

# SMART PARKING VIA RFID TAG

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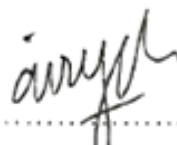
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To my beloved family

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## ABSTRACT

This project proposed a smart parking system with the aid of RFID technology by allowing driver to choose the parking space by themselves. With the help of RFID, this system will detect free parking spots, then guides drivers to the closest ones and helps in remembering the parking location. Since people nowadays prefer to travel with their own vehicle, so it is hard to find a vacant parking space when everyone is out. People also find it hard to remember where exactly they park their vehicle especially in the multilevel parking bay where each parking level looks similar. This project can prevent this problem to happen and it provides convenient for drivers to find a free parking space available. Features of this project included the vacant parking space detection, driver is able to select the parking space by themselves and parking indicator. In developing this project, three stages of methodology is being approached which are the hardware design, software design and also the integration of both hardware and software. The system allows the driver to choose the parking space at the entrance of the parking mall along with an RFID tag. The RFID tag is used to prevent from wrong parking, alert the system of vacant parking space and to indicate the vehicle location.

## ABSTRAK

Projek ini mencadangkan satu sistem letak kereta pintar dengan bantuan teknologi RFID dengan membenarkan pemandu untuk memilih tempat letak kereta itu sendiri. Dengan bantuan RFID, sistem ini akan mengesan tempat letak kereta percuma, kemudian memberi panduan kepada pemandu yang tempat letak kereta yang paling rapat dan membantu dalam mengingat lokasi tempat letak kereta tersebut. Sejak orang ramai kini memilih untuk perjalanan dengan kenderaan mereka sendiri, jadi ia adalah sukar untuk mencari ruang letak kereta yang kosong apabila semua orang keluar. Orang ramai juga merasa sukar untuk mengingat di mana sebenarnya mereka meletakkan kenderaan mereka terutama di kawasan letak kereta bertingkat di mana setiap peringkat tempat letak kereta kelihatan sama. Projek ini boleh mengelakkan masalah ini berlaku dan ia menyediakan kemudahan untuk pemandu untuk mencari tempat letak kereta yang masih kosong. Ciri-ciri projek ini termasuk pengesanan ruang letak kereta yang kosong, pemandu boleh memilih ruang letak kereta sendiri dan penunjuk tempat letak kereta. Dalam membangunkan projek ini, tiga peringkat kaedah yang didekati iaitu reka bentuk perkakasan, perisian reka bentuk dan juga integrasi kedua-dua perkakasan dan perisian. Sistem ini membolehkan pemandu untuk memilih tempat letak kereta di pintu masuk tempat letak kereta pusat membeli-belah bersama-sama dengan tag RFID. Tag RFID digunakan untuk mencegah dari tempat letak kereta yang salah, memberitahu sistem tempat letak kereta kosong dan menunjukkan lokasi kenderaan.



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## LIST OF ABBREVIATIONS

CCU	–	Central Control Unit
COM	–	Communication
GUI	–	Graphic User Interface
IC	–	Integrated Circuit
ID	–	Identification
LED	–	Light Emitting Diode
PC	–	Personal Computer
PCB	–	Printed Circuit Board
PGS	–	Parking Guidance System
PIC	–	Programmable Integrated Circuit
PIS	–	Parking Information Server
RF	–	Radio Frequency
RX	–	Receiver
RFID	–	Radio Frequency Identification
TX	–	Transmitter
UART	–	Universal Asynchronous Receiver-Transmitter
USB	–	Universal Serial Bus
VB	–	Visual Basic
VMS	–	Variable Messaging System
WSN	–	Wireless Sensor Network
ZCU	–	Zone Control Unit

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## CHAPTER 1

### INTRODUCTION

#### 1.1 Project Overview

RFID is a technology that enables wireless data transmission where able to control data through the use of electromagnetic wave. It is currently used in tracking objects in many industries [1] [2].

This project consists of a system that gives the driver a specific parking lot when entering the car park where the driver needs to park their vehicle at the specified parking with the aided of RFID technology. When driver enters the parking entrance, system will identify and generate the vacant parking space for them and once they accept the parking, an RFID tag will be given. The driver only needs to follow the given sign to search for their parking.

After parking the vehicle, the driver needs to scan their given RFID tag at the RFID receiver in front of their parking to indicate system that the parking is not available anymore. In case if they park in the wrong parking spot, the alarm will trigger. The driver also needs to sweep their RFID tag when they want to leave the parking lot. So, the system will know that the parking lot is vacant and can be generated to another driver.

Moreover, a screen is provided at the entrance or the exit of the mall for the driver to search their car in case they forgot their vehicle location. They only need to scan the RFID tag and the screen will show the location of their vehicle.

## **1.2 Problem Statement**

Most problems about parking that occurs is coming from the shopping mall. During peak hours especially on weekend and holiday where everyone is coming out doing shopping and spend their leisure time, it would be a frustration for them to find an available parking spot. Although most shopping malls provide very large parking bays but this problem still occurs. The driver will keep on turning around at the parking bay to find a vacant parking space and even sometimes they need to compete with others in order to get their own parking spot. Time taken to park their car is high even can take more than 10 minutes [3] and driver had wasted the fuel consumed plus it is not green. Apart from that, drivers also waste their precious time. As a solution, this project is able to reduce the frustration and increase efficiency of driver to find a vacant parking space.

Another problem that occurs is sometimes driver does not remember or forgotten where they had parked their car after they have done with their shopping or their business. It is also a troublesome to find the vehicle if the parking bay is quite large and had multiple level especially when each level look similar. Besides that, to find the forgotten vehicle location will take some times. An indicator is needed to solve this problem.

## **1.3 Objective of Project**

The objectives of this project are as follows:

- (a) To design a system that gives convenience for drivers to find a parking spot.
- (b) To develop an indicator which able to detect the vehicle location using RFID.

## **1.4 Scope of Project**

In order to achieve the project objectives, the scope of the project is determined as to specify the requirement and function of the project. All the scopes are listed as follows:

- (a) Driver can choose the parking lot for themselves.
- (b) Passive RFID tag is used.
- (c) An RFID tag is given when driver confirms the parking lot.
- (d) Sweep the RFID reader with RFID tag when entering and leaving the parking lot is required.
- (e) Indicator only shows the parking lot for the particular RFID tags.

## **1.5 Brief Description of Methodology**

This project gives a specific parking space to the driver upon entering the parking area with the aided of RFID elements. RFID tag helps the system identify how many vacant parking spaces that available along with helping to indicate the parking location for the drivers. In order to develop this project successfully, the project methodology is divided into three stages which are hardware design, software design, as well as hardware and software integration. The methodology of this project included all of the flow processes are briefly explained in chapter 3 of this report.

## **1.6 Report Outline**

This project report is organized as follows. In Chapter 1 inform about the introduction of the project which includes the project overview, problem statement, objective and scope of the project. Chapter 2 describe about the literature study that related with this project which done by other researcher. Chapter 3 gives explanation of the method to complete this project where it is divided into three stages which are

hardware design, software design also hardware and software integration. Chapter 4 discussed all the result obtained in developing the project. While in the last chapter conclude the regarding the project achievement. Some recommendation also stated in the final chapter.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

Nowadays, there are many researchers develop a new parking system using different approach method to solve the current problem having by driver that want to find a vacant parking space. The parking system is being improved day by day to make it more reliable and efficient in regard of solving the problem that still occurs and also the safety of the vehicle.

In this chapter will discuss the literature study of another researcher made that relate to this project.

#### 2.2 Parking System

There are various types of parking lots that available such as multilevel parking, roadside, parking with ticket and barrier gate and roadside parking with meter [4]. Everywhere will provide a parking space for visitor especially shopping complex, tourist attraction along with the business building where these places are visited by many visitors. In order to create a systematic and reliable parking, many parking systems are developed to solve the problem having by the driver that concerning the difficulty in finding a vacant parking space, time and safety.

### 2.2.1 PGS using Ultrasonic Detection

A smart parking system is proposed to assist drivers to find a vacant parking space in a shorter time [5]. The approach method used in this system is by using sensor of ultrasonic detection at the parking lot. The ultrasonic sensor is placed over each parking lot to sense the presence of vehicle at the parking lot. The ultrasonic sensor work by transmitting sound wave and this sound wave will reflect back. The time differences taken between transmit and receive signals of the ultrasonic sensor will determine the presence of the vehicle. Figure 2.1 [5] show how ultrasonic sensor is working.

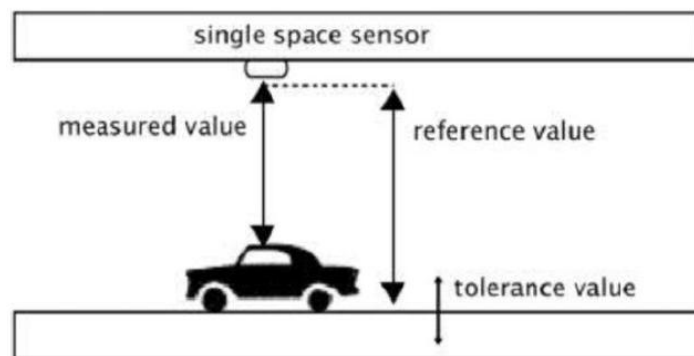


Figure 2.1: How Ultrasonic Sensor Work

The overall system of this smart parking system is shown in the Figure 2.2 [5]. The ultrasonic sensor will provide information regarding the occupied and vacant parking space to the system. All data from the sensor will collect by the ZCU and then be forwarded to the CCU through the network switch. A ZCU is able to handle a maximum of 60 ultrasonic sensors. For large parking bay and multiple parking levels will use several ZCU and being connected to CCU via the network switch.

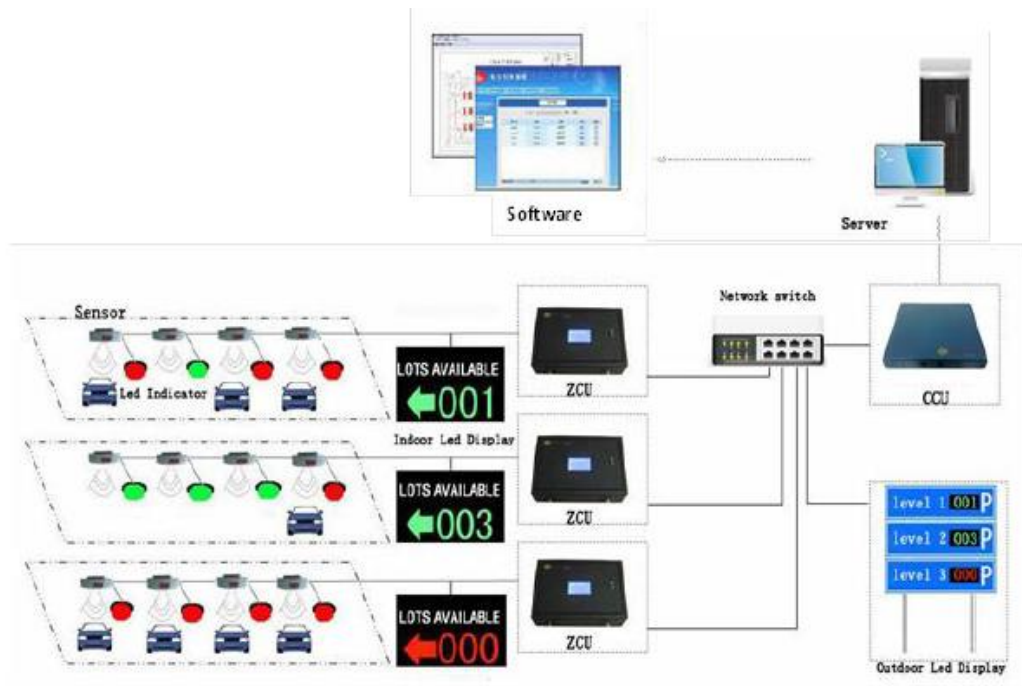


Figure 2.2: Smart Parking System uses Ultrasonic Detector

CCU will process the data that receive from the ZCU and instruct the command to the ZCU and the LED display board to update the parking space information. Apart from receiving data from the ultrasonic sensor, ZCU also receive commands from CCU to control the LED indicator at each parking lot and also the indoor LED display. All the data collected that receive at CCU will be saved on the server and allows the information be monitored and managed by the management.

This system guides the driver to the available vacant parking space by showing the amount of available vacant space on the LED display. The LED display is being placed in several places included the entrance of parking lot, entrance each level and end of each aisle [5]. From the LED indicator which have several colors that indicate either reserved, occupied, vacant or handicap also helps the driver to observe the vacant parking space smoothly.

Although this system guides the driver to the available vacant parking space but it is not a guarantee for the driver to obtain that vacant parking space. During peak time, and there are many cars existing, the driver still needs to compete with

other driver that wants the same vacant parking space. It is still unreliable parking system development and problem still occur with this system implementation.

### 2.2.2 Wireless Sensor Network

Wireless sensor network is one of the enabling technologies for such a ubiquitous computing world which expected will be used in all sorts of applications including home security, asset and inventory tracking and etc. [6] [7]. A wireless sensor network is implemented in a parking system to build a systematic parking guidance system which consists WSN based vehicle detection sub-system and management sub-system as shown in Figure 2.2 [8]

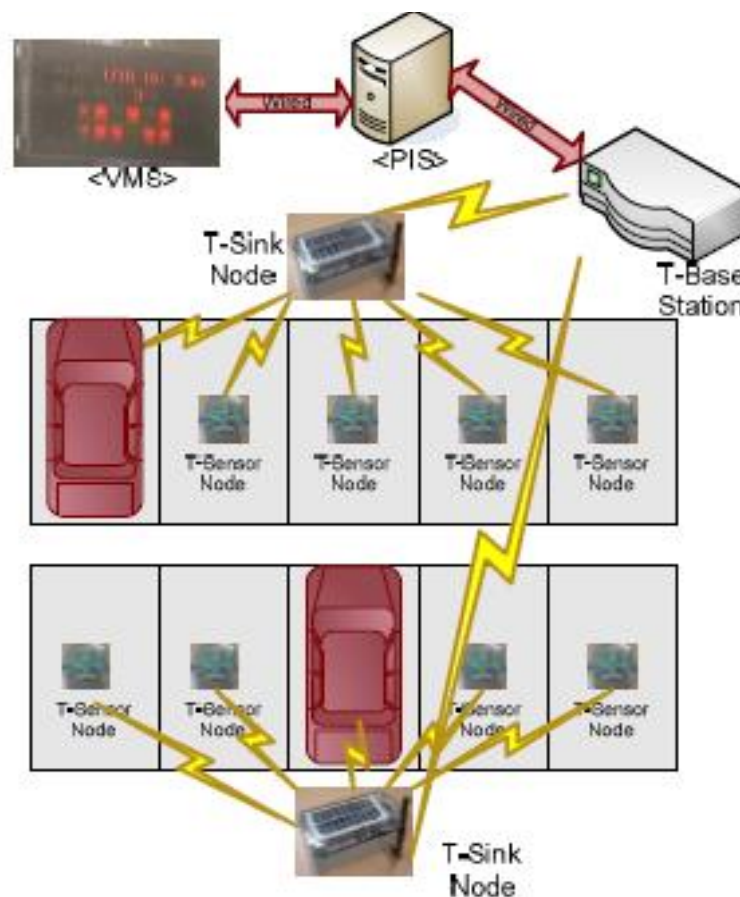


Figure 2.3: PGS Based on Wireless Sensor Network