Faculty of Computing and Informatics (FCI)
Multimedia University
Cyberjaya

PSP0201 – Mini IT Project

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Title: Car Park Finder

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Abstract

This program is a prototype for a car park finding program. Upon registering and logging in, the program allows the user to see available parking spots in compatible malls, its parking fees as well as the time spent being parked for each spot. It will contain the information of various malls and their spots as well as their rates and should receive Boolean data from existing car sensors from said malls while starting a timer that calculates how long the car park has stayed occupied and based on its ID while displaying a diagram or table for the user to identify which parking spot is available and for how long a spot has been parked. However, since it's a prototype and we do not have sensors, we will use a randomizer as a placeholder. It will also feature a parking fee calculator in which the user can enter an estimated period of parking and it will help calculate the corresponding fees for it for each mall, further helping the user in planning their mall trip.

Upon starting the program, it will show the title screen and a registration and login screen before the user uses the program. After registering the username and password and using it to log in, it will let the user choose the malls or places the user wants to have their car parked. After the user chooses a mall, it will show the user a diagram of the car park map of a single floor along with its availability for each parking spot as well as the number of hours parked. The visible floor can be changed by choosing which floor to view in a corner, preferable the bottom right corner. Other than that, it also contains a fee calculator on the top right corner which after the user selects, will allow user to estimate their parking fee by putting the time parked or estimated time of staying parked. Each page with the exception of the login page will have a button for going back, leaving to the main menu or logging out.

Table of Content

1.0 Introduction

In recent days, as the number of cars kept increasing and malls getting more and more attention, trying to find parking slots for one's trip to the mall has hence become increasingly harder and time consuming. In order to solve this problem, the team has decided to create a software to remedy this problem by increasing the efficiency of parking spots by showing users the location of available parking slots so that users can easily find available parking spots and hence, the time spent of a parking slot not parked between different cars will be reduced. To further aid the user's experience in planning a trip to the mall, the team also included a calculator for parking rates for users to plan their budget and time in the mall.

1.1 Background of the program

This kind of program somewhat exists in Malaysia in the form of a counter that shows how many parking spots are left in some malls, but otherwise does not provide information on where the parking spot is which is something our program intends to fix. Due to the sheer amount of cars in our country with 93% car ownership (Car ownership in M'sia third highest in the world: Nielsen, 2014), finding a parking spot is often proven to be a challenge for driver as it was recorded that people in Kuala Lumpur wastes an average of 25 minutes every day to search for parking (Lim, 2017). Hence, to reduce the time taken only to find a car parking spot, the team decided to create a program that aids the user in identifying the available parking spots and the time parked is deemed appropriate by the team. A calculator that helps the user to estimate their parking time is also included to further help them plan their trip to the mall.

The program will only be a prototype, as we do not have actual sensors that allows for detection for available parking spots, so a randomizer will be used instead for determining which spot is available. If the program is well received among mall owners and users, we will corporate with various mall owners to make one big app that displays the available parking spots in their respective malls.

As stated before, this program is utilized by various retail industries with an emphasis on malls. It can also be utilized by tourism services like hotels or attractions. Hence, the user of this program are the customers of said malls. Ease of using this program will have to depend on the user's ability to read maps and identify places, otherwise the program should be simple to use and easy to understand given its design. Lastly, whether or not the user will accept this program will have to depend on whether or not mall owners are willing to invest on putting sensors and allowing us to access the parking spot information, because the team feels that this program will be a big help in helping people reducing their time spent and frustrations.

1.2 Problem Statement

With the high amount of cars in Malaysia and our enthusiasm with shopping malls, finding parking spots have proven to be a huge problem for most of us in our country as it was recorded that people in Kuala Lumpur wastes an average of 25 minutes every day to search for parking (Lim, 2017), making most of our precious time wasted. Hence, a program that, with the aid of sensors, displays the available parking slots is proposed in order to reduce the time spent trying to search for parking spots by showing where said spot is, thus increasing the efficiency of each parking spot by increasing the time spent occupied.

1.3 Objectives of the Study

Part of the objective of this study is to prove our worth as programmers and software designers, but the three major objectives are as follows:

1. To make the process of finding a parking spot smoother by providing organized and automated visual representation of available parking spots and hence reduce the customer's time.
2. To help customers plan their trip to the mall by showing the number of parking spots available as well as helping them calculate their parking fees.
3. To increase the efficiency of each parking spot by increasing the time spent occupied for each parking spot.

2.0 Literature review

2.1 Introduction

For this project, the team have decided to make a program enhancement which is based on a similar program. That program is a car park finding program and the enhancement will be explained in detailed in the following literature review. Also included are the issues that people around Malaysia face when they patronized malls around the country. The reason why the team chose to make this program was due to the issue that this problem is faced by every Malaysian on a daily basis as studies shown that the we waste a lot of valuable time in searching for parking spots. The team will also be talking about the parking fee rates in each mall and how the program aims to improve on the similar solutions. In order to make the appropriate enhancements, the team have done a comparison table between 2 programs which will provide some guidance on how to enhance the program with features that were not available in both similar programs.

2.2 Parking Issues In Malaysia

While Malaysia has been known as the third highest rate of car ownership in the World, according to Nielsen (2015), which is mentioned in The Star Online's article, is a company that studies consumers, stated that parking has been one of the biggest problem in the country. The problem is mostly due to drivers circling around the parking area or basements without having any idea where there are available parking spots.

2.2.1 Longer parking time

One of the issues of parking in Malaysia is the time of parking. According to Wilson (2017), it is said that every car owner in Kuala Lumpur spends 152 hours annually, based on Uber Malaysia's research. Besides, Lim (2017) found that citizen spends an average of 25 minutes a day finding parking spots. One of the causes of this issue is due to low visibility, which makes drivers not able to clearly and swiftly see where there are available parking spots and other cause of this is, traffic which is another issue.

2.2.2 Traffic and Congestion

Traffic can be both the cause of longer parking time and the effect of longer parking time. Having drivers to circle around the parking areas repeatedly make parking areas, cramped up and causes traffics in the area itself. Not to mention, having traffic in these areas can be more difficult to solve in the driver's perspective than having traffic on roads as spaces are limited in these areas. Especially during busy hours or public holidays, malls are usually packed with many shoppers, which makes this issue worse,

where there will be congestion in parking areas. According to Datuk Noorizah Abd Hamid, a PLUS managing manager, during festive seasons and peak periods, there are always massive congestions due to sudden spike in traffic (Astro Awani, 2016). As everyone has the intention to enter the shopping mall, many drivers will be circling around to find parking spots and having the drivers to do that at the same time, can make the parking areas quite hectic.

2.2.3 Higher parking fee

This brings the team to another issue drivers in Malaysia face, which is the rate of parking fee. As the time of the parking is counted right after the driver enters the parking area, having them to spend time on finding parking spots like mentioned before, the time spent is also included in the parking fees, which is unnecessary. These situations make drivers have to pay extra. Moreover, as mentioned by Wilson (2017), during busy hours, drivers' time to find a parking space is even longer, therefore money will be wasted even more, also needing to keep in mind that parking fees are quite costly in Malaysia.

2.2.4 Little awareness on parking fee

Drivers tend to not be very aware and well known of the parking fee of each malls. The regulation and fees may apply at certain times but sometimes do not. According to Malaysia Parking Rate Directory website, different malls have different parking rates and fees therefore it would be difficult for drivers or customers to know them by heart. Other than that, some malls give a discounted fee when the shopper spends more than a certain value specified by the malls themselves so this will provide some confusion and uncertainty of the exact parking fee for the customers. Having this issue, it does not let customers to plan their time of the trip nor their budget for the parking fee

2.3 Parking fee rates

	IOI City Mall	Mid Valley	Dpulze	Berjaya Times Square
First hour	RM2.00	RM2.00	RM2.00	RM3.00
Second hour	-			RM2.50
Third hour	-			RM2.00
Subsequent hour	+RM1.00	+RM1.00	+RM1.00	+RM1
Max charge	-	-	-	RM9.50

Table 2.3.1: Weekday parking rates

	IOI City Mall	Mid Valley	Dpulze	Berjaya Times Square
First hour	RM4.00	RM3.00	RM2.00	RM3.50
Second hour	-			RM3.00
Third hour	-			RM2.50
Subsequent hour	+RM1.00	+RM1.00	-	+RM1
Max charge	-	-	-	RM9.50

Table 2.3.2: Weekends and Public Holidays parking rates

Parking rates taken from http://parking.com.my/

As discussed before, determining the parking fees for any malls can often be a small hassle when planning a trip especially if the person is on a tight budget.

While some malls are quite straight forward with their rates as they directly show them and have no gimmicks, there are some that chooses to be a little more ambiguous (some malls do not officially put their parking rates online for easy viewing), have a separate parking area with different parking rates (IOI City Mall and Mid Valley's Premier Parking) or have slightly complicated calculations (Berjaya Times Square's inclusion of different charges for the 1st, 2nd and 3rd hour as well as a maximum charge per day).

Other than that, customers can sometimes overlook the fact that their parking day is either on weekends or public holiday which jumbles up their manual calculations and results in a poorly planned mall trip.

2.4 Comparison of Bayz Parking & JomParking

The team found 2 applications that have similar function to the team's program which are Bayz Parking and JomParking. The team decided to compare these 2 applications to see their differences and find their strengths and weaknesses. A brief introduction of these 2 applications will be provided in the following topics before the comparison.

2.4.1 Bayz Parking

Bayz parking is parking software created by Scott Badger and Sven Janson. The software is published to the public on March 2018 (Idris , 2018).The software aims to provide parking by their parking supplied by their host partners to the public access and park at designated parking spot.

2.4.2 JomParking

JomParking is an application that make paying parking fees in Malaysia easier and faster. According to e27 website, which is an organization that helps small companies to build and grow their businesses, the application was developed by AppCable Sdn Bhd, a mobile application developer company lead by Muhamad Nasir.The application aims to ease visitor by allowing them to pay without cash and without displaying any receipt or proof when they park.

	Bayz Parking	JomParking
Price	Free	Free
Features	Pay parking fees online, Book parking spaces, Rent unused parking spaces, accessible from smartphone	Pay parking fees online, Shows time parked and time remaining to park, accessible from smartphone
Area covered	Worldwide as long as parking spaces are registered	Only in Malaysia and certain area that managed by JomParking
Precision	Uses car plate and parking spot code to park at registered parking spots	Uses real-time location and GPS to pinpoint location and parking spots
Time limit	Can park for a longer time as long as in duration of parking period	Can only park in a certain period of time
Usability	Users have to manually find host and get access to parking spaces after booking parking.	Users can access parking or pay parking fees easily just by using the application
Parking rates	Parking rates are set by the host or owner of the parking spaces allowing flexibility	Parking rates are fixed according to parking terminal or authorities thus showing no flexibility
Enforcement	Owner of parking space can monitor the parking through the application to detect any exploit or problem	Authorities have to manually supervise the parking area to ensure that the parking are not being exploited
Unique features	Allow users to rent their car park to earn profit	Simple registration and use for quick and easy parking

Table 2.4.1: Comparison between Bayz Parking and JomParking

2.5 Existing Solutions

There are several existing solutions available to solve various parking issues, such as finding user's car location on a map by using a gadget, or use applications to pay parking fees and finding available parking spot.

2.5.1 Gadget

There is a gadget called The Automatic Parked Car Finder, is used to plug into a car's cigarette lighter and then it communicates with an iPhone application using a Bluetooth connection to show where the vehicle is parked. This gadget is useful for the forgetful

drivers because it helps them to track where their vehicles parked at if they cannot remember.

The device will even date and time stamp each location, allowing it to remind the drivers when a parking meter needs to be topped up or their paid parking runs out, helping them avoid expensive fines. (Griffiths, 2015)

2.5.2 Applications

Speaking of applications, there is one application in Malaysia called ParkEasy that helps user to find parking spaces available in shopping malls.

When you reach the area that you want to park, you can begin the search for a parking spot and the app will help you to detect someone who's in the district that will leave their spot soon. When a match is made, both parties will see the details of the location of the parking bay as well as the cars in question - the person that will leave his spot can see the details of the car that's going to take his place, while the person who needs the spot will see details of the car that occupies it presently. (Chee, 2016)

This application also uses a credit system where the user has to pay 3 credits each time they paired up with someone leaving their parking slot, and vice versa. If the user runs out of the credits, they can either recommend the application to their friends, or just purchase them.

Another application called JomParking which the objective of the application is to reduce the hassle of utilising the parking meters in Kuala Lumpur by using the application itself to pay street parking fees. The user has to download the application, fill in some details such as vehicle plate number, then they can set the location zone and duration to park. After the user finishes setting up, by tapping the JomParking logo within the application, it automatically pays the parking fee. The user can also choose the extend the time if they wish to, and the application will notify them 15 minutes before the duration is up.

2.6 Conclusion

In conclusion, the team have reviewed each parking issues the team have right now which include unawareness of parking fees and high parking times which results in traffic congestion and higher parking fees in order to properly understand the problem the team is trying to solve. The team also identified the parking rates of each mall to get a grasp of the system which malls use to calculate parking fees to appropriately design the program's way of handling and displaying parking rates.

The team also compared similar programs to the team's vision to see what worked and what needs improvement. Lastly, the team also reviewed the existing solutions that solves or at least attempts to solve the issues discussed earlier and other extra solutions for better implementation in the program. Hence, with all the knowledge acquired, the team is now fully aware of what the program needs and its design.

3.0 Methodology

3.1 Data Gathering and Analysis

The team has conducted a survey through Google Forms to acquire information about car parking. The team has surveyed 40 students from Multimedia University to use the data as references for actual mall parking, since that the number of the university's parking spaces is almost equivalent as an actual mall's parking spaces.

3.2 Results and Findings

The results and findings that the team has found from the survey are based on the respondents' faculty, average time spend to find parking, average parking time, and program availability.

3.2.1 Faculty

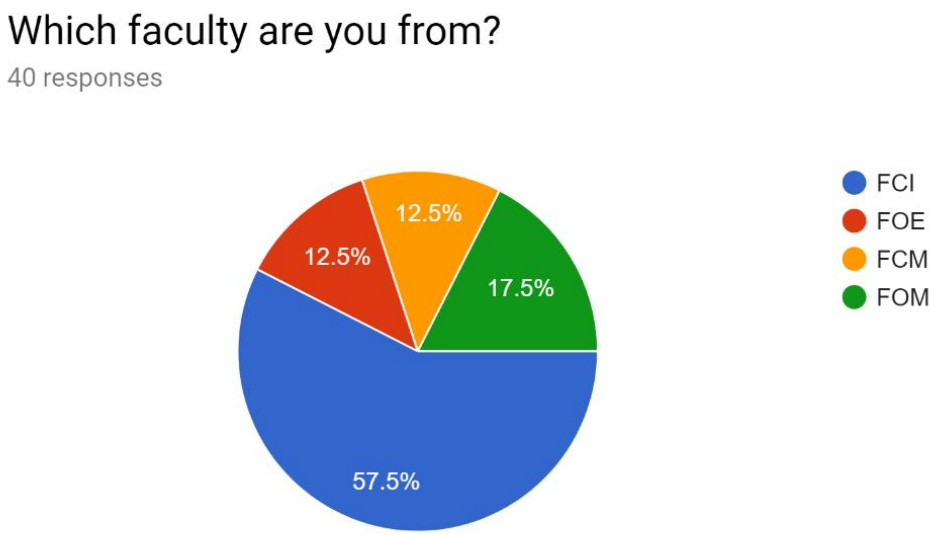

Diagram 3.2.1: Faculty of students

Based on the chart, 57.5 percent of the respondents are from the Faculty of Computer & Informatics, 17.5 percent of the respondents are from the Faculty of Management. The respondents from the Faculty of Engineering and Faculty of Creative Multimedia share the same percentage, which is 12.5 percent.

3.2.2 Average time spend to find parking

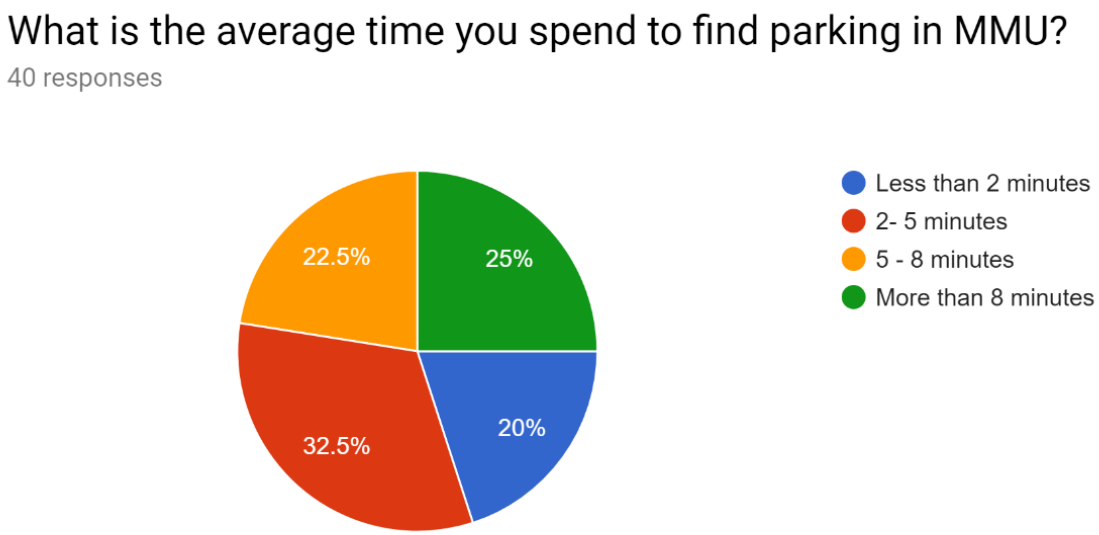

Diagram 3.2.2: Time spent finding a car park of students

Based on the chart, the team observed that 13 respondents spend at least 2 to 5 minutes to find a parking spot in MMU. 10 out of 40 respondents spend more than 8 minutes to find a parking spot. Additionally, 9 respondents spend 5 to 8 minutes instead and the rest spend less than 2 minutes to find a parking spot. The main functionality of the program is to help people to find a parking spot as soon as possible to reduce the time needed to spend to find parking.

3.2.3 Average parking time

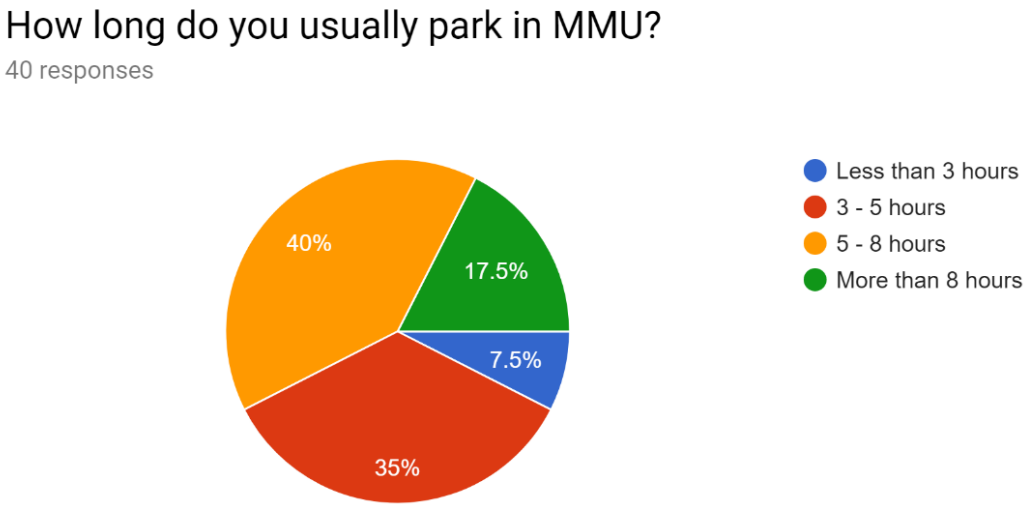

Diagram 3.3.1: Students' average parking time

Based on the chart, 16 students will park the spot for at least 5 to 8 hours in MMU, while 14 students park the spot for 3 to 5 hours. A small percentage of students will park the spot for more than 8 hours and only 3 students will park the spot for less than 3 hours. This shows that students will park the same spot for at least 5 hours in average within the campus, which is similar with customers parking inside the shopping malls.

3.2.4 Program availability

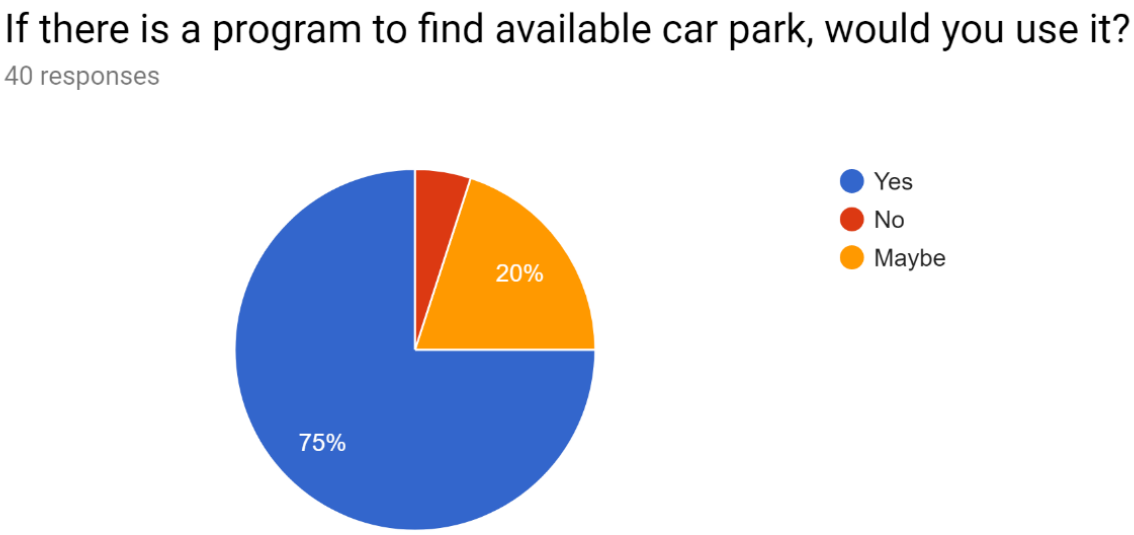

Diagram 3.4.1: Students' likeliness to use a similar program

In the chart, 75 percent of the respondents would try to use a parking program to find a parking spot, while 20 percent of the respondents will consider trying it. Only 5 percent, which is 2 respondents will not use the program to find available car park spot. This shows that the potential of the car park finding program is high as it helps users to quickly find a parking spot.

4.0 Conclusion and Future Studies

4.1 Conclusion

To conclude, the team's effort to solving the problem of too much time taken while finding parking spots by creating a car park finder is shown to be rather favourable based on our methodology. The team hopes that this program will move on from being just a prototype to being a full fledge program that supports actual data from the various malls in order to improve the customer's experience.

4.2 Future Studies

After the project, we have found ourselves a couple of limitations when it comes to making this program a truly useful program. One of the flaws our program is that if there are two cars interested in the same spot, only one of them can enter the spot and leave the other in an awkward place and hence, have to relocate if they find another slot, especially if the next spot is very far away and competition might occur. Another thing about this program is that it does not show the way to the empty parking slot with respect to the user's current location, making navigation still a little work required for the user to do.

Hence, in a future study we will need to find a way to locate the cars within the parking area to show which car is near which slot so that if there appears to be an empty spot but another car is near it, the user can opt not to get involved with it and continue finding without wasting efforts.

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Midvalley Car Park

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6.0 Appendix

6.1 Task Distribution Table

Name	Role	Documentation	Flowchart/ Algorithm/ Coding
Kok Zhen Hoong	- Group leader - Director	- Introduction - Conclusion and future study	Settings Module
Teo Yan Xue	- Secretary - Pseudocode checker - Reference list checker	- Literature Review	Main module
Casey Teh Qi Shi	- Graphical User Interface designer - Ensures the objective of program	- Methodology: Data gathering	Parking fee calculation module
Yap Wei Lun	- Pseudocode checker - Report compilator	- Methodology	Registration module
Ng Jia Liang	- Main program designer - Data dictionary	- Conclusion and future study	Mall directory module

6.2 Pseudocode

Parking Fee Calculation Module #By Casey Teh Qi Shi

```
Function calc_fee(selection*)
    Start
    menu = 0
    From parkings.txt extract rates
    Store into rates[]
    selection = selection - 1 #Index starts from 0
    while menu == 0
        get park_hour
        if park_hour > 0
            total_fee = rates[selection] * park_hour
            print "Total parking fee is " , total_fee
        get recalc
        print "Do you want to recalculate? 0 => NO, 1 => YES"
        if recalc == 0:
            menu = 1
        end if
    while end
    Exit
```

Settings module #By Kok Zhen Hoong

```
Function settings():
    Start
    menu = 0
    From parkings.txt extract rates
    Store into rates[]
    while menu == 0:
```

```
    get selection
    print "Select mall that you want to change rates"
    selection = selection - 1 #Index starts from 0
    get newRate
    rates[selection] = newRate
    get resetSetting
    print "Do you want to reset other mall? 0 => NO, 1 => YES"
    if resetSetting == 0:
        menu = 1
Exit
```

Mall Directory Module #By Ng Jia Liang

```
Function selectmall(username*, isadmin*)
    Start
    malls = ["Midvalley", "Dpulze", "Sunway", "One Utama Mall", "IOI City Mall",
    "Pavillion"]
    numSpace = [10,20,30,15,25,35]
    parkings = [0,1,2,3,4,5] #Each number represents a mall ID, later to be replaced by arrays
    of parking spaces
    currentHour = find current hour # Get Current Hour
    rates = [2,3,4,5,6,7]

    #Try to open file, Create one if cannot be found and load if file is found
    if parkings.txt is found == False
        #File is not found! Create new file and generate data.
        Loop: mallid = 0 to number of element in malls[] step 1
            parkings[mallid] = []
            Loop: counter = 0 to numSpace[mallid] step 1
                parkings[mallid] = parkings[mallid] + [random number selected from 0 to 3]
```

```
            # Generate hour of parking 0, 3
        Loop end: counter
    Loop end: mallid
else
    #File is found! Loading data from file.
    From parkings.txt extract hour, parkings
    Store into hour, parkings[]

    #Check if the current hour is not the same in the file, if true process data else do nothing
    if currentHour != hour
        Loop: mallid = 0 to number of element in malls[] step 1
            Loop: parkid = 0 to numSpace[mallid] step 1
                parkhr = parkings[mallid][parkid]
                if parkhr > 0 #Every hour - 1 until it reaches 0
                    parkings[mallid][parkid] = parkings[mallid][parkid] - 1
                elseif parkhr == 0
                    parkings[mallid][parkid] = generate random number between 0 to 3 #
Generate hour of parking 0, 3 if car park is empty
                end if
            Loop end: parkid
        Loop end: mallid
    end if
end if

#User select mall with int, 1 = Midvalley, 2 = Dpulze, etc.
get selection
if selection >= 1 and selection <= number of element in malls[]
    parknum = 1
    Loop: counter = 0 to numSpace[selection] step 1
```

```
        #Access to each parking spot to check their hour will be parked
        parkhr = parkings[selection][counter]
        #Shows which parking spot is available and which is not with hour left
        if parkhr > 0
            print “Parking spot “ , parknum , “ is parked for “ , parkhr
        else
            print “Parking spot “ , parknum , “ is empty and available”
        end if
        parknum = parknum + 1
    Loop end: counter
    get wantCalcFee
    if wantCalcFee == 1
        Process calc_fee(selection)
    end if
else if selection == 8 and isadmin == true
    Process settings() # send to settings module
else if selection == 9
    return True # this is to break the loop at main to logout
else
    print "Mall does not exist!"
end if
return False # This is continue the loop
Exit
```

Registration Module #By Yap Wei Lun

```
Function registration()
    Start
    menu = 1
    From parkings.txt extract usernames, passwords
```

```
Store into usernames[], passwords[]
while menu == 1
    Get newuser
    menu = 0 # Changed back to 1 if username is not allowed so the loop continue
    Loop: counter = 0 to number of elements in usernames[] step 1 # Check if username
    already taken
        if usernames[counter] == x
            print "Username is already registered."
            menu = 1
        end if
    Loop end: counter
    if menu == 0
        usernames = usernames + [newuser]
    end if
while end
menu = 1
while menu == 1
    Get newpw
    if length of newpw < 8
        print "Password must contain atleast 8 characters"
    else
        passwords = passwords + [newpw]
        menu = 0 # Exit loop
    end if
while end
print "Account is successfully registered"
Exit
```

Main Module # By Teo Yan Xue

```
Start
run = 0
while run == 0
    loggedIn = False
    name = False
    pw = False
    From parkings.txt extract usernames, passwords
    Store into usernames[], passwords[]
    usernames = usernames + ["admin2019"] # This added into the array as well
    passwords = passwords + ["iamadmin"]
    get firstinput
    if firstinput == 1
        while loggedIn != True
            Get username
            Get password
            Loop: index = 0 to number of elements in usernames[] step 1 #Check each value in usernames[]
                if usernames[index] == username
                    name = True
                endif
            Loop end: index
            Loop: index = 0 to number of elements in passwords[] step 1 #Check each value in passwords[]
                if passwords[index] == password
                    pw = True
                endif
            Loop end: index
```

```
        if name == True and pw == True and username == "admin2019"
            print "Admin Logged In"
            loggedIn = True
            logout = False
            while logout == False
                logout = Process selectmall(username, True) #send to select mall admin
            while end
        else if name == True and pw == True
            print "Logged In"
            loggedIn = True
            logout = False
            while logout == False
                logout = Process selectmall(username, False) #send to select mall user
            while end
        else
            print “Username or Password does not match”
        end if
      while end
   end if
   if firstinput == 2
      Process registration()
   end if
End
```

6.3 Data Dictionary

Variable	Data Type	Usage / Meaning
run	Integer	Loop for the program to keep running
loggedIn	Boolean	To indicate if user have already logged in
name	Boolean	To indicate if username entered by user is valid
pw	Boolean	To indicate if password entered by user is valid
firstinput	Integer	Ask if user wanted to login or register
username	String	Username entered by user to login
password	String	Password entered by user to login
index	Integer	Counter to loop into elements in array
currentHour	Integer	Shows current real time hour
parkhr	Integer	Indicate how long the parking space will be occupied
selection	Integer	User's selection to indicate malls by ID number
parknum	Integer	Represent each parking spot in a mall
wantCalcFee	Integer	Ask if user wanted to calculate fees after selecting mall
isAdmin	Boolean	Indicate if user is an admin or just a normal user
newuser	String	Username entered by user to register
newpw	String	Password entered by user to register

menu	Integer	Counter to keep user in a loop
park_hour	Integer	User’s input for number of hour parked
total_fee	Integer	Total fee for number of hour parked
recalc	Integer	Ask whether user want to recalculate parking fee
resetSetting	Integer	Ask whether user want to change setting for other mals
newRate	Integer	User’s input for a new parking rate
mallid	Integer	To represent each malls by a number