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JUDUL: SMART PARKING SYSTEM

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Tesis dimaksudkan sebagai Laporan Projek Sarjana Muda (PSM)

SMART PARKING SYSTEM

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This report is submitted in partial fulfillment of the requirements for the Bachelor of
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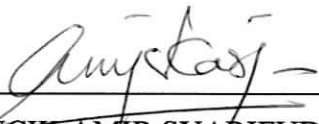
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I hereby declare that this project report entitled

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DEDICATION

To my beloved family members, my supervisor, academic adviser, friends

Thank you for your support.

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During this semester, I faced many obstacles in doing the *Projek Sarjana Muda (PSM)*. However, I am very lucky and I feel gratitude to those who have helped me along the way to make this project an interesting course program. Without them, it would have been impossible for me to complete this project successfully.

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ABSTRACT

Smart Parking System is a standalone-automated system that provides parking availability information to motorists. The system is developed to fit the needs of parking services improvement at organizations by providing the parking activities monitoring and parking information controlling features. The purpose of research, particularly literature review is to investigate the issues and reveal some passed research and case study that relevant to this project. From the literature review, the problems of current system can be clearly known. The main problem in the project research is motorists at crowded parking area are hard to find an available parking space. Most of previous research applied the concept of Parking Guidance and Information System and used loop detector to count vehicles at the main entrance. Thus, a list of objective and scope are determined to solve the problems. The main objective of the project is to develop software that is integrated with sensors in every parking space to determine the available parking space precisely. Object Oriented Software Engineering has been chosen as the project methodology and guides the project development process throughout the timeframe given. Thus, an analysis on the problem and requirement is done by using object-oriented method through activity diagram, use case, and interaction diagram. The appropriate software and hardware requirements which are used in the project have been declared. The project design covers high level and low level design where includes all design from broad-spectrum to the details. The system implementation focuses on the software development setup and software configuration management. Black box testing strategy is applied to examine software output by preparing test cases and perform unit testing in order to obtain correct test result. The project is expected to bring benefits to both motorists and organization in different ways. Motorists may feel satisfy with parking guidance information system because they will experience the stress-free parking area and Organization also increases the good parking services and management.

ABSTRAK

Smart Parking System adalah sebuah sistem yang menyediakan maklumat tentang petak meletak kenderaan yang kosong kepada pemandu. Sistem ini dibangunkan untuk memenuhi keperluan meningkatkan taraf servis di tempat meletak kereta yang disediakan oleh organisasi. Untuk tujuan itu, sistem ini dilengkapi oleh fungsi yang dapat memerhati situasi di tempat letak kereta dan fungsi mengawal maklumat yang dipaparkan kepada pemandu. Projek ini melibatkan kajian literatur yang bertujuan untuk menyiasat kajian-kajian lepas yang berkaitan dengan projek ini. Daripada kajian tersebut, masalah yang dihadapi oleh sistem semasa dapat diketahui dengan jelas, iaitu masalah utama ialah kebanyakan pemandu sukar untuk mendapatkan petak meletak kenderaan di kawasan letak kereta yang agak sesak. Kebanyakan kajian lepas mengaplikasikan konsep *Parking Guidance Information System* dan menggunakan pengesan ulangan untuk mengira kenderaan di pintu masuk utama. Oleh itu, satu senarai objektif dan skop telah ditentukan untuk menyelesaikan masalah sistem semasa. Objektif utama dalam projek ini ialah untuk mengira petak kosong di tempat letak kereta dengan tepat dengan menggunakan pengesan individu. *Object Oriented Software Engineering* telah dipilih sebagai metodologi yang memberi panduan dalam membangunkan sistem sepanjang tempoh masa yang diberikan. Oleh itu, analisis ke atas masalah yang dihadapi dan keperluan projek dilakukan dengan menggunakan gambar rajah aktiviti, *use case*, dan gambar rajah interaksi. Rekabentuk perisian merangkumi rekabentuk paras tinggi dan rendah secara umum hingga teliti. Implementasi projek memfokus kepada *Software Development Setup* dan *Software Configuration Management*. Strategi *Black Box Testing* diaplikasikan untuk menguji ketepatan hasil perisian dengan menyediakan *test cases* dan menjalankan *unit testing*. Projek ini dijangkakan akan mendatangkan kebaikan kepada kedua-dua pihak, iaitu pemandu kenderaan dan organisasi. Pemandu mungkin akan merasai pengalaman yang tidak stres di tempat letak kereta manakala organisasi juga meningkatkan tarat servis dan pengurusan.

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LIST OF ABBREVIATION

ABBREVIATION	DESCRIPTION
API	Advanced Parking Information
DBMS	Database Management System
ERD	Entity Relationship Diagram
GPL	General Public License
GSM	Global System for Mobile Communications
GUI	Graphical User Interface
IPS	Intelligent Parking System
ITS	Intelligent Traffic System
LAN	Local Area Network
LED	Light Emitting Diodes
NAPA	Nearest Available Parking lot Application
OOSE	Object Oriented Software Engineering
OS	Operating System
PDA	Personal Digital Assistants
PGI	Parking Guidance Information
RAD	Rapid Application Development
SPS	Smart Parking System
UML	Unified Modeling Language
UTMC	Urban Traffic Management and Control
VB	Visual Basic
VMS	Virtual Memory System
VSS	Visual SourceSafe

CHAPTER I

INTRODUCTION

1.1 Overview

Smart Parking System (SPS) plays the important role to provide good parking services to public. The SPS project is developed based on the research in existing parking system at the crowded parking area. Realize that some parking areas are hard to find available parking spaces, this project is purposely implemented to solve the problem. The project is focus on finding the best way to guide motorists to get available parking spaces smartly. SPS can inform motorists of parking zones and availability of parking space so that they can make good decision about where they wish to park, and thus find parking conveniently. It will reduce traffic congestion by reducing the amount of traffic circulation in search of open spaces, or attempting to park at a specific facility that is full.

1.2 Project Background

Information technologies have been introduced into vehicles parking management system for decades. Under the guidance of parking information, drivers are supposed to reduce searching time for parking spaces, which can consequently release the traffic congestion during peak hours.

Nowadays, Parking Information and Guidance (PGI) system have been put into practice in Europe, United State, Japan, and China. However, there is no such concept of parking system applies in Malaysia. In Malaysia, the existing car parking system requires car drivers look for parking spaces on their own effort. There is no guidance element in the existing system to help car drivers find parking spaces in any kind of ways. Thus, SPS project will apply the PGI concept to assist motorists to park their cars easily and faster.

1.3 Problem Statements

The SPS project is developed due to the problems stated as follow:

- i. Hard to search for an available parking space

Motorists may have to drive through crowded parking area and compete for an available parking space.

- ii. Time wasting in searching parking space

Searching for a parking space may waste motorists' time especially when traffic congest in the parking area. This may effects on their routine activities and cause productivity loss.

- iii. High frustration and stress level among motorist

Poor parking environment will lead to increase the motorists' frustration and stress level. They become impatient to wait in the traffic congestion or long queue.

iv. Traffic congestion

In crowded parking area, most of motorists drive slower in parking area to look for a parking space and this situation create the traffic congestion in the parking area.

v. Parking space wastage

Most of the motorists are more likely to search for parking spaces at popular spot e.g. near the shopping complex entrance, near the escalator, or near the lift. Thus, some of parking spaces will not be utilized, yet some location will be over crowded with vehicles.

1.4 Objective

Smart Parking System (SPS) is implemented to achieve the four objectives as below:

i. To deliver an automated software system that run data acquisition function on individual parking space via single sensor detection.

Photoelectric sensors or light sensors are set up on the floor of each parking lot. The sensor will detect car presence and will automatically send a signal to the central computer via electronic lines. The signal is indicating cars entering or leaving the specific parking lot.

ii. To provide sensor signal processing features that capable to determine parking availability information.

The signals are received from parking lots sensors will be determined their statuses by central software using mathematical calculation. The calculation processes will result the total number of parking lot vacancies at each parking zones.

- iii. To provide on screen monitoring and controlling features for parking management

This system serves as the command and control centre. The software enables user to monitoring and controlling the information displays to the motorists as easy as a click of the mouse.

- iv. To display parking availability information for multiple zones car parks to motorists.

The software at control center will communicate with display board to present dynamic and understandable parking availability information to motorists. The information includes “FULL” sign, “CLOSED” sign, and the number of available parking spaces for all parking zones. The information will assist car drivers to look for parking spaces faster, easier, and stress free.

1.5 Scope

The Smart Parking System (SPS) is developed within the scope as follows:

- i. Output Deliverables

Briefly, the system will deliver functionalities as follows:

- a. Monitoring parking activities for multiple zone car park.
- b. Provide parking availability information to driver.

- ii. Domain

SPS is a software product that ideals and applicable for shopping malls and office buildings that provide parking facilities and services to its customers. It benefits organizations and users with comprehensive method of monitoring and guidance their customers to search for available parking space through providing

parking availability information. The application is best for resolving any traffic congestion in over crowded parking area.

iii. User

The system has two types of target users: front end users and back end users. Front end users deal with system in the parking area. The system will display the available parking spaces in motorist and offer the parking guidance services. Back end user deals with system in the control center. They are responsible for controlling and monitoring the system operation.

iv. Platform

Both development and installation of system are done in Windows based environment. The system is characterized as stand alone, independent and centralized.

v. Database

The database for the system is a small-scaled database. It is used to store the data of users only.

vi. Methodology/Approach

Object Oriented Analysis and Design (OOSE) is the methodology for developing the project from initial stage towards the end. Thus, Unified Modeling Language (UML) will be widely applied in the project analysis and design.

vii. Technology/Concept

In order to accomplish the project successfully, the technology and concept that are studied and practiced in the project are Parking Guidance Information (PGI) system, Computer Interfacing, and Sensor Signal Processing with Data Acquisition and client server communication.

viii. Assumption

There are two assumptions have been made for the system:

- a. Parking simulation model represents the real parking environment when the system is demonstrated.
- b. Parking capacity e.g. zones and spaces are fixed and known for that simulation model.
- c. The system is not covering the whole parking management system e.g. parking ticketing and payment.

ix. System boundaries/Constraint

There are aspects that considered as constraints of the system are:

- a. The system may not provide accurate parking availability information if sensor(s) damage or facing the problem in detecting vehicles.
- c. The system may occur some problem in transferring parking availability information to display board.
- d. The parking simulation may not fully represent the real parking area.

1.6 Project Significance

Smart Parking System (SPS) brings multiple benefits to any organization that provides parking services to its customers.

i. Benefits of System to the Organization

a. Manage Parking Services Effectively

SPS will improve parking management due to good services provided to customers. Less supervision needed to monitor the parking situation in the parking area because the system will handle it smoothly.

b. Improve Parking Spaces Utilization

By providing the accurate space availability information for all car park entrance, empty spaces are filled faster, delivering higher occupancy levels. Hence, the operator receives a higher revenue yield per parking space. Furthermore, the optimum use of existing parking spaces help to reduce the need to construct new parking facilities. Also, the occupancy of parking spaces is more balancing at all zones.

c. Regulate, Fasten, and Smoothen the Traffic Flow

The system is a helpful and practical traffic-monitoring tool for the car park management. It aids to reduce and relieve traffic congestion within the car park and in the adjacent queuing area by re-directing motorists to other zones or levels.

d. Improve Productivity

Another benefit obtained by implementing SPS is that it can help to stimulate business activity in the organization (e.g. shopping centre, office).

ii. Benefits of System to the Motorist

a. Easy to Find a Parking Space through Information Guidance

System has the feature to inform the motorists of the number and location of available parking spaces. Besides, the system also capable to show the "FULL" and "CLOSED" signs on certain parking zone to redirect motorists to go to other zones. Thus, system assists the motorists in finding the parking spot quickly and easily.

b. Reduce the Searching Time

System helps to cut down the amount of searching time that motorists spend on looking for an available parking space. Therefore, this will save their time and not effect on their routine activities that might cause productivity loss.

c. Increase the Motorists/Customers Satisfaction

By providing customers with instant space availability information, frustration levels can be reduced dramatically. This gives the customer a much better parking experience and encourages repeat visits.

1.7 Conclusion

The Smart Parking System is a PGI system that built with guidance functions. The system is expected to prove that it is very effective in terms of user convenience, social benefits, and improvement of parking system management. Implementation of corrective measures is expected to achieve all the objectives of the project.

The next chapter will describe the literature review on passed research and project methodology that best suit to this project.