MOBI PARKING NAVIGATOR SYSTEM

(USER DASHBOARD MODULE)

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ABSTRACT

The using of vehicle is very important to everyone. Normally, the vehicles used to connect people from one place to another place. For example, from house want go to the workplace or shopping complex. In that case, the parking space has become costly and limited in almost for every big city in the world. In UMP Gambang Campus, the problem to get parking spaces is very difficult especially during peak hour. There is also a general problem happen in the parking spaces in front of FSKKP building, where staff and guest have to circle around the parking spaces a few times to find parking. Mobi Parking Navigator Systems was proposed and will be implementing at FSKKP office parking spaces. User Dashboard Module is web based application to assist administrator summarize the data from database. The data present using visualization technique like bar chart, pie chart, line chart, and many more. The user dashboard used to provide information about the parking area. This project use Software Development Life Cycle (SDLC) methodology to implement the development process. PHP and MySQL have been be used as programming language and database respectively for project development.

CONTENTS

CHAPTER 1

INTRODUCTION

1.1 Overview

Nowadays, in the era of globalization, the using of vehicle is very important to the people. Normally, the vehicles used to connect people from one place to another place. For example, from house want go to the workplace or shopping complex. In that case, the parking space has become a very big problem in this era of modernization it is become very crucial necessity to avoid the wastage of space in modern era. In places where cars need to be parked, the Mobi Parking Navigator System (MPNS) application will give information and displayed number of available parking for vehicles to park and thus reducing the time searching for available parking space.

In the same scenario happen where drivers often frustrated when arrive at a shopping mall during weekends or employees coming to office early, so that they could park their car safely near walking distances to their office. Some might also be circling around the parking lot a few times trying to find empty space to park their car. In University Malaysia Pahang (UMP), the same problem occurs not only to the staff and students but also to the visitors or parents themselves. They all face the same problem and spent time to park their vehicle especially during peak hours.

For many drivers, finding and then navigating a vehicle into a suitable parking spot is a challenge because mainly the driver can't see or determine the parking space from far. So, Mobi Parking Navigator System (MPNS) is a system that will help the user to find an available parking space at the place where the system is installed. It helps the user by showing the available parking space at the area throughout their mobi devices such as smart phone, tab and iPad. This will help the user to plan their movement in order to save their time from circling around the area to find an available parking space.

But in the information technology, predicting and collecting the outcome data from user is possible especially data about user that use Mobi Parking Navigator System (MPNS). The data are very important use as requirement to user and administrator. To present the data, data visualization is use. Data visualization actually is study about the visual or graphical representation of any data or information. There are several characteristics of data such as numeric or symbolic, scalar, vector or complex structure, various units, discrete or continuous, ordered or non-ordered, disjoint or overlapping, single or multiple sets, and lastly may have intuitive graphical presentation like temperature with color.

The goal is to provide the viewer with a qualitative understanding of the information contents. Graphical presentation may involve the manipulation of graphical entities and properties. There are some example of graphical entities such as points, lines, shapes, solid, images, and text. Example for the graphic properties like color, size, location, position, and shape. The understanding of data visualization may entail measurement, detection, and comparison. Then it will increase through interactive technique and provide the information from multiple views and with multiple techniques.

1.2 Problem Statement

Drivers often face a problem of finding a good parking spot especially during peak hour. This problem happened at University Malaysia Pahang (UMP) where the user consists of staff, students, and visitors. The limited space parking area make the user compete each other to get the parking first especially parking that nearest to their main destination like office or shopping mall. The aim of this project is to investigate about user information whose use the Mobi Parking Navigator System (MPNS) by using the Data Visualization technique.

When people want to find a parking space, they have to consider other user might be also searching for parking space. So, this will create problem if several users are going to the same place and might not get the available parking space. The concept use is first come first serve. Besides that, other problem is the data that had been collected from the user of Mobi Parking Navigator System (MPNS) are save in the database and shown in table. The data that show in

database also not sequence in correctly. For example, the using of Google doc form. All information that collected from the form, it can visualize the result in shape such as pie chart or graph. Before the data can visualize to the user, investigation should be conducted to identify the parameter of user using parking system. By having the data visualization system, the users just need to login the dashboard and all the data about user pattern will be display automatically such as the frequency user use the parking area.

1.3 Motivation

The prevalence of parking is costly and limited in almost for every big city in the world. The main reason that makes driver frustration is finding an empty parking spot especially if another car takes the spot before the driver can reach it. So, with the development of Mobi Parking Navigator Systems (User Dashboard), user can reduce their time to find the vacant parking. Not only that, user also can visualize their information about car parking system in UMP especially at FSKKP parking lot through dashboard that will develop. The dashboard used to assist people in decision making of finding the available parking space and provide information about the parking area. Before that, the investigation about the parameter of user using parking system will be made to make sure all data can be collect.

1.4 Objectives

The objectives of this project are:

i.   To investigate parameter of user using parking system in visualization technique to represent data in MPNS.

ii.   To implement user dashboard using visualization technique in MPNS.

iii.   To integrate real time sensor with user dashboard in MPNS.

1.5 Project Scope

The scopes of this project that have been identified are:

i.   This project comes with administrator site management system to summarize data from MPNS.

ii.   Other users of this system are staff, students and visitors in University Malaysia Pahang especially from Faculty of Computer Systems and Software Engineering (FSKKP).

iii.   Concept will use on this system is Data Visualization technique.

1.6 Methodology

This chapter will discuss about the methodology that will use to develop of Mobi Parking Navigator System (User Dashboard). There are five phase of the methodology which are planning, analysis, design, implement, and testing. The methodology is present in Figure 1.6.1.
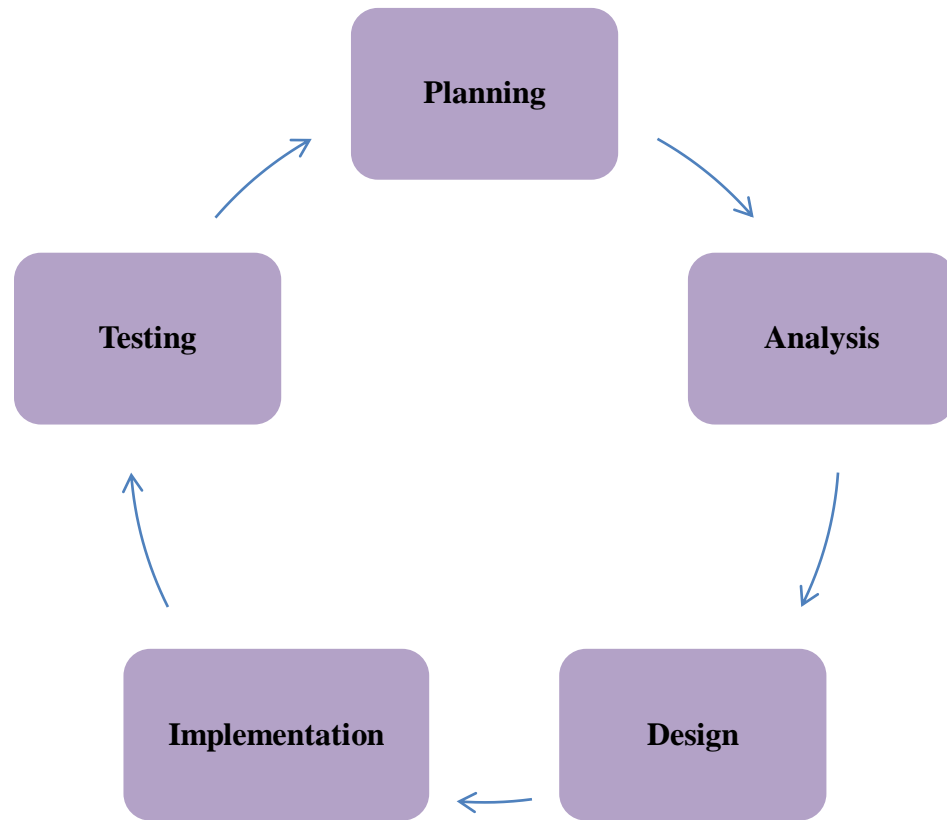
Figure 1.6.1: Diagram of Software Development Life Cycle (SDLC)

Figure 1.6.1 shows the diagram of Software Development Life Cycle (SDLC) that will apply for the project [1]. The first phase is planning. At this stage, the entire user requirement will be collect to develop the system. The flow of system that use to show the process of system development. The second phase in the methodology is analysis. During the analysis phase, all information needed to develop the system are gathered and analyst. Some of the information or parameter that needed to gather is the user information like gender, type of vehicle use, history login to dashboard, period time of parking the car at once time and many more. All the information are gathered by two method. First is using observation method at parking space lot in front of FSKKP. Second is distributing the questionnaires to the user that using parking system in University Malaysia Pahang (UMP).

The third phase that will apply in this methodology is design. Here, the design of the system will be made base on the information gather from the requirement analyst. The design will provide a user friendly interface so that the user can use the system easily. After the designs

of the system are finished, the design will be implemented in the implementation phase. The implementation will be done by using the software and hardware that had been decided in chapter 3. After that, the system will be going through to the testing phase. This phase is the process where the system will be tested to display whether the system fulfill the requirement or not. Besides that, the system will also be tested to check whether the system has any error or not.

1.7 Thesis Organization

This thesis consists of four (4) chapters. Chapter 1 will discuss on introduction of the system, problem statement that face by current system, objectives, project scope of the development, motivation, methodology and lastly thesis organization.

Chapter 2 is a literature review that discuss the existing system and technique or software that use in that existing system.

Chapter 3 is propose work. The purpose of this chapter is to discuss what type of user requirement want that will be used while develop this system. This chapter also explains about the justification of methodology used and hardware and software necessity.

Chapter 4 is about result, discussion and conclusion. The elements that should have in this chapter include result analysis, the problems of build project and suggestion of the project approach to the next research. This chapter also includes summary of project.
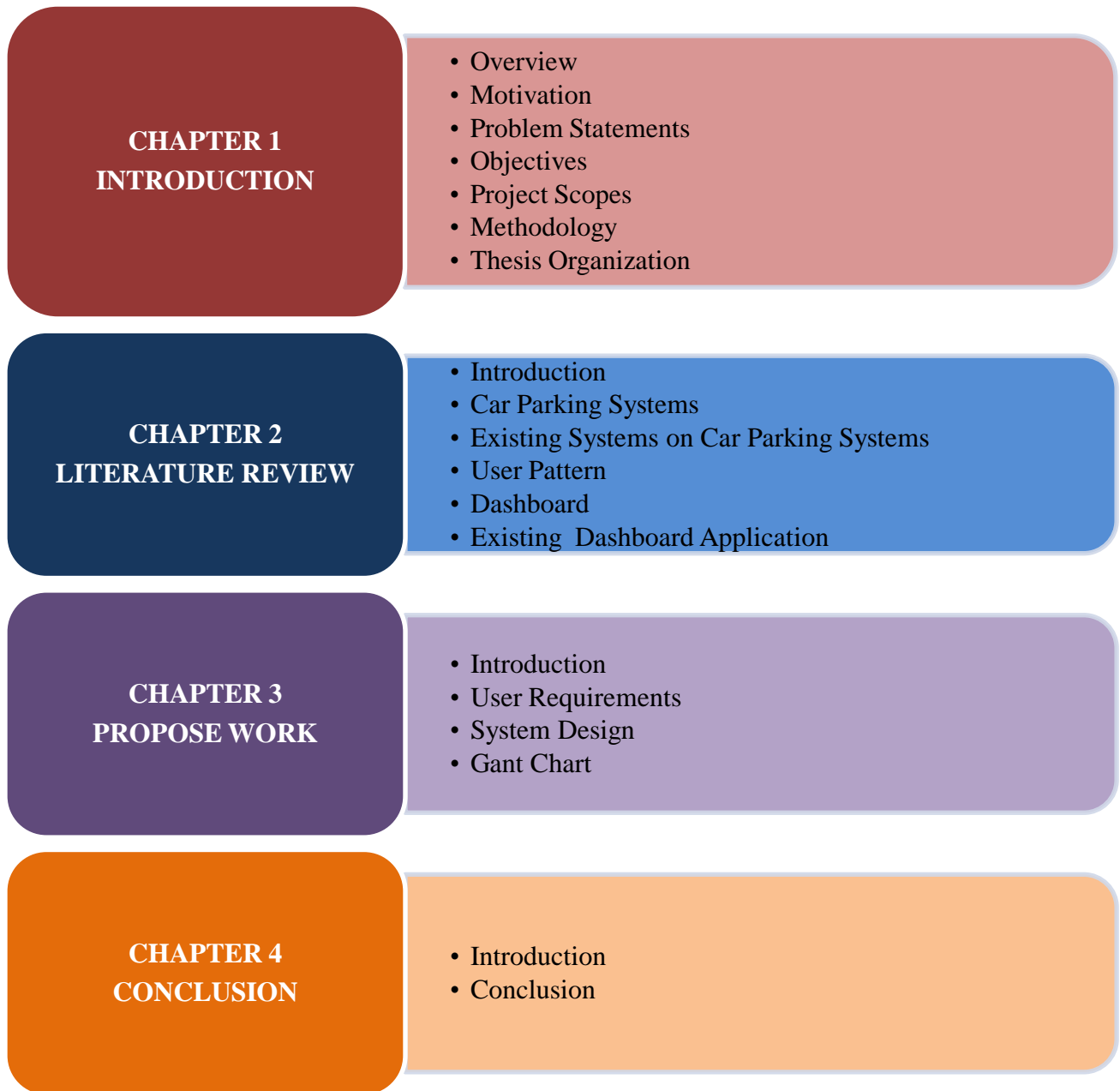
CHAPTER 1 INTRODUCTION	• Overview • Motivation • Problem Statements • Objectives • Project Scopes • Methodology • Thesis Organization
CHAPTER 2 LITERATURE REVIEW	• Introduction • Car Parking Systems • Existing Systems on Car Parking Systems • User Pattern • Dashboard • Existing Dashboard Application
CHAPTER 3 PROPOSE WORK	• Introduction • User Requirements • System Design • Gant Chart
CHAPTER 4 CONCLUSION	• Introduction • Conclusion

Figure 1.7.1: Thesis Organization

Figure 1.7.1 shows the diagram of thesis organization that represent the main content of each chapter.

CHAPTER 2

LITERATURE REVIEW

2.1   Introduction

This chapter elaborated about the existing system that use in market and explains the existing research/process/technique/methods that related to Mobi Parking Navigator System (User Dashboard) by using data visualization technique.

Car Parking Sytems

User Pattern
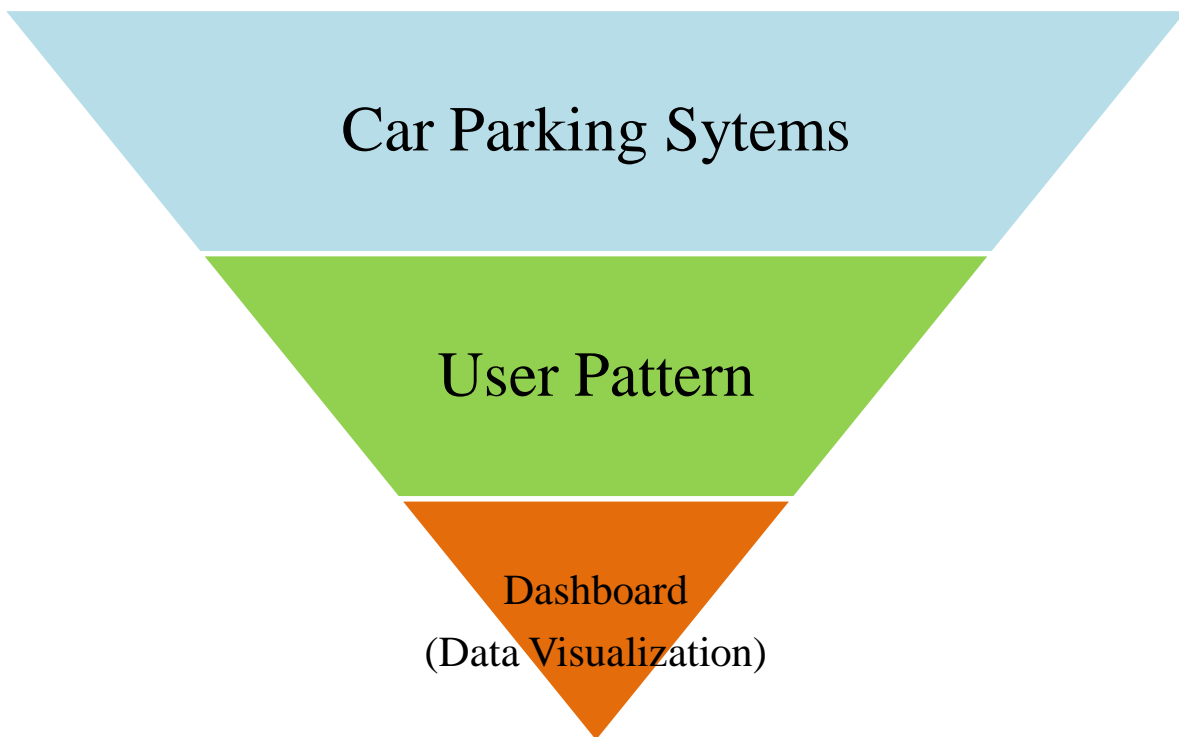
Dashboard
(Data Visualization)

Figure 2.1.1: Theoretical Framework

Figure 2.1.1 shows the theoretical framework that separate into three layers which are car parking systems, user pattern, and dashboard. This three layers are related each other in the development of Mobi Parking Navigator Systems (User Dashboard). The next section will discuss more details about each layer.

2.2   Car Parking Systems

Nowadays, people manipulate to use technology on their work life which is easier and can reduce from use of manpower. In addition, with technology people also can save their time in doing the work. The use of this technology has opened a new chapter to apply to all environments such as in car parking system. In the past, car parking systems usually use the manpower to keep the flow in and out of the car. But it is different from now, where technologies like machines are more use to replace the humans. There are many technologies that apply on car park such as Smart Parking Using Wireless Sensor Networks, Smart Parking: A Secure and Intelligent Parking System Using NOTICE and An Intelligent Car Park Management System based on Wireless Sensor Networks and many more.

There are many problems happen if the car parking systems not exist. One of the problems is user must circle the parking lot area until found an empty parking lot space. This problem occurs because when the number of vehicle is higher than the number of available parking lot .This condition occurs because the not implement of the technology in the parking lot area. Various systems have been done to ensure smoothness of traffic in car park areas. With the help of current existing car parking system, people can find the parking lot that vacant in short time. Users no need to take long time to find the parking lot that available or suitable.

2.2.1   Existing Systems on Car Parking Systems

There are a lot of systems or application that can be used to find a free parking space. Below are some of the existing systems on car parking systems used.

2.2.1.1 Smart Parking Using Wireless Sensor Networks

Smart Parking Using Wireless Sensor Networks also can be known as SPARK is a management system that operates with monitoring the availability of parking spaces and free. Besides that, Smart Parking Using Wireless Sensor Networks (SPARK) is very important to make sure that information available to customers and facility administrators. If customers want

to use SPARK system, customers capability in guiding to choose and reserve vacant car parks. For administrators, SPARK can help in overall management and planning [2].
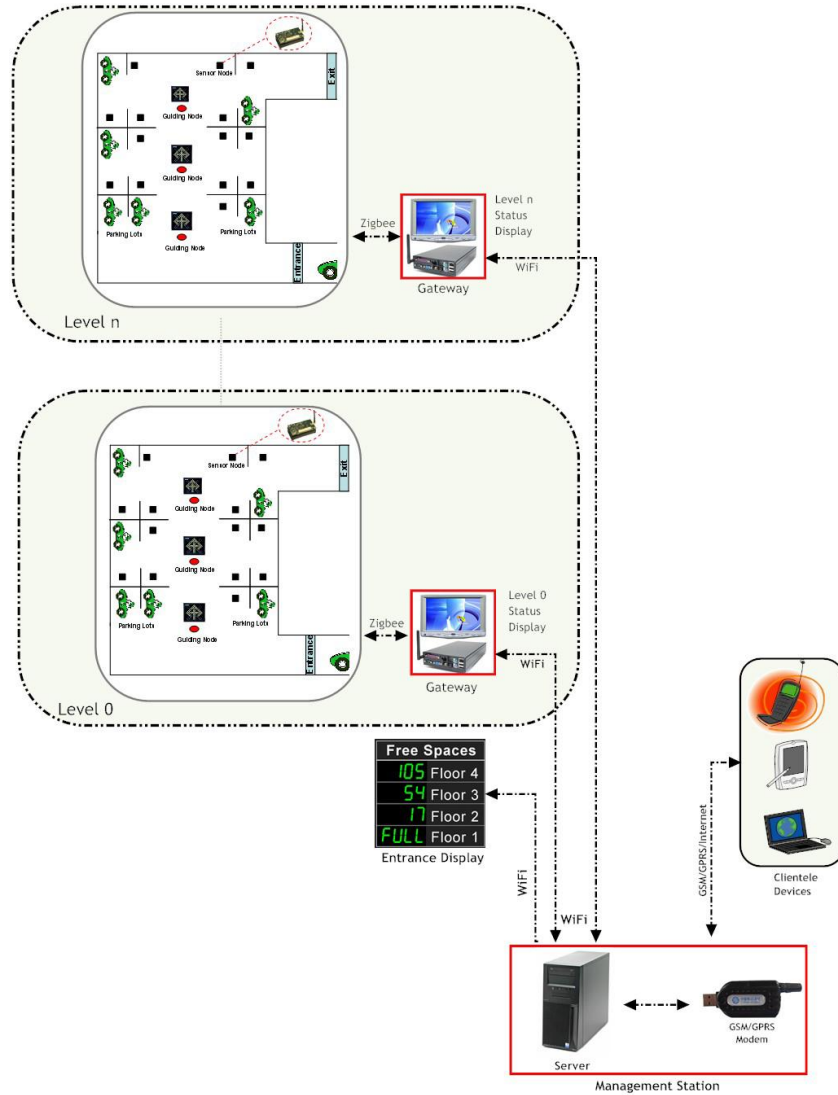

Figure 2.3.1.1: SPARK architecture

Figure 2.3.1.1 shows SPARK architecture that consist several components such as Wireless Sensor Node, Gateway, Management Station, Parking Entrance Display, Guiding Node, and Clientele Devices. Wireless Sensor Node can detect the status of parking by using ultrasonic sensor and transmits message through Radio Frequency communication module.

Figure 2.3.1.2: Ultrasonic Sensor

Figure 2.3.1.3: Gateway

Figure 2.3.1.2 shows the sample of one type ultrasonic sensor. The function of ultrasonic sensor is to generate high frequency from sound waves. Other function is to evaluate the echo that was received back by the sensor. Figure 2.3.1.3 shows the figure of gateway. The Gateways at each level parking space are collecting parking status reports and deliver them to the management station or administrators. The gateways also act as a path between wireless sensor network and networks outside.

For the Management Station, the function is taking charge of managing and maintaining for the overall system. The data were received from the gateway node will be process and then will displays the necessary information on the monitor and updates the display screen at the entrance of parking lot in time. In the Management Station contains an administrative interface which means the administrator can see the parking behavior even from a remote place.

Figure 2.3.1.4 shows the sample figure of parking entrance display use in SPARK. The Parking Entrance Display was placed at the entrance of parking which shows the status of the parking lots for each level parking area. This information will help the driver to decide before entering to the parking level. Figure 2.3.1.5 shows the sample figure of guiding node. The Guiding Node is receiving guiding information from the Gateway and shows it on LED display

after equipped with Radio Frequency communication module and a display module. With the Guiding Node, it can help user to guide their vehicles to get vacant parking spaces in a short time. The Clientele Devices can be handled in nature like PDAs or Smart Phones, which can used to reserve an empty parking space [2].

Figure 2.3.1.4: Parking Entrance Display

Figure 2.3.1.5: Guiding Node

2.2.1.2   Smart Parking: A Secure and Intelligent Parking System Using NOTICE

A Secure and Intelligence Parking System Using NOTICE or short name Smart Parking is a service base on oriented intelligent parking system. Through Smart Parking, drivers can view and reserve a free parking space on the fly. The process of car parking can be easy and nonstop process. The more important is Smart Parking is one of the secure and has its own privacy aware parking systems. Figure 2.3.2.1 shows the figure of SmarttParking Software Architecture. There are four modules that contain in the architecture which are driver module, communication module, function module, and application module [3].
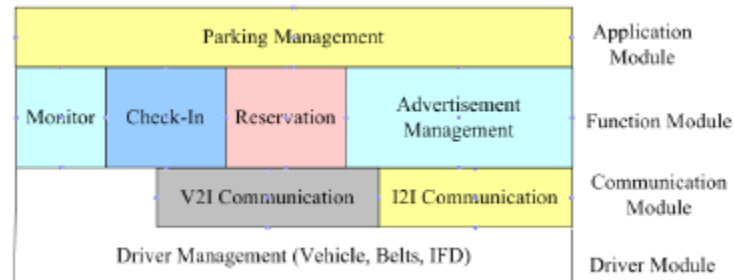

Figure 2.3.2.1: SmartParking Software Architecture

2.2.1.3 An Intelligent Car Park Management System based on Wireless Sensor Networks (WSN)

An Intelligent Car Park Management System based on Wireless sensor Network or WSN as short name is systems that use the lowest cost of wireless sensors are assigned into a car park field. Each parking lot will equip with one sensor node as function to detect and monitor the occupation of the parking lot. The sensor nodes will detect the status of the parking field and then reported to database via deployed wireless sensor network from time to time. In the WSN has three parts which are the hardware components, architecture of application systems based on WSN, and lastly the intelligent car park management system.

There are three layers that exist in WSN. The first layer is the Mote layer which is a wireless sensor mesh network. The second layer is Server layer that provides collecting of data and database service to transfer to the base station and stored at server. The last layer is about the client layer which provides visualizing, monitoring, and analyzing tools to display the data. Figure 2.3.3.1 shows the layer framework of WSN based system [4].
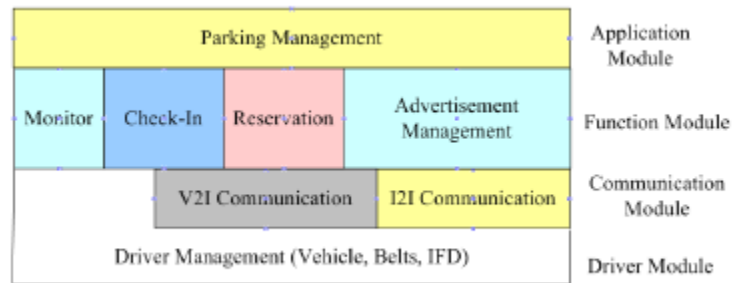

Figure 2.3.3.1: The layer framework of WSN based system

Lastly part in the WSN is about the intelligent car park management system. Figure 2.3.3.2 shows the architecture of WSN system. The architecture illustrates the relationship between the sensor network, Mote-View, PosgreSQL database, TinyOS, CarRecord database, and lastly the car park application.
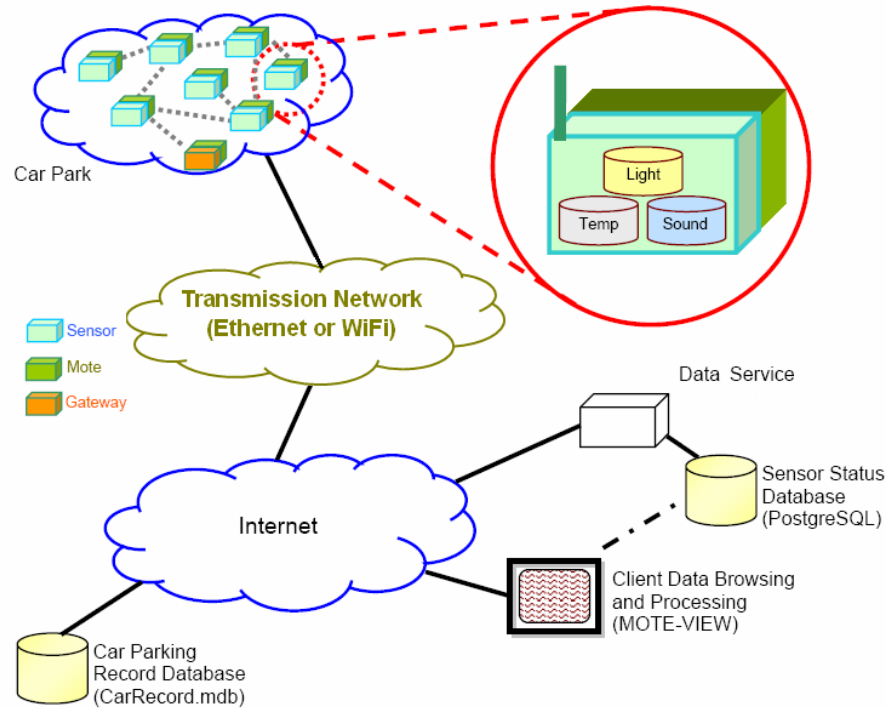
Figure 2.3.3.2: The architecture of WSN system

2.3 User Pattern

User pattern is a fixed shape and understandable form or sequence seen in the way in which something happens or was done. For example is a complicating factor is the changes in the pattern work. In the car parking system, the user pattern is like the duration car park of user at once parking place. Not only that, the peak hour of user find the parking is also the user pattern. To get the user pattern, all information from users that use the car parking system must be collect. How many people see or search the available parking space is also one of the user patterns. From the user pattern, the development of dashboard will help the user of car parking system in find the free parking space more easy and effective.

2.4 Dashboard

Dashboard is basically an easy to read, often single page, real-time user interface, showing a graphical presentation of the current status (snapshot) and historical trends of an organization's key performance indicators to enable instantaneous and informed decisions to be made at a glance. For example, a manufacturing dashboard may show key performance indicators related to productivity such as number of parts manufactured, or number of failed quality inspections per hour [5].

In Mobi Parking Navigator Systems (User Dashboard), dashboard used to assist people in decision making and provide information about the parking area. Dashboard also act as to visual display the most important information needed to achieve one or more objectives and will arranged on the screen so that the information can be monitored at a glance.

The following are some of the benefits of using a dashboard:

- Visual presentation of performance measures
- Ability to identify and correct negative trends
- Ability to generate detailed reports showing new trends
- Ability to make more informed decisions based on collected business intelligence
- Align strategies and organizational goals
- Measure efficiencies/inefficiencies
- Saves time compared to running multiple reports
- Gain total visibility of all systems instantly
- Quick identification of data outliers and correlations

2.4.1 Designing and Building Dashboards considerations

In designing and create the dashboard, there are few factors need to consider. First, the type of user should be defined to make sure the data are relevant and suitable with the user task. If the data not relevant to the user, the failure will happen to the objective of designing the dashboard. For example, the data about parking space are very important to the user that use car parking system application. Second is about the right selection type of dashboard. Table 2.4.1.1 shows the description type of dashboards [6].

Table 2.4.1.1: Description type of dashboard

Type of dashboard	Description
Operational	Display data that facilitate the operational side of a business. In a business with an inside sales function, user may want to measure number of calls made and number of appointments booked.
Strategic / Executive	Provide the KPI's (Key Performance Indicators) that a company's executive team tracks on a periodic (daily, weekly or monthly basis).
Analytical	Display operational or strategic data that will offer drill-down functionality to allow the user to explore more of the data and get different insights.

2.5 Existing Dashboard Application

There is a lot of existing dashboard application in the market that can be used by the user. Below is some of the existing dashboard application that already used [7].
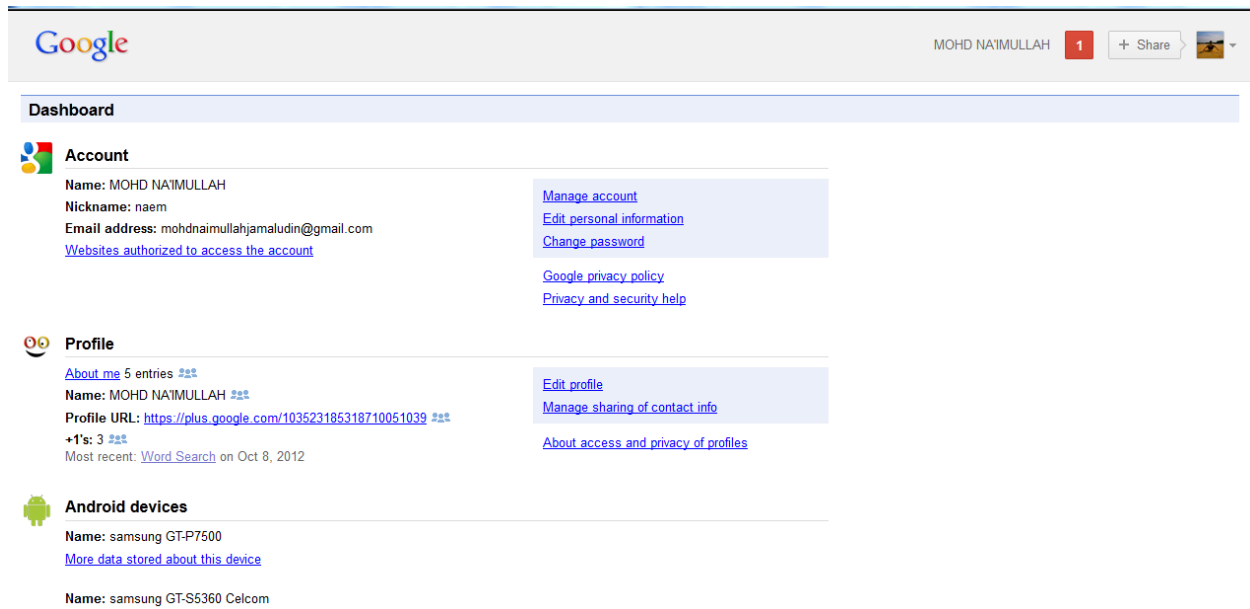
2.5.1 Google Dashboard

Figure 2.5.1.1: Interface of Google Dashboard

Figure 2.5.1 shows the Google dashboard used for represents the data that associated with Google account [8]. There are many products or services that consist in Google Dashboard which are user account, profile about user, Android devices, Calendar, Contacts, Gmail, Google+ and many more. Other than that, Dashboard in Google was created to help answer the user question such as "What information does Google have about the user?". Organized by product, the page displays product-specific data that's associated with your Google Account. Google focused on Google Account data because that is the data that is personally associated with users. Figure 2.5.1.2 shows the Gmail section in Google Dashboard as an example of how each section was presented.
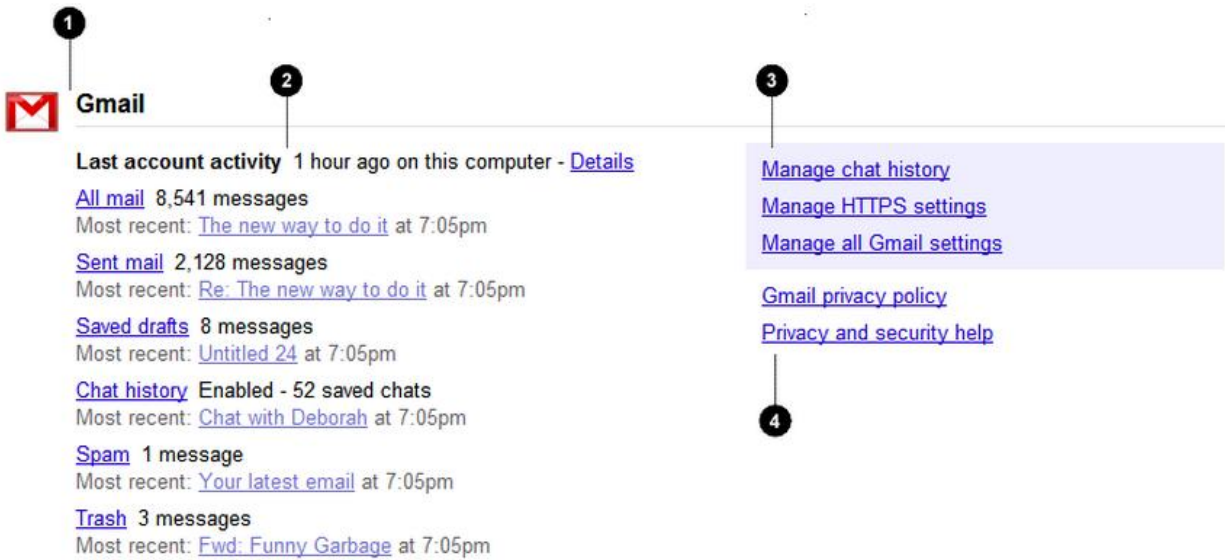
Figure 2.5.1.2: Gmail section in Google Dashboard

1. **Service name**

   The name that present as Google product or service.

2. **Data**

   Summary of data that stored by the product such as the amount of data, an indication of whether user sharing the data with anyone else, and recent example. When users click a link, it will directly to a produce page where user can view more details and mange this data.

3. **Control**

   Users will direct links to pages where users can control the data for this product. For example, user can delete their Web History, or choose not to store their chat history in Gmail.

4. **More info**

   Links to the articles that related assistance and information pages [9].

2.5.2 Dashboard for Google Analytics

Figure 2.5.2.1: Screenshot Dashboard for Google Analytics

Figure 2.5.2.1 shows the screenshot dashboard for Google analytics. This application was designed for both iPhone and iPad with free download. Dashboard for Google analytics is function as key performance indicators (KPIs) for website in the smart phone. By using Google Analytics account, this application shows the most important web analytics metrics of user website on one single dashboard. Users will not have all the Google Analytics metrics on their Smartphone but that is very important from a management of view. In addition, the "Website Performance Index" is automatically calculated, which indicates the performance of user website today, this week and this month in a single number. Even more, the index shows red or green