

RFID-NURSERY SAFETY NETWORK

SITI HAJAR BINTI HAMDAN

This report is submitted in partial fulfillment of requirement for the award of Bachelor of
Electronic Engineering (Computer Engineering) With Honours

Faculty of Electronic and Computer Engineering
Universiti Teknikal Malaysia Melaka

April 2011



UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : RFID- Nursery Safety Network

Sesi Pengajian : 2010/2011

Saya SITI HAJAR BINTI HAMDAN

mengakumembenarkan Laporan Projek Sarjana Muda ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Laporan adalah hak milik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajiansahaja.
3. Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antarainstitusi pengajian tinggi.
4. Silatandakan () :

SULIT*

*(Mengandung maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktubdi dalam AKTA RAHSIA RASMI 1972)

TERHAD**

** (Mengandung maklumat terhad yang telah ditentukan oleh organisasi/badan di manapenyelidikandijalakan)

TIDAK TERHAD

Disahkan oleh:


(TANDATANGAN PENULIS)

Alamat : BATU 23, JALAN IMAM HAJI HASSAN,
78300 MASJID TANAH, MELAKA.


(COP DAN TANDATANGAN PENYELIA)

NOOR MAZLINA BT MAHMUD
Pensyarah
Fakulti Kejuruteraan Elektronik Dan Kejuruteraan Komputer
Universiti Teknikal Malaysia Melaka (UTeM)
Karung Berkunci No 1752
Pejabat Pos Durian Tunggal
76100 Durian Tunggal, Melaka

Tarikh: 29/4/2011

Tarikh: 29/4/11


“I hereby declared that this report entitled RFID-Nursery Safety Network is a result of my own except for quotes that have been cited clearly in the reference.”

Signature : 

Student Name : SITI HAJAR BINTI HAMDAN

Date : 29 April 2011

“I hereby declared that I have read this report and in my opinion this report is sufficient in terms of the scope and quality for the award the Bachelor of Electronic Engineering (Computer Electronics) With Honours”

Signature : 

Supervisor Name : Pn. NOOR MAZLINA BINTI MAHMOD

Date : 29 April 2011

Especially for my beloved parents, family and friends.

ACKNOWLEDGEMENT

Foremost, I would like to thank to Allah the Al- Mighty for blessing and guiding me to finish my final year project successfully. And I would like to express my sincere gratitude to my supervisor Pn. Noor Mazlina Binti Mahmod for support of my project study and research, for her patience, motivation, enthusiasm, and immense knowledge. Her guidance helped me in all the time of research and to build up my project.

Besides my advisor, I would like to thank to all my friends, involved directly or indirectly. My grateful thanks also go to my friend Siti Zubaira Binti Mamat. A big contribution and hard worked from you during the process of this project. All projects during the program would be nothing without the enthusiasm and imagination from you. Besides, project makes me realized the value of working together as a team. The whole program really brought us together to appreciate the true value of friendship and respect of each other.

Last but not the least, I would like to thank my family: my parents Hamdan Bin Adam and Hendon Binti Said, for giving birth to me at the first place and supporting me spiritually throughout my life.

ABSTRAK

Untuk mengelakkan anak-anak daripada menjadi sebarang mangsa jenayah, Teknologi RFID sangat sesuai untuk melindungi anak-anak kita dari risiko. Sistem yang didasarkan pada Radio Frequency Identification (RFID) teknologi ini, belum pernah diimplementasikan di Malaysia; RFID teknologi ini boleh dilaksanakan dalam pelbagai jenis aplikasi. Salah satunya adalah untuk memantau anak-anak semasa di pusat jagaan dan mengambil kehadiran anak-anak ini secara automatik. Sistem ini sangat sesuai untuk dilaksanakan di pusat jagaan kerana sistem berasaskan RFID sangat cekap dibandingkan dengan cara manual mengambil kehadiran. Projek ini mencadangkan suatu rangkaian keselamatan untuk anak-anak di penjagaan yang merakam kedatangan dan masa meninggalkan setiap kanak-kanak dari pusat jagaan dan melaporkan kepada ibubapa mereka dengan sms. Setiap anak akan diberikan dengan tag RFID yang tertanam pada kad ID pintar mereka atau gantungan kunci yang boleh dimasukkan dalam saku atau beg tangan sekolah mereka. Sistem ini juga memudahkan pentadbir pusat jagaan dalam mengemaskinikan kehadiran anak-anak. Selain itu, sistem ini juga membolehkan pentadbir nurseri untuk memantau lokasi anak di tempat-tempat tertentu bagi meningkatkan keselamatan anak-anak .walaupun kos yang lebih tinggi sedikit berbanding cara yang lama, tetapi ia bersesuaian kerana sistem ini tahan lama untuk kegunaan jangka panjang. RFID-Nursery Safety Network projek, mengandungi tiga unsur utama dalam rangkaian yakin bahawa projek ini selesai dengan jayanya, iaitu merancang bahagian, dan mengintegrasikan peranti (hardware dan software); yang RFID reader, RFID tags, RFID antena, GSM modem, Graphic User Interface (GUI) dan pangkalan data.

ABSTRACT

To prevent children from any criminal activity, The RFID technology is suitable to protect our kids from become a victim. There is no system which is based on Radio Frequency Identification (RFID) technology that had been applied in any nursery in Malaysia; The RFID technology now can be applied in many types of application. One of them is for the nursery kids' monitoring with auto-attendance taking system. This system is very suitable for the nursery because RFID based system is very efficient and faster compared to manual way of taking attendance. This project proposes a safety network for children in nursery which record the arrival and leaving time of each child of the nursery and report to their parents by sms. Then parents will be able to know, whether their kids is in nursery or on the way home. Every child will be provided with RFID tag which embedded at their smart ID card or key chain that can be put in their pocket or their school bag. The system also eases the nursery administrator in updating the children's attendance. Besides, this system also allows the nursery administrator to monitor the location of the child at specific places in the nursery to increase the children safety in the nursery. Although the cost is a bit higher compared to conventional way, but the price is worthy as this system is durable and the tags are reusable for long-term use. This RFID-Nursery Safety Network project contains three main elements in order to make sure that this project completes successfully, that is designing part, implementing part and integrating the devices (hardware and software); which are RFID reader, RFID tags, RFID antenna, GSM modem, Graphical User Interface (GUI) and a database.

CONTENTS

CHAPTER	TITLE	PAGE
	PROJECT TITLE	i
	CONFIRMATION REPORT STATUS	ii
	DECLARATION	iii
	CONFIRMATION	iv
	DEDICATION	v
	ACKNOWLEDGEMENT	vi
	ABSTRAK	vii
	ABSTRACT	viii
	TABLE OF CONTENT	ix
	LIST OF TABLE	xiii
	LIST OF FIGURE	xiv
	LIST OF ABBREVIATION	xvi
	LIST OF APPENDICES	xvii
I	INTRODUCTION	
	1.1 Introduction of Project	1
	1.2 Objectives of Projects	3
	1.3 Problem Statements	3
	1.4 Scope of Project	4
	1.4.1 Users	4
	1.4.2 Operations	5
	1.4.3 Functionality	5

1.4.4	Development tool hardware/ software	5
1.5	Significant of Project	6
1.6	Methodology	7
1.6.1	Data collection/ background	8
1.6.2	Data analysis	8
1.6.3	Design	8
1.6.4	Implementation	8
1.6.5	Testing	9
1.6.4	Deployment	9
1.7	Maintenance	9

II LITERATURE REVIEW

2.1	Introduction RFID	10
2.1.1	RFID versus Barcode	11
2.2	Concept of RFID	13
2.2.1	Faraday's Law	14
2.2.2	Coupling	14
	2.2.2.1 Inductive Coupling	15
	2.2.2.2 Capacitive Coupling	16
	2.2.2.3 Radiative Coupling	16
2.2.3	Radio Waves in RFID	17
2.2.4	Radio Frequency and Applications	18
2.2.5	Transmission and Reception	19
2.2.6	Modulation	20
2.3	RFID components	20
2.3.1	Types of RFID Reader	20
	2.3.1.1 Handheld	21
	2.3.1.2 Fixed Position	21
	2.3.1.3 Mobile Mount	21

2.3.1.4	Interrogator/Encoder	21
2.3.1.5	Reader Specifications	22
2.3.2	RFID Tags	22
2.3.2.1	Passive Tags	23
2.3.2.3	Active Tags	24
2.3.3	RFID Antenna	25
2.4	GSM Modem	26
2.5	Software Database	27
2.5.1	Microsoft Access 2007	28
2.5.2	Microsoft Visual Studio 2005	29
2.6	RFID Applications	30
2.6.1	Security and Access Control	31
2.6.2	RFID privacy issues	32
2.7	Literature Review Summary	33

III RESEARCH METHODOLOGY

3.1	Project Outline Review	34
3.1.1	Understanding / Overview the Concept	35
3.1.2	List out the Important Specifications	35
3.2	Collection of Research Data	36
3.2.1	Documentation Review	36
3.3	Analysis and Organization of Data	36
3.4	Design Database	37
3.4.1	Designing Approach	37
3.5	Implementation and Integration	38
3.6	Testing the Overall System Performance	38
3.7	Maintenance	38

IV FINAL RESULTS AND ANALYSIS

4.1	Introduction	39
4.2	Results	40
4.3	User Interface Design (Admin and User access)	40
	4.3.1 Flow Chart of Login Prompt	43
	4.3.2 Flow Chart of Display Information	46
4.4	GSM (Global System for Mobile Communications)	47
4.5	Tagging the RFID cards	49
4.6	Tracking children using RFID	53
4.7	Actual Result versus Expected Result	55
4.8	Project Analysis	56

V CONCLUSION AND RECOMMENDATION

5.1	Summary and Conclusion	57
5.2	Recommendation and Project Extension	59

REFERENCES	60
-------------------	----

APPENDIX	62
-----------------	----

Appendix A	63
Appendix B	64
Appendix C	65
Appendix D	66

LIST OF TABLE

NO	TITLE	PAGE
2.1.1	Comparison between RFID system and Barcode System	12

LIST OF FIGURE

NO	TITLE	PAGE
1.6	Methodology	7
2.1.1	RFID versus Barcode	11
2.2.1	Magnet through a coil of wire	14
2.2.2.1	Inductive coupling	15
2.2.2.3	Backscatter coupling	17
2.2.3	The Electromagnetic Spectrum	17
2.2.4	Specific ranges of frequencies	19
2.2.4	Frequency-ranges used for RFID	19
2.3.2	Basic RFID tag silicon	22
2.3.2.1	Passive Tags	23
2.3.2.3	Active Tags	24
2.3.3	RFID Antenna	25
2.5	Example of GSM modem	26
2.5.1	Microsoft Access 2007	28
2.5.2	Microsoft Visual Studio 2005	29
4.3	Entrance page of the database	41
4.3	Login Prompt for the Admin access	41
4.3	Message box appears if the login is successful and Warning box appears if the login is invalid	42
4.3	Choose Admin interface	42
4.3	Detail information of kids (administrator use)	44
4.3	Choose User interface	45

4.3	Detail Information of kids (User access)	45
4.4	Form to display information	47
4.4	Message box appear for connected GSM modem	47
4.4	Message box retry for GSM modem setup	48
4.4	Error message box for RFID reader port	48
4.4	MOD 9001-D RS232 GSM modem	48
4.4	SMS notification to parents	49
4.5	Key chains and cards of passive RFID tags	49
4.5	The list of sample students assigned with ID	50
4.5	The RFID reader with red light	50
4.5	RFID reader with green light	51
4.5	After RFID tag is detected	51
4.5	Attendance form with display the recorded database	52
4.6	The access room, gate nursery and exit.	53
4.6	The child access Room B.	53
4.6	The child location track by admin.	54
4.7	Expected result for the whole system	55

LIST OF ABBREVIATION

RFID	-	Radio Frequency Identification
IFF	-	Identity Friend or Foe
AM	-	Amplitude Modulation
FM	-	Frequency Modulation
VB.NET	-	Visual Basic.Net

LIST OF APPENDICES

NO	TITLE	PAGE
A	Sample of project Source Code	57
B	Sample of project Source Code	58
C	Project Gantt Chart	59
D	Slide	60

CHAPTER I

INTRODUCTION

Chapter I will cover the introduction part of this Final Year Project 2010/2011 of Degree. It contains subchapters of objectives, problem statements, scopes of project, methodology and report structure.

1.1 Introduction of Project

Nowadays, nursery is very important in Malaysia especially for parents with careers. To prevent children from any criminal activity, The RFID technology is suitable to protect our kids from become a victim. This project proposes a safety network for children in nursery which record the arrival and leaving time of each child of the nursery and report to their parents by sms. Then parents will be able to know, whether their kids is in nursery or on the way home. Every child will be provided with RFID tag which embedded at their smart ID card or key chain that can be put in their pocket or their school bag. The nursery provides day care for children at aged 3 months to 5 years old and at here the children are taught, to develop basic skills through creative play and social interaction [1]. It is a pre-school education program that can build and stimulate the children self-development throughout the activities, which covers children holistic

development: physical, cognitive (brain and thinking), language and socio-emotion. In Malaysia; children usually attend to the nursery between the ages of three months and six years old. In the meantime, not all of the kids are sent to the nursery by their parent, some of them are going by bus or even sent by their neighbors or relatives. These factors have made most of the parents feel curious and concern about their children presence in nursery, whether their child be in nursery on time or not. This project is basically based on RFID operational system. RFID is stands for Radio Frequency Identification, further definition and description about this system will be discussed later on the Literature Review at (Chapter 2).

This system will be applied at nursery, each of the kids will be provided with an ID card or a wristband. In the ID card or wristband, it will contain a tag that contains the information of the kids. The system will detect the tag and read the information of the children's. Then, time and date the child arrival will be automatically recorded into the database. Additional features of this project may be added, which is the time and date of children leave the class and also detect where the kids are, and its will recorded too. The system also eases the nursery administrator in updating the children's attendance. Besides, this system also allows the nursery administrator to monitor the location of the child at specific places in the nursery to increase the children safety in the nursery. This will depend on the significant of this feature to this system. The system will also be connected to the GSM modem in purpose of sending a SMS notification to the parents as a report of their children's attendance in the nursery.

1.2 Objectives of Projects

The foremost objective of this project is to apply a RFID system as one of the nursery as a security purpose for children. This project provides a various application for the ‘nursery management system’, and there are main objectives for this project. In fact, this system also monitoring the children while at nursery, and can reduce the parents’ anxiety about their child presence because it will be automatically record and update the arrival and leaving time of children attendance. This is related to the second objective which is to build a project that can send a SMS to the parents to notify them about the attendance. With this project is can reduce the time taken to record kids’ attendance. As the time of taking students’ attendance can be reduced, there will be an extra time for the teachers to fill it will any valuable activities to improve the children’s learning quality and self-building progress. Plus, we can reduce the use of paper-based method which can lead to a positive impact for our green environment condition.

1.3 Problem Statements

Recent nurseries do not own a system that can be implemented as for the students’ security purpose; especially that based on the RFID operational concept. The other problem is that the attendance records of the kids are taken manually by their teachers. This will waste amount of time. The time wasted, actually, can be spent for another useful educational activity. Another difficulty is some of kindergartens do not have guards to help the teachers in monitoring the arrival of the kid in the morning due to the numbers of teacher in kindergarten these days, is insufficient, as the number of kids attending the kindergarten is increasing. Parents also do not have the confirmation whether their children arrive at the kindergarten; safely and on time. Moreover, parents can’t ensure safety while children are at the nursery.

1.4 Scope of Project

The scope of this project is divided into fourth main elements which are users, system operations, and functionality and develop a system using a tool hardware and software.

1.4.1 Users

The system is used by nursery admin, babysitter in order to monitor children while at nursery. The other targeted users to use this system are the children at nursery and their parents; parents who can access this system are able to check their child information and others application. This system will differentiate the admin and the parent's access, to justify what type of user can access and which outline from the system. Admin nursery is the administrator; children and parents are client of this system where some application cannot access by them, but can access by admin such as children information.

(a) Nursery Admin/ Babysitter

The system will facilitate the job of admin to monitor children location the hold function in this system such as update or delete children information. Takes the attendance of children arrival and leaving time, and send sms notification for parents.

(b) Parents/ Children

The system allows the parents and child to access the children information of this system, but they cannot update or delete the information. And parents also can admission the attendance and leaving time of their children.

1.4.2 Operations

For the operations part, the kids' card or keychain will have to scan on or through the RFID antenna. Then, the antenna will detect the tag and activate it. RFID reader will then reads the kids information from the tag, display it on the host computer and read the time and date for the attendance record purpose and nursery administrator also can monitor location of the children in specific place inside the nursery. This system only applicable at nursery building and database of the system will be automatically updated and their parents will receive a SMS notification.

1.4.3 Functionality

For the functionality scope, this project will apply the concept of RFID (Radio Frequency Identification). The system will send and receive data when its tag and reader meets with specific frequency ranges; within their minimum and maximum distance. The function of host computer in this project is to display the general information of the students and store their detail information and can track the attendance in databases. Besides, this system also allows the nursery administrator to monitor the location of the child at specific places in the nursery to increase the children safety in the nursery. The system will also be connected to the GSM modem in purpose of sending a SMS notification to the parents as a report of their children's attendance in the nursery. The attendance of the children can be view in the report at every month and week. And data arrival and leaving time can update automatically.

1.4.4 Development tool hardware/ software

At this stage, Microsoft Visual Studio 2005 (VB.Net) and Microsoft Access 2007 is used to build RFID- Nursery System Network. This matter will be discussed in detail in the Literature Review chapter and Preliminary Result part. GSM modem will be implemented in the project to send a SMS report to the parents.

1.5 Significant of Project

This project is significant as it differs from other projects. This project will be applied at nursery which based on RFID concept. The RFID system that will be applied is for the baby/child Identification, Time and Attendance reasons and to monitor the kids, while in nursery. This project will apply a GSM modem in order to send a SMS notification to the parents. Furthermore, this project involves the integration between database, host computer, RFID and GSM modem. Contributions from this project are; it will provide a security purpose of the nursery. Furthermore, it is one of methods to save time and it is a systematic way especially in handling the kids' attendance and discipline. This will increase parents and teacher awareness about the children presence in the nursery and indirectly, it will has a potential to gain the parents trustworthy on the nursery's administration management.

1.6 Methodology

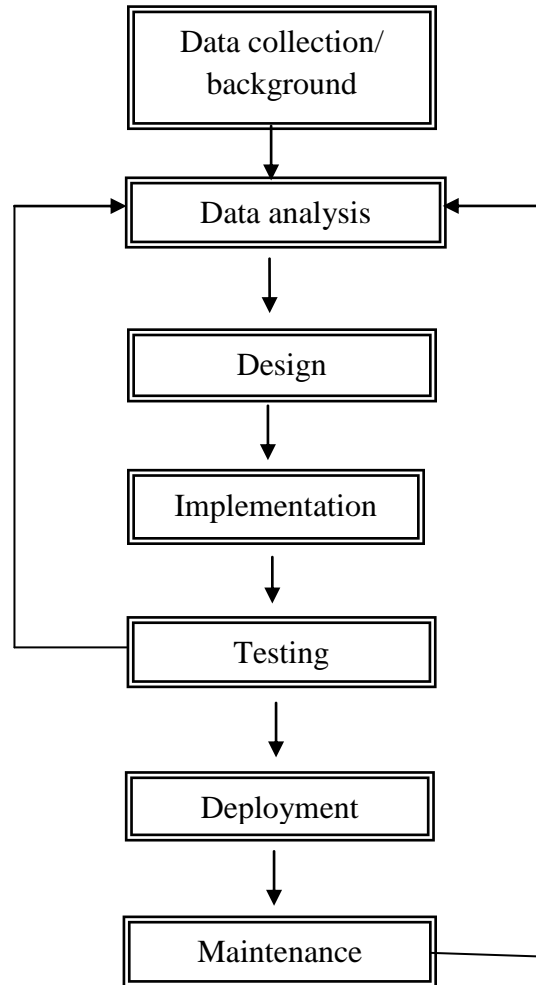


Figure 1: flow chart of the project