RFID AUTOMATED GATE SYSTEM

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Dedicated to my beloved family especially my parents, family members and friends.

Last but not least, to my supervisor and all the UTeM lecturers and staffs.

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ABSTRACT

This project is about RFID application. The concept of RFID is applied to an Automated Gate System. The theory of radio frequency identification (RFID) is applied into home gate system which is one of application that will be installed into the modern house. Using this application, the complete system automatically opens and closes the home gate. This will be happened when system received data from a RFID transponder which also known as RFID tag. Meanwhile, the home gate is automatically close when the system lost the data. Furthermore, system receives and lost data is depends on the specific range of frequency that system can identify. Thus, user do not have to open and close their home gate manually after this system is completely installed to their house gate system and this make user's life more easy. Hence, this project is using the passive RFID which can detect signal between 2cm - 5cm

ABSTRAK

Project ini bertajuk RFID Automated Gate System di mana mengaplikasikan teori pengesahan frekuensi (RFID) ke dalam sistem pintu pagar rumah sejajar dengan dunia moden. Dengan aplikasi ini, sistem akan berfungsi membuka dan menutup pintu pagar secara automatik dan ini berlaku apabila sistem menerima data daripada RFID Transponder yang juga di kenali sebagai RFID Tag. Dalam pada masa sama, pintu pagar akan tertutup secara automatik apabila sistem tidak menerima data daripada RFID Tag. Secara teori, penerimaan data bergantung kepada jarak frekuensi yang tertentu. Oleh itu, pengguna tidak perlu membuka pagar rumah secara manual dan ini memastikan tidak banyak masa yang digunakan untuk keluar dan masuk halaman rumah. Projek ini menggunakan RFID pasif yang boleh mengesan isyarat pada jarak 2cm - 5cm.

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LIST OF ABBREVIATIONS

AIDC - Automatic Identification and Data Capture

AM - Amplitude Modulated

ASK - Amplitude Shift Keying

AVI - Automated Vehicle Identification

CMOS - Complementary Metal Oxide Semiconductor

DSP - Digital Signal Processing

EAN - European Article Number

EEPROM - Electrically Erasable Programmable Read-Only Memory

FM - Frequency Modulated

IC - Integrated Circuit

MHz - Megahertz

OCR - Optical Character Recognition

PM - Phase Modulated

RF - Radio Frequency

RFID - Radio Frequency Identification

SAW - Surface Acoustic Wave

TP - Transponder

TPDR - Transponder

UART – Universal Asynchronous Receiver/Transmitter

UPC - Universal Product Code

XPDR - Transponder

XPNDR - Transponder

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CHAPTER I

INTRODUCTION

Radio Frequency Identification (RFID) technology uses radio waves to identify objects by retrieving data embedded within RFID tags. It is a contactless technology that uses radio waves to retrieve labels tagged to a product, animal or person. A unique serial number that identifies a product, person or object is stored on a microchip which is encased together with an antenna to form a tag or transponder. RFID system is comprised of two sub-systems which are the tag and the reader, both of which have their own antennas.

The tag is the device that contains the identification data. It identifies the item it is attached to. The reader retrieves data from the tag. It is also called an interrogator that reads or reads/writes from/to the tag. The antenna attached to the reader emits electromagnetic waves and receives responses from the tag. Tags can be

classified in two main categories based on their respective power source, passive and active tags.

Passive tags have no attached power source and rely on excitations by the signal emitted from the reader antenna to energize itself. Active tags on the other hand contain an embedded battery as the power source. The passive and active tags can be further distinguished by their memory type. The classifications are RO (Read-Only), WORM (Write Only, Read Many) and RW (Read-Write). However, different RFID carrier frequencies may result in different read-write ranges, data transmission speed, and cost. The operational frequencies available for RFID are low frequency (LF), high frequency (HF), ultra high frequency (UHF) and microwave.

1.1 Background of Project

The RFID automated gate system consist of two major components which are a reader and a tag. The reader or tag combination will communicate back and forth using RFID technology. The stationary reader will poll out periodically from within the gate to see if the correct RFID tag is in range. If a valid tag is found, the reader will send a signal to instruct the home gate to open. The gate will open when the system received data or information in frequency form and close back the gate when it lost the signal from the tag. An RFID tag will be placed inside the desired car. It is not physically embedded into the car, in case of the user wants to switch to a different vehicle.

The advantage of using RFID in this project is by using the system, users are avoid to open manually their home gate. Otherwise, the user just scan the tag to the reader to open the gate and if the is valid, then the system sending signal to open.

1.2 Project Objectives

This project consists of several objectives that to be accomplish at the end of this study. The objectives are:-

1. To develop an automated gate system using RFID concept.
2. To built a prototype of gate system which can be controlled by RF.
3. To develop the valid access by own which is like password.

1.3 Problem Statement

Nowadays, the bar-code is the universal technology used for automatic identification in distribution with the EAN/UPC code being dominant. This seems occurred to remote control which was applied to the automated gate system but the system is very slow and less sensitive to the signal. Thus, by proposing this project, it is expected to solve the problem that occurred in conventional or previous system. This new system will provide the more sensitivity to the signal by regarding to the frequency. It also provides the range that needed to detect a signal faster

1.4 Scope of Work

RFID concept that applied in this project basically consists of three main parts and they are a scanning that called antenna, transceiver with decoder to interpret data and RFID tag called, transponder which is has been programmed with information. The operation is the scanning antenna puts out radio-frequency signals in a relative range. When RFID transponder passes through the field of scanning antenna, it detects the activation signal from the antenna. That wakes up the RFID chip, and it transmits the information on microchip to be picked up by the scanning antenna. So, the system was active and this will also automatically activate the motor system that use to open and close the gate automatically. Furthermore, the transponder is located in or at the widescreen of a car and the antenna will locate near the home gate. This is to make the project function effectively.

1.4.1 Range of Functionality

The RFID automated gate system shall be able to detect and validate an RFID tag at a range of at least 5 centimetres from the user-defined location of the reader. The user shall dictate the sensitivity of the system for distances less than 5 centimetres. In short range RFID applications, passive tags may use RF backscattering to establish communications, which means no power source is required. These ranges are typically limited to one foot in distance. To achieve the desired range, tag will utilize a battery which provides the tag with its own power supply for RF communication.

1.5 Short Brief of Project Methodology

In hardware design part, the circuit of Radio Frequency Identification is developed as the driver for detecting or identify the frequency in specific range. The circuit consist of electronics component such as antenna as a receiver and tag as a transceiver.

On the other side of this project is software design. In this section the PIC (Programmable Integrated Circuit) will be entered the data that are programmed and control the overall circuit.

1.6 Thesis Outlines

This report consists of five chapters: the chapters respectively are Introduction, Literature Review and Methodology.

Chapter one is the Introduction, it had discussed about project objective, project background, problem statement, scope of work, and overview of remaining chapters.

In chapter two Literature Review, it had reviews some references from previous project, journal, article, books and datasheet. All the materials were useful to ensure the success of this project.

In chapter three Methodology, discussed the flow of this project started and how it will be functional. There are several block in flow chart to explain the process of the circuit within combining hardware and software until project archive the project objectives.

In chapter four Result and discussion, it shows the result that had been obtained in this project.

In chapter five conclusions and suggestion. It concludes the entire project and proposes some future plan for this project.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

This chapter reasons to review and discuss some of references from previous projects, journals, books and datasheet. All the information was collected from the different sources such as library, internet and product manual. The useful related data of this project is discussed in this chapter.

2.2 Background Study

Nowadays, most of the houses use almost the same system for their automated gate. The system is either barcode or remote control. In barcode system, user need to scan their tag to the system so that the system will identifies the data and then activated. By using this method, users usually bring or touch the tag close to the scanner or antenna to activate the system. Due to this, some of users think this system not friendly enough since they have to walk and scan their tag.

Another system is remote control. This system is more easily compare to barcode because it just need the user to press the button to open and close their home gate. However this system has some delays in a few second before activated and the user also have to press the button in front of the gate.

In this project, the system is using RFID to detect the valid data from a tag at certain range of meters. This mean, that the system required certain range to identify the tag for activation. Therefore, the gate will be opened when the user are in some range such as in between 10-30feets.

2.3 The basic of RFID

Radio-frequency identification (RFID) is an automatic_identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. The technology requires some extent of cooperation of an RFID reader and RFID tag. RFID tag is an object that can be applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader.

Most RFID tags contain at least two parts. One is an integrated_circuit for storing and processing information, modulating and demodulating a radio-frequency (RF) signal, and other specialized functions. The second is an antenna for receiving and transmitting the signal. Future Chipless RFID allows for discrete identification of tags without an integrated circuit, thereby allowing tags to be printed directly onto