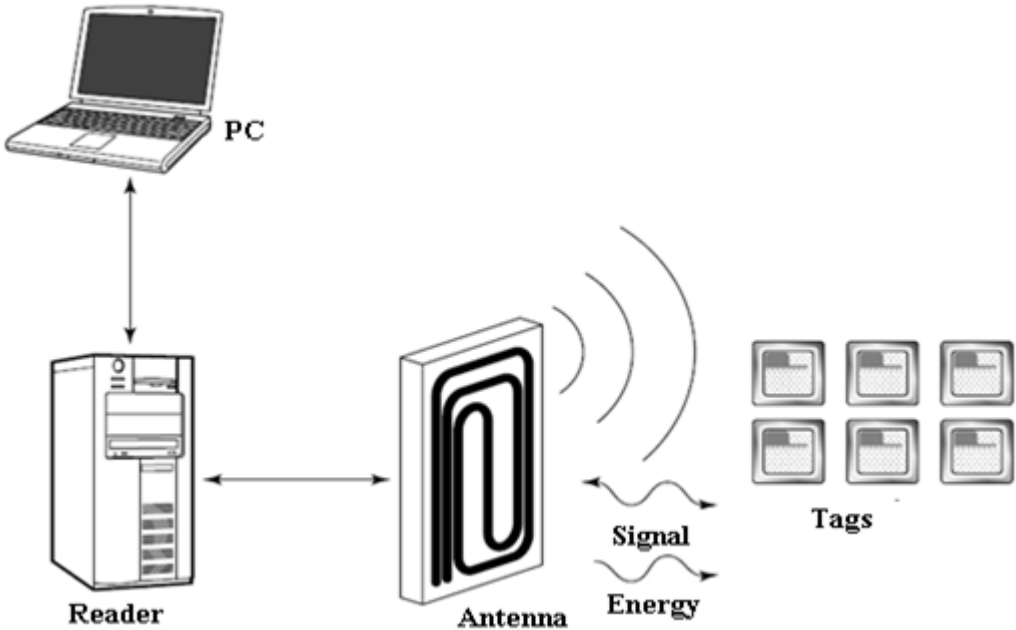


Figure 2.1: A RFID System Transmitting Data [3]