IMPROVED CAR PARK CONTROL CENTER

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Dedicated to my dearest dad and mum who supported me all the time and my friends who always by my side.

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ABSTRACT

Nowadays commercial mall and airport provide good parking service to customers. They show the drivers information of available parking space at the entry of parking area. However, drivers still waste a lot time and fuel for looking an available parking space, especially when there are limited parking space in a bigger parking area. Therefore, this project focused on development of the management parking system in order to assist drivers finding the nearest available parking space from the control center. In this project PIC microcontroller control all the process of the system which include assigning the nearest available space from the control center. Then the system tells drivers the location. The system also indicates the status of each parking space so that maintenance personnel can monitor the whole parking system.

ABSTRAK

Pada masa kini, pusat membeli-belah dan lapangan terbang menyediakan perkhidmatan letak kereta yang baik kepada pelanggan. Mereka memberikan isyarat tentang tempat kosong kepada pemandu semasa mereka masuk ke tempat letak kereta. Walaubagaimanapun, pemandu masih juga membuang masa dan petrol untuk mencari tempat kosong untuk meletakkan kereta, terutamanya di tempat letak kereta yang luas. Oleh itu, projek ini memberi fokus kepada pembangunan sistem perngurusan tempat letak untuk membantu pemandu mencari tempat letak kereta yang terdekat yang diberi dari pusat kawalan. Dalam projek ini, PIC microcontroller mengawal semua proses termasuk memberikan isyarat tempat kosong yang terdekat kepada pemandu dari pusat kawalan. Sistem ini juga menunjukkan status setiap tempat letak kereta supaya kakitangan penyelenggaraan boleh memantau sistem tempat letak kereta keseluruhan.

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LIST OF ABBREVIATIONS

DCE   -   Data Communication Equipment.

DTE   -   Data Terminal Equipment.

IR   -   Infrared

LCD   -   Liquid Crystal Display

LED   -   Light Emitting Diode

GUI   -   Graphical User Interface

PC   -   Personal Computer

VIP   -   Video Image Processor

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CHAPTER 1

INTRODUCTION

1.1 Overview

In many areas, parking has becomes a serious problem. People have encountered difficulty in finding an available parking space around parking area, especially in peak hours. Therefore, an efficient parking management system is needed to solve this problem. One of important aspect to solve the problem is providing real time or near time parking guidance information to drivers finding an available parking space[1].

In general, a sensor is installed in each parking space to monitor its status whether it is available or occupied. Then, the sensors collect and process the data into parking availability information. This information is disseminated by using information media such as message signs, cell phones and others to help drivers finding an available parking space. The advantage of this system is drivers can save their time and fuel to finding an available parking space around the parking area. On top of that, it reduces traffic congestion around parking area.

In this project, a system is developed to make the management of parking system become more efficient. This system is able to help drivers find a nearest available parking space from the control center. In addition, graphical user interface has been designed for maintenance personnel monitor the status of each parking space around parking area.

1.2 **Problem Statement**

Nowadays, many commercial mall, hospital and airport car parks have experience of traffic congestion during weekend and public holidays. It happens because numbers of drivers are eager to find available parking space. Driving around the parking area to find an available space is already waste time and fuels. All of these happen because the driver does not know where exactly an available parking space.

1.3 **Objectives**

The objectives of this project are:
   a) To develop a parking management system that able to suggest the nearest available parking space from the control center.
   b) To develop a low-cost and easy to assemble circuit system.
   c) To design a Graphical User Interface (GUI) for management use to monitor the whole parking system.

1.4 **Scope**

This project mainly focus on the hardware design and software design to development parking management system in order to tell drivers the nearest available parking space from the control center. The circuit of the system consists of a PIC 16F877, LCD display and sensors. PIC 16F877 as a control unit help to control all the process of the system. Sensors are used to detect the available parking spaces. LCD display is used to display the information for the drivers. In addition, the project designs prototype for 5 parking spaces only and a control center. The GUI displays all the parking locations for maintenance or troubleshooting purpose. The GUI is designed using Java.

1.5 **Thesis Outline**

Introduction was included to briefly explain some important parts of whole project, objective of project, problem statement of project, and scope of project. Chapter 2 discuss about literature review that study the related journal, conferences paper, book and other resources required in this project in order to improve car parking control center. In addition, certain components will be described in this chapter. Chapter 3 discuss about methodology that is required to complete this project. It is includes details of the circuit design, PIC programming and Java program.

Chapter 4 shows the results of the circuit that run in PIC microcontroller to ensure the objectives of this project is achieved. Discussion will also be done in this chapter to discuss about the problem faced along the project. Chapter 5 includes the conclusion and recommendation of further work

CHAPTER 2

LITERATURE REVIEW

2.1 Parking Management System

Atul and Felipe (2006)[2] designed a system that can be deployed in existing parking structures which provide information about available parking space to drivers trying to access the facility. This system beginning installs sensors in each parking space to provide owner with accurate information on parking space occupancy. Drivers can obtain the parking availability information via display boards before they enter the facility. One of the features of this system is the manager can made unavailable parking space bypass the sensors. Figure 2.1 show parking spaces layout made through a Graphical User Interface (GUI).
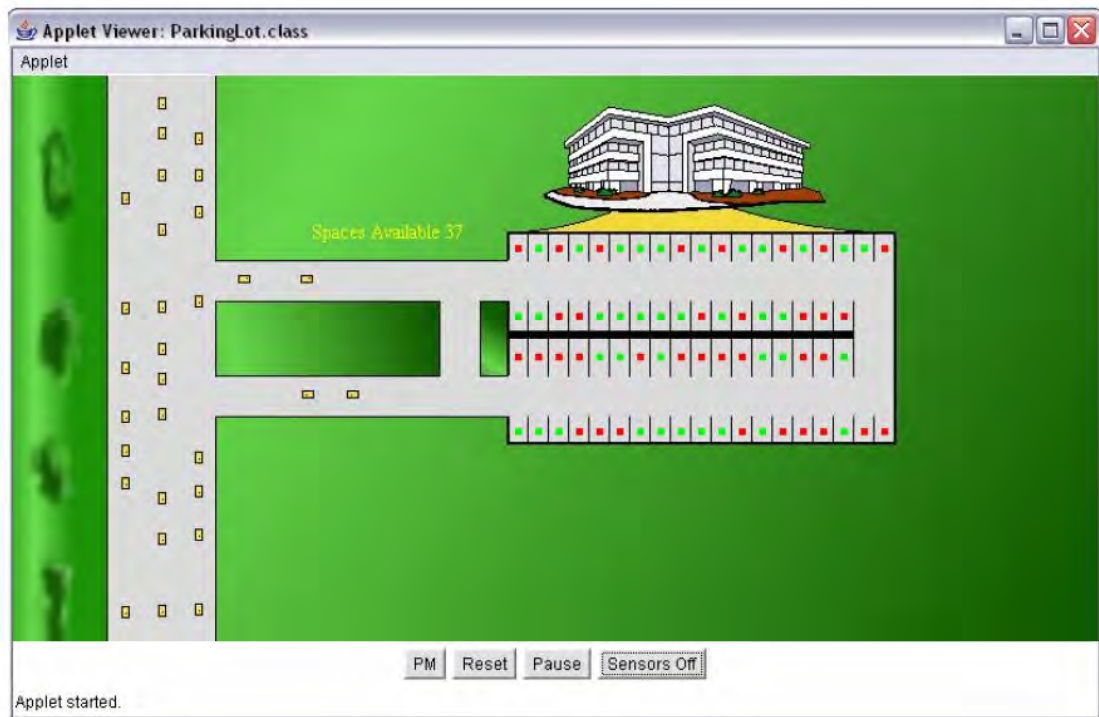
Figure 2.1: Parking space layout

Narmada (2012)[3] designed a parking assistance system based on wireless sensor networks technology integrated with IP capability using wireless microcontrollers. Each parking space install ultrasonic sensor to provide accurate information on the available parking space. This information is used to guide the user to the available parking space. The system also gives the direction to the parked vehicles to eliminate confusion of the user. Besides that, this system include reservation feature for privileged users in specific time period.

Kianpisheh, Mustaffa, Limtrairut, and Keikhosrokiani (2012)[4] designed Smart Parking System (SPS) to help drivers to find an available parking space in parking area. Once drivers enter the parking area, they can obtain parking availability information at each level from the display board. The system also shows the drivers the direction of the aisle that has an available parking space through the internal signs. Figure 2.2 show that ultrasonic sensors not only use to detect the status of parking spaces, it also uses to detect improper parking actions. Sometimes, drivers do not aware that they parked their vehicles in two available parking spaces. The results

from demonstration show that if any vehicle is parked in two parking spaces, the sensor will triggers an alarm and driver should adjust his/her car until the beeping sound stop. In addition, each parking space has installs LED indicator to show the status of parking space for drivers. The different of coloured LEDs show that different types of parking space. Green colour LED shows the parking space is available, red shows the parking space is occupied, blue shows the parking space is assigned for handicapped drivers and yellow shows parking space is reserved for other driver. Green colour of LED indicator changes to red when a driver enters an available parking space.
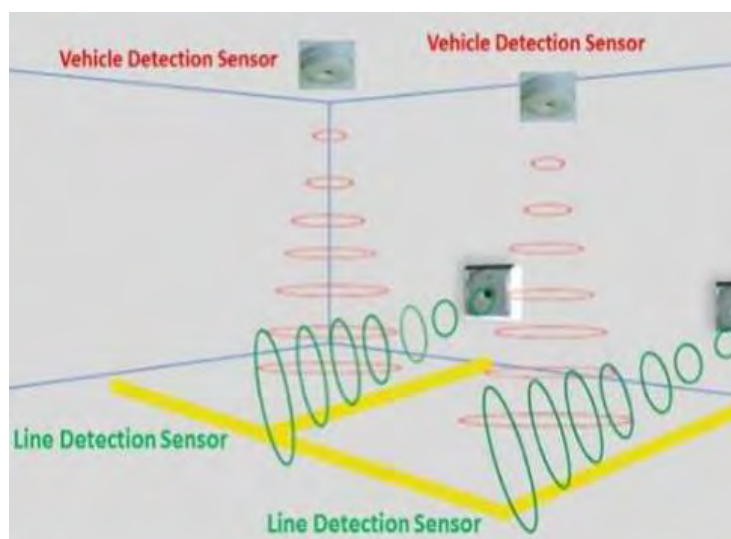

Figure 2.2: Ultrasonic sensor uses to detect car and improper parking actions

Chon, Agrawal, and El Abbadi (2002)[5] developed a location-based application, named NAPA (Nearest Available Parking lot Application). NAPA is an application that assists users to find a nearest available parking space in the controlled area. There are two choices for users query a nearest available parking space. One of choices is find the nearest available parking space to a destination and another one is find the nearest parking space from the current location. The advantage of this feature is users can choose their desire nearest parking space. Once user choose the choices, the server look up the parking spaces list associated with the specified building and assist user find the nearest available parking space. After user finding out the nearest available parking space, the user must send a message to

the NAPA server so that it can update the information about the parking space. Besides that, users can reserve an available parking space when they near the controlled area. NAPA server also can automatically charge the parking fees when user leaving the parking area.

Rehanullah,Yasir, Zeeshan, Kashif, Muhammad, and Amjad (2013)[6] developed Intelligent Car Park Management System (ICPMS) using FPGA. This system use IR sensor to detect vehicle when the car enters or exit car park. If the car park has a available parking space, the car is allowed to enter the car park and security token is assigned to it. The car also assigned to park in the nearest parking space which is shown on the display. When the car exits, the sensor in the parking space detects it and the security token will check status of parking space. If the car is exist in proper parking space, the car is allowed to exit. The system keep track of all the parked cars and available parking space. The advantage of this system is all drivers must parked their car in the exactly parking space which assign from security token to avoid case of theft.

2.2 Research Analysis

After reviewed the parking management system in different journal papers, the similarity among them are install sensor to detect vehicle presence, display number of available parking space and display the direction toward available parking space to assist drive find the available parking space. It does not effectively solve the traffic congestion in the car park and reduce searching time for looking an available parking space.

In this project, there is an idea to solve the traffic congestion problem in parking area is assist driver find the nearest parking space from the control center. This new idea can help drivers reduce fuel consumption and reduce searching time for looking an available parking space in car park.

In addition, the project also develops the low-cost and easy assembles circuit system. So, the authorities are able to install this system in their car park and provide a good parking management system for their customers.

2.2.1 Microcontroller

Microcontroller is an integrated chip consisting of central processing unit (CPU), data and program memory, serial and parallel I/O, timers, external and internal interrupts. It also called embedded controller, since most of microcontrollers are embedded in the devices they control.

The main difference between microcontroller and microprocessor is microcontroller integrate all the components such as CPU, data and program memory, I/O devices and timers in the same chip while microprocessor requires these components as external devices.
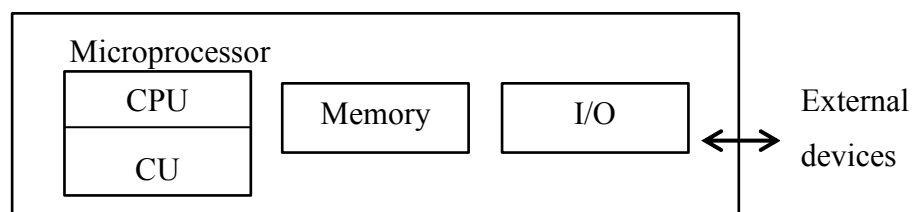

Figure 2.3: The simplest microcontroller block diagram [7]

The simplest microcontroller block diagram consists of microprocessor, memory and I/O device as shown in

Figure 2.3. The microprocessor in the microcontroller consists of a central processing unit (CPU) and control unit (CU). The CPU is the brain of the microcontroller. It administers all the activity in the microcontroller and performs all the arithmetic and logic operations. The CU controls the internal operations of the