RFID BASED SMART ORDERING SYSTEM

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Special dedicated to my beloved family, lecturer, friend and those people who have guided and inspired me throughout my journey of education.

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ABSTRACT

Radio Frequency Identification (RFID), a method of remotely storing and receiving data using devices called RFID tags, brings many real business benefits to today world's organizations. Over the years, RFID research has resulted in many concrete achievements and also contributed to the creation of communities that bring scientists and engineers together with users [1]. RFID Based Smart Ordering System is an electronic device that used at the restaurants to replace the already ordering system that used at restaurants. The main objective for this project is to design and produce a device to replace the manually ordering system. This project includes the research and study on how the RFID works. RFID Based Smart Ordering System can be divided into two parts which are RFID and database. RFID that will be use is just the normal RFID with tag that can be detected at closed range which is it can be read the distance up to 10cm and operating frequency at 125 KHz. The Microsoft Visual Studio (Visual Basic), VB software will be use to create the main frame of the menu that will be appear after the RFID and PC is connected. For database part, all the customer details such as location of the table, foods and drinks, and also including bills will be recorded within database by using Microsoft Office Access (MOA) Software. Microsoft Access is used to create and manage computer-based database and it also enables to organize, manage, and store information for reference, reporting and analysis. This project is using RFID to identify guest that entering the restaurant and have their table "activated" as soon as they sit down by their server.

ABSTARK

Pengenalan Frekuensi Radio (RFID), merupakan satu kaedah menyimpan dan menerima data jarak jauh dengan menggunakan alat yang dipanggil „RFID tag‟, ianya dapat memberi pelbagai faedah organisasi dunia sekarang. Selama beberapa tahun ini, penyelidikan RFID telah menyebabkan pelbagai pencapaian konkrit dan juga menyumbang kepada pembentukan masyarakat yang membawa ahli-ahli sains dan jurutera bersama-sama dengan pengguna [1]. RFID Berdasarkan Sistem Pesanan Pintar adalah alat elektronik yang boleh digunakan di restoran-restoran untuk menggantikan sistem manual yang digunakan di restoran-restoran. Objektif utama projek ini adalah untuk mereka bentuk dan menghasilkan peranti bagi menggantikan sistem pesanan manual. Projek ini merangkumi penyelidikan dan kajian mengenai bagaimana RFID berkerja. RFID Berdasarkan Sistem Pesanan Pintar boleh dibahagikan kepada dua bahagian iaitu RFID dan pangkalan data. RFID yang akan digunakan adalah RFID yang boleh dikesan pada jarak tertutup dan boleh dibaca pada jarak sehingga 10cm dan kekerapan operasinya adalah 125 KHz. Perisian Microsoft Visual Studio (Visual Basic),VB akan digunakan bagi menghasilkan menu kerangka utama yang akan dipamerkan selepas RFID dan PC disambungkan. Untuk bahagian pangkalan data pula, semua butiran pelanggan seperti lokasi meja, makanan dan minuman, dan juga termasuk bil akan direkodkan dalam pangkalan data dengan menggunakan Perisian Microsoft Office Access (MOA). Microsoft Access digunakan untuk mewujudkan dan menguruskan pangkalan data berasaskan komputer dan ia juga membolehkan untuk menganjurkan, menguruskan, dan menyimpan maklumat untuk rujukan, laporan dan analisis. Projek ini menggunakan RFID untuk mengenal pasti tetamu yang memasuki restoran dan mempunyai meja yang telah "diaktifkan " sebaik sahaja mereka duduk.

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LIST OF ABBREVIATIONS

RFID - Radio Frequency Identification

PC - Personal Computer

USB - Universal Serial Bus

ID - Identification

VB - Visual Basic

MOA - Microsoft Office Access

MVS - Microsoft Visual Studio

LF - Low Frequency

HF - High Frequency

UHF - Ultra-High Frequency

BAP - Battery-Assisted Passive

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CHAPTER I

INTRODUCTION

RFID Based Smart Ordering System is introduced and designed to provide convenience to customers in terms of saving time and also highlight the usage of high-tech equipment in accordance with the progress of the country. This device is suitable for use throughout neither the restaurant nor the café to provide comfort and convenience to their customers. This chapter will briefly discuss the general background, concept, objectives, scope of work and the problem statement of this project.

1.1. Project Background

At the age of modernization, the use of high technology is increasingly widespread throughout the world, including our country. In fact, it plays an important role in our daily life because now people are spending more time in the pursuit of economic growth now. Therefore, the sophistication of the production of devices that can contribute such as time savings are highly recommended. RFID Based Smart Messaging System is a project that includes programming and electronic devices that are installed on a personal computer (PC) or tablet at a restaurant or cafe for smart ordering services to their customers. This is because, with the advent of devices like this, customers can make the ordering directly into the kitchen without the need for a

middleman. There were benefits for those working in the kitchen too, such as having the customer communicate directly with the cooks meant there'd be less in the way of bungled orders. Thus, it can prevent communication error and can cuts out the middleman. This device is also produced so that customers can continue to place orders without having to wait for the waiter came to bring menus and take orders from them. This is because, as soon as customers enter a restaurant or cafe, they will be given a tag that contains an identification number. After acquiring the tag, their table will automatically 'activated,, menus and ordering system can be done directly. After completing the orders, customers also can look back on the food that were selected and they also can check the total price of the order that has been done.

The identification number that has been activated and all orders were chosen to be recorded in the database for the payments to be made by the customer at the main counter either by cash or credit card. The software that was used to record all the details of the customers is a Microsoft Access, MA. This database is intended to facilitate the restaurant or cafe makes reference if there are any unexpected problems. Everything in this system will be handled by the touch-screen but for drinks and foods are brought out by a real person or waiter.

1.2. Problem Statement

As soon as entering the restaurant or cafe, the first thing that customer might not satisfied is time management and services that provided by the restaurant. Guests are desperately trying to attract a waiter"s attention but there is no response from the waiters because they are too busy to deal with the other guests. As a guest, we might think that it would be great if we could press a button and get our food. Furthermore, sometimes there are mistakes that often occur by a restaurant or cafe, such as delivering the wrong foods or foods that have been ordered are not delivered to the customer. In addition, the usage of the time taken by the waiters running between the client and the kitchen (to and from) take about 15 minutes long average meal, causing customers who have limited rest time wasted. Thus, in order to solve this problem, RFID and databases are used to convert existing messaging systems to intelligent systems orders.

1.3. Project Objectives

The main objective for this project is to design and produce a device to replace the manually ordering system. This project includes the research and study on how the RFID works. The objectives of this project are:

- To replace the existing ordering system with RFID.
- To change the system with high technology.
- To develop an application using Visual Basic Programming
- To create a database using Microsoft Access.

1.4. Scope Project

This project involved the usage of Radio-frequency identification or RFID for ordering system. RFID Based Smart Messaging System is a project that includes programming and electronic devices that are installed on a personal computer (PC) or tablet at a restaurant or cafe for smart ordering services to their customers.

Based on this project, it can be divided into two parts which are RFID and database. The first part is more focus on the RFID; RFID is a generic term for technologies that use radio waves to automatically identify people or objects [2]. Whereas the RFID that will be use is just the normal RFID with tag that can be detected at closed range which is it can be read the distance up to 10cm and operating frequency at 125 KHz. The interface between RFID and Personal Computer (PC) will be connecting by using Universal Serial Bus (USB) cable. The Microsoft Visual Studio (Visual Basic), VB software will be use to create the main frame of the menu that will be appear after the RFID and PC is connected.

For the second part will be the database, whereas this database is use to install or storing all the customer details such as Identification (ID) number, ordering details and total price. The database will be recorded by using Microsoft Office Access

(MOA) Software. Besides that, the menu that will be display on the main frame also will be stored at the database.

1.5. Project Methodology

In order to achieve the objectives, several methodologies have been proposed. The literature review is done by obtained information about this project from the journal, article, books and papers in order to get more information and knowledge. First of the most, the literature review that have done is including RFID, VB programming, and MOA. Then, the methodologies proceed with design and analyze the results of this project. At the end of this project, student will be learnt and gain programming skills and prepared the report.

1.6. Thesis Outline

Chapter I consists of the introduction of the project includes the project background and problem statement. Besides that, the objectives scope of work and methodology of the project also discussed and mention in this chapter. Then, a little explanation is discussed related of this project.

In chapter II will be covered on the literature review of this project. The literature review was obtained from journal, article, books and papers in order to get more information and knowledge regarding of this project. The literature reviews are divided into three parts which are previous project study, hardware development and software development including programming.

For Chapter III, the project methodology is fully covered with discussion and explanation about the method and approach that apply in this project. The methods of design process of RFID, VB and MOA including the design process, simulation, and fabrication. Besides that, this chapter also explained in details about all of steps of this project design.

Chapter IV is about the results of the project. All the results were obtained from the simulation and have been analyzed and explained in detail in this chapter. Lastly is Chapter V that contains an overall conclusion and future improvement of the project.

CHAPTER II

LITERATURE REVIEW

The literature review was obtained from journal, article, books and papers in order to get more information and knowledge regarding of this project. This chapter describes some of literature related to the information which utilizing Radio Frequency Identification (RFID), Microsoft Visual Basic (VB) programming, Microsoft Office Access (MOA) software. Based on this chapter, it has been divided into three parts which are previous project study, hardware development and software development including programming.

2.1.   Previous Project Study

In order to understand and get more knowledge about the related topic of this project, the previous case studies were obtained and some research has been done. There are many previous case studies that have applied the usage of RFID in their project based on different applications.

Table 2.1: Case Studies

Title	Source	Description	Authors
RFID-Based Equipment Monitoring System	Universiti Tun Hussein Onn Malaysia	• Automated monitoring systems are becoming trends, creating easier method to identify item, tracking, monitoring and add on security values. • In places where there are lots of items accessed by many users, the tendency of loss is high due to weakness in items monitoring.	1. Mohd Helmy Abd Wahab 2. Herdawatie Abdul Kadir 3. Zarina Tukiran 4. Nor˝aisah Sudin 5. Mohd Hafiz A. Jalil 6. Ayob Johari
RFID Technology: A Review of its Applications	Proceedings of the World Congress on Engineering and Computer Science 2009 Vol II	• RFID technology has found application in the healthcare, construction, hospitality [9], • RFID sensors help in monitoring the health and performance of systems such as power facilities [13, 12] and buildings [5]. This enables early identification of potential problems and thus helping in preventing them from escalating into bigger problems.	**2.1.1.1**Arun N. Nambiar
The RFID Technology and Its Current Applications	Computer and Automation Research Institute, Hungarian Academy of Sciences.	• Location identification If a given reader is assigned to a known location, it is possible to track the current place of a given uniquely identifiable item. • Transfer of further data An interesting application is envisaged for washing machines where read-write tags in clothes also record how many times the given piece has been washed and select the proper washing program to adapt to aging of the fabric	1. Elisabeth Ilie-Zudor 2. Zsolt Kemeny 3. Peter Egri 4. Laszlo Monostori

2.2. Hardware Development

Based on this sub topic, the hardware that will be used in this project is Radio Frequency Identification (RFID) reader and tags.

2.2.1. RFID

RFID is short for Radio Frequency Identification. Basically a RFID consists or two parts which is reader and one or more transponder, it also known as tags. RFID systems evolved from barcode labels as a means to automatically identify and track such as people, animals, and objects.

Figure 2.1: RFID Reader

2.2.1.1. RFID Reader

RFID systems can be broken down by the frequency band within which they can operate at low frequency (LF), high frequency (HF), and ultra-high frequency (UHF). If an RFID system operates at a lower frequency, it has a shorter read range and slower data read rate, but increased capabilities for reading near or on metal or liquid surfaces. If a system operates at a higher frequency, it generally has faster data transfer rates and longer read ranges than lower frequency systems, but more sensitivity to radio wave interference caused by liquids and metals in the environment.

a) Low Frequency (LF) RFID

The LF band covers frequencies from 30 KHz to 300KHz. Typically LF RFID systems operate at 125 KHz, although there are some that operate at 134 KHz. This frequency band provides a short read range of 10 cm, and has slower read speed than the higher frequencies, but is not very sensitive to radio wave interference. LF RFID applications include access control and livestock tracking.

b) High Frequency (HF) RFID

The HF band ranges from 3 to 30MHz. Most HF RFID systems operate at 13.56 MHz with read ranges between 10 cm and 1 m. HF systems experience moderate sensitivity to interference. HF RFID is commonly used for ticketing, payment, and data transfer applications.

c) Ultra-High Frequency (UHF) RFID

The UHF frequency band covers the range from 300MHz to 3GHz. Systems complying with the UHF Gen2 standard for RFID use the 860 to 960 MHz band. While there is some variance in frequency from region to region, UHF Gen2 RFID systems in most countries operate between 900 and 915MHz.

The read range of passive UHF systems can be as long as 12 m, and UHF RFID has a faster data transfer rate than LF or HF. UHF RFID is the most sensitive to interference, but many UHF product manufacturers have found ways of designing tags, antennas, and readers to keep performance high even in difficult environments.

2.2.1.2. RFID Transponder Tags

In RFID system there have few categories of RFID tags, which is active RFID, passive RFID and BAP RFID. Based on figure 2.2, it shows the types of active RFID and Passive RFID.