NANYANG TECHNOLOGICAL UNIVERSITY

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

School of Computer Science & Engineering

SC2006 Software Engineering

Project Name - ParkIt

Done By :

Insert full name (Matric Num)

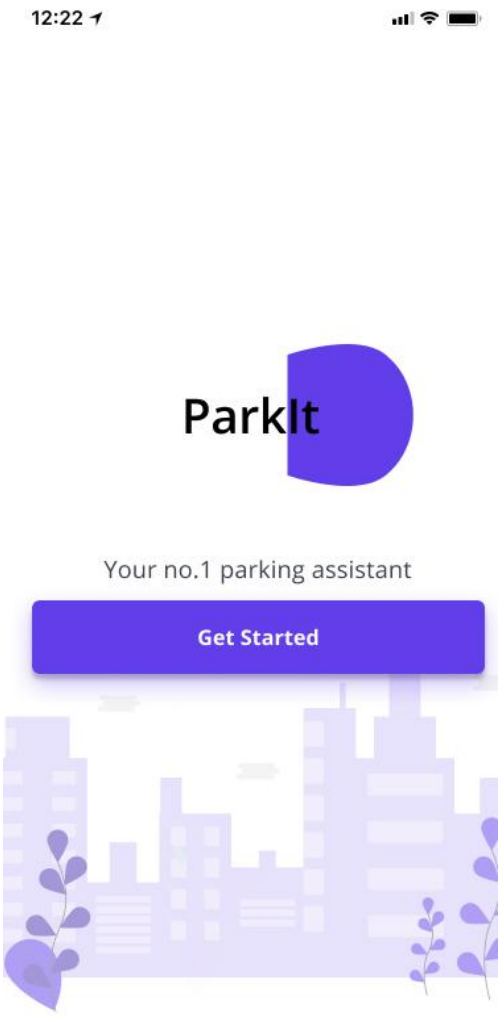
1. Product Description

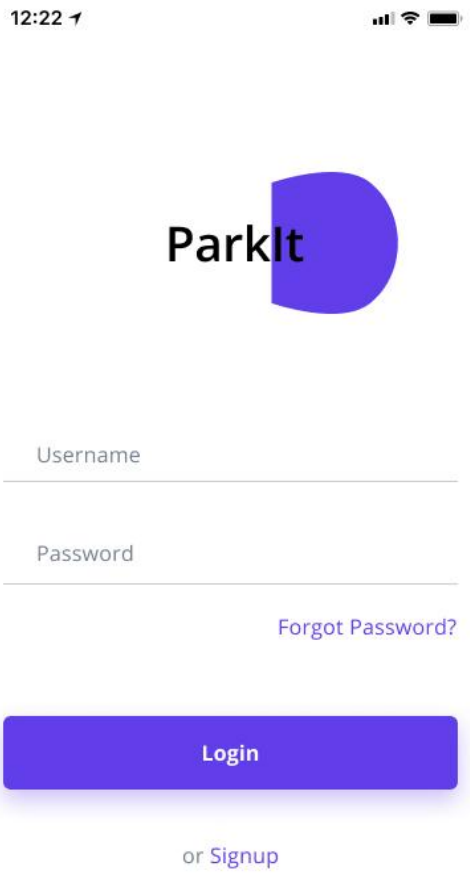
1.1 Purpose

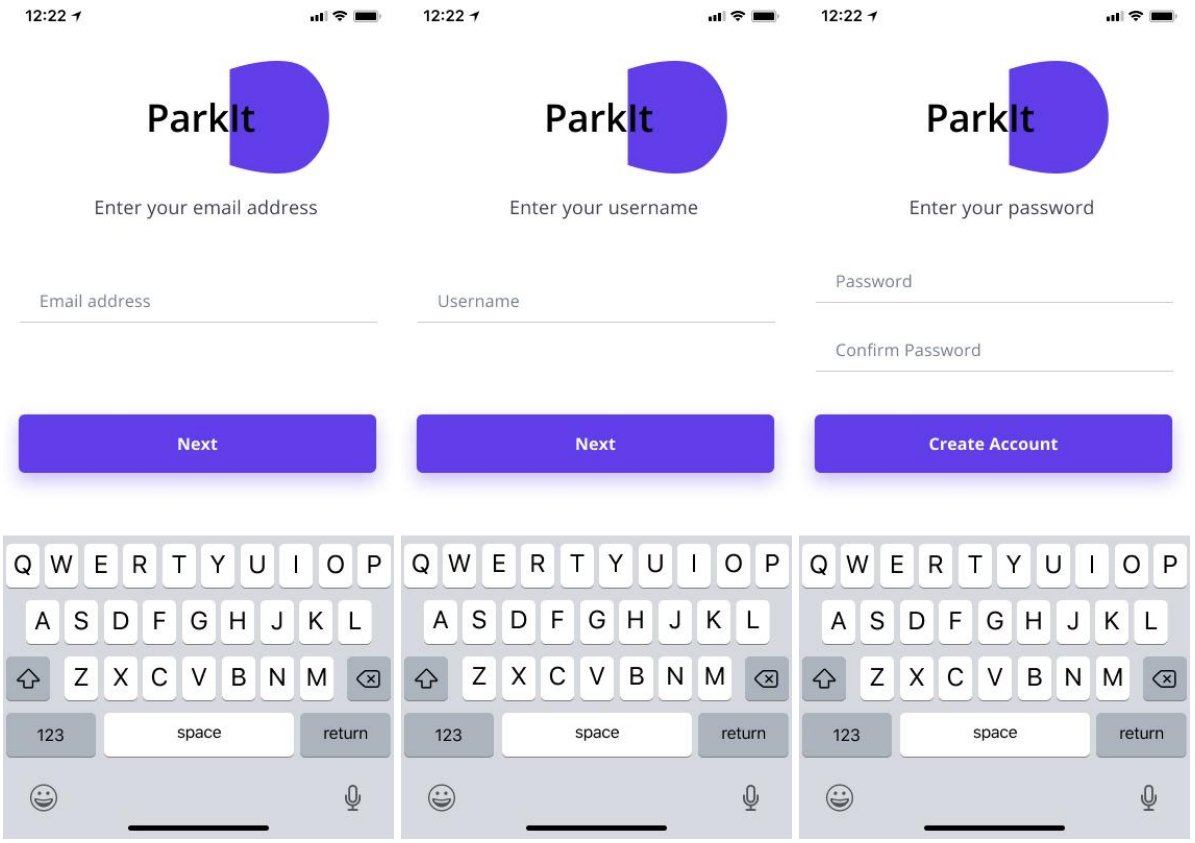
ParkIt is a mobile application that can alleviate the stress of drivers who are unable to find a parking lot when they are out and about. Our application displays the parking lots at the user-input destination, and with a hyperlink to the Google Maps site for directions to the exact location. ParkIt is able to give drivers real-time availability of the car parks around their destination and pricing information as well.

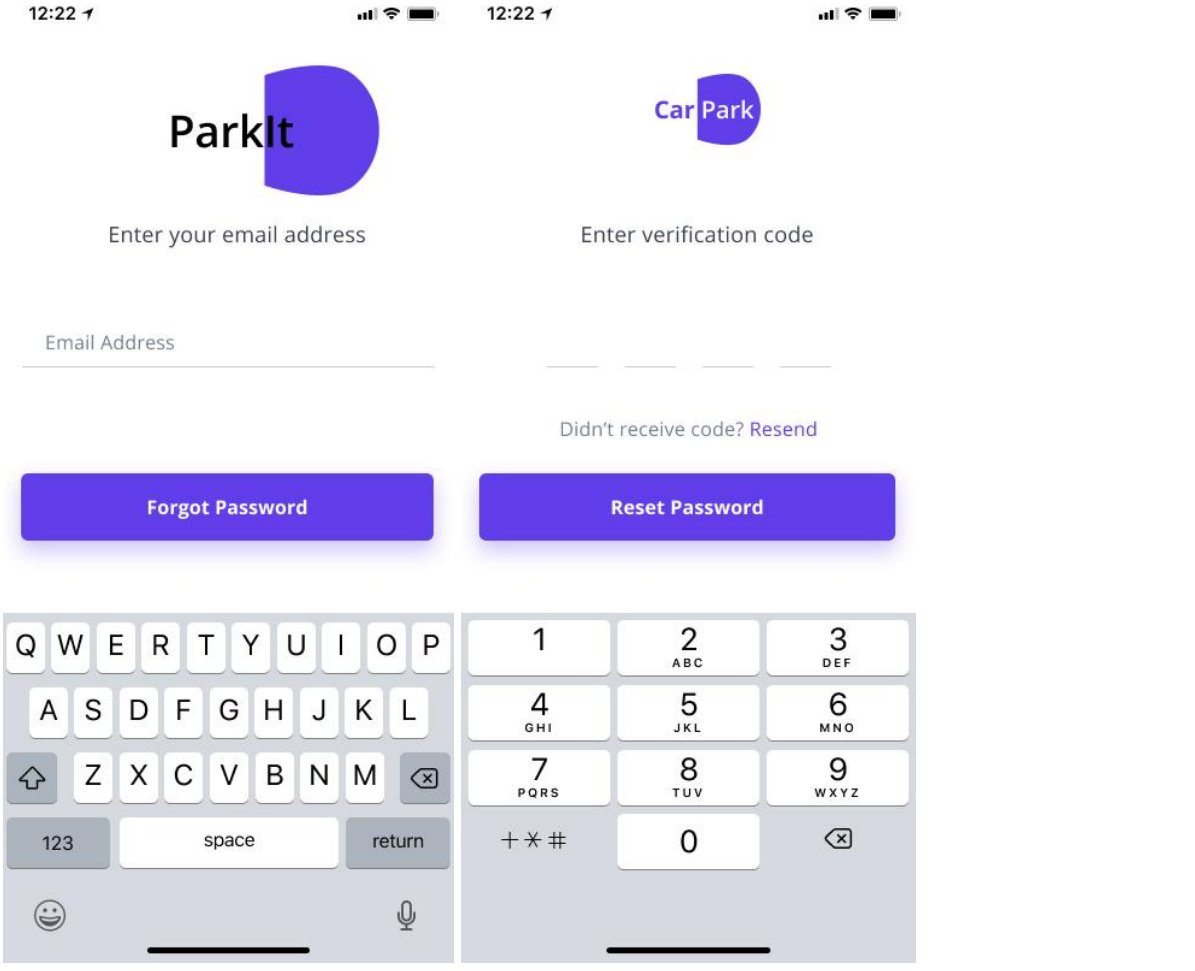
1.2 Scope

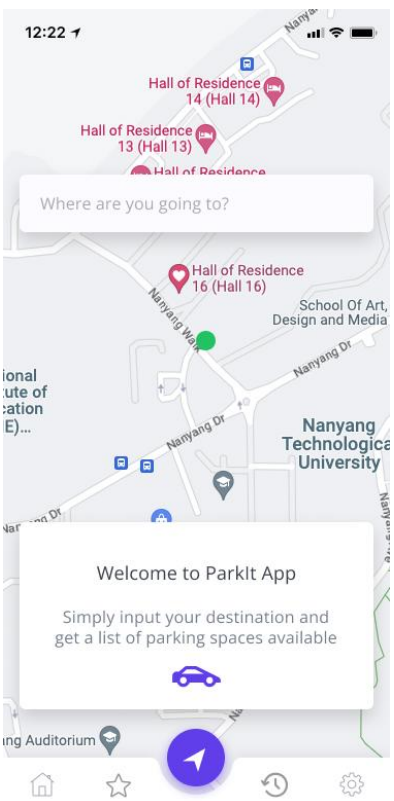
1.6 Initial UI mockups

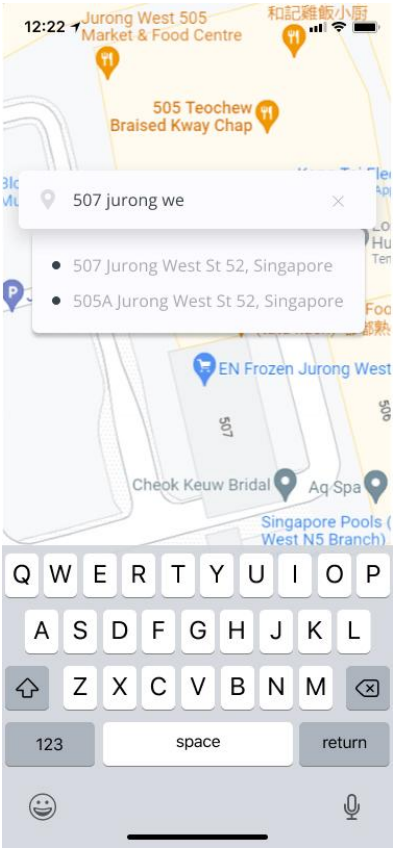


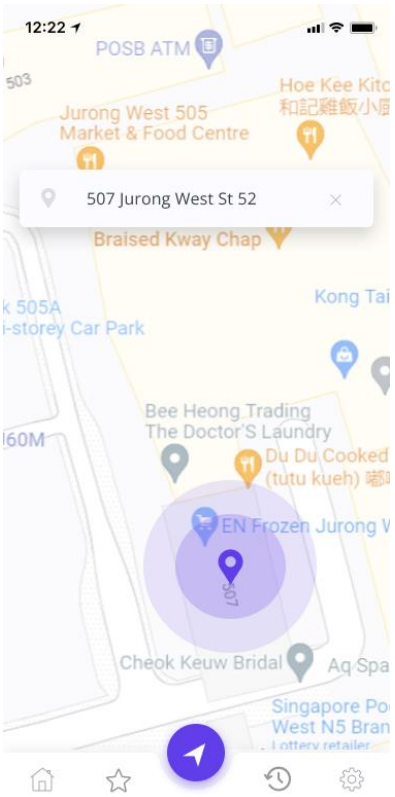


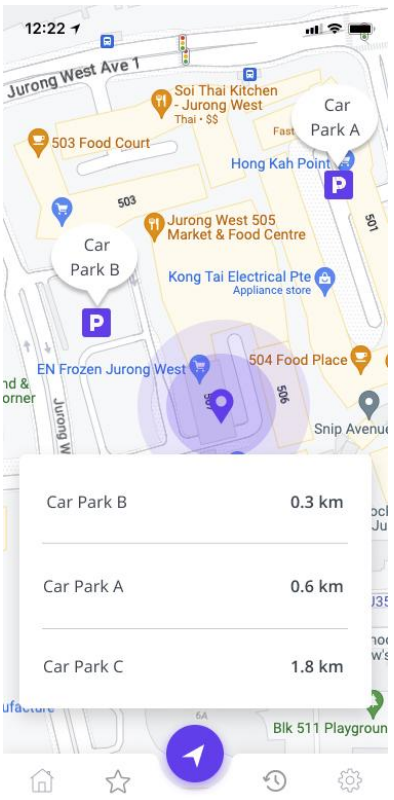

12:22
ParkIt
Enter your email address
Email address
Next
12:22
ParkIt
Enter your username
Username
Next
12:22
ParkIt
Enter your password
Password
Confirm Password
Create Account

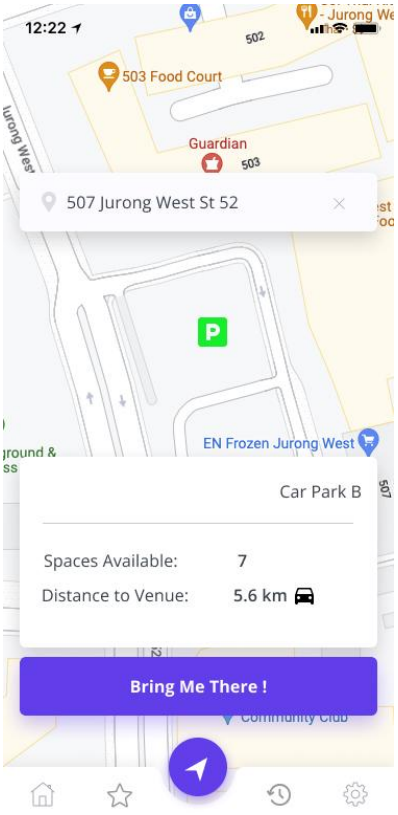

12:22
ParkIt
Enter your email address
Email Address
Forgot Password
12:22
Car Park
Enter verification code
Didn't receive code? Resend
Reset Password

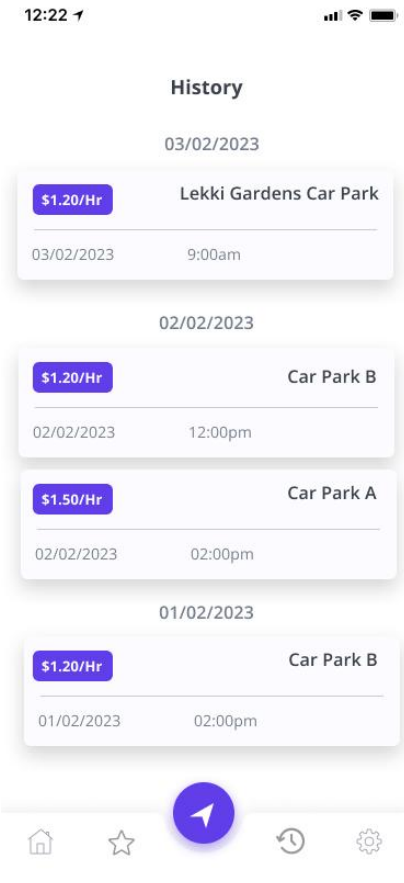

12:22
Hall of Residence 14 (Hall 14)
Hall of Residence 13 (Hall 13)
Where are you going to?
Hall of Residence 16 (Hall 16)
School Of Art, Design and Media
Nanyang Technological University
Welcome to ParkIt App
Simply input your destination and get a list of parking spaces available

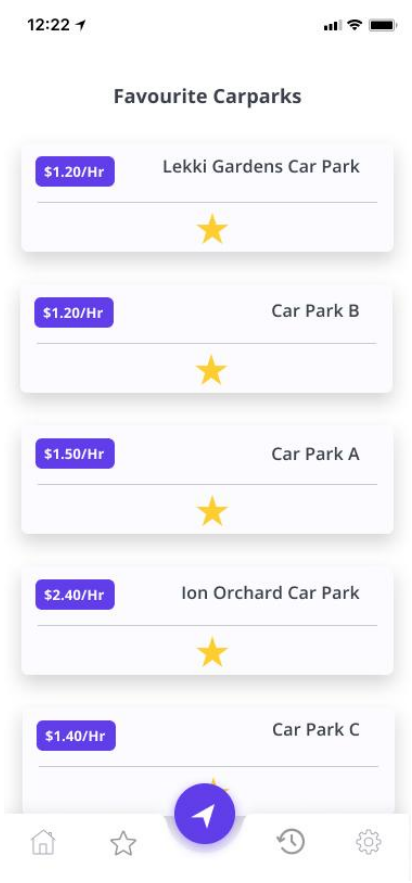

12:22
Jurong West 505 Market & Food Centre
505 Teochew Braised Kway Chap
507 jurong we
507 Jurong West St 52, Singapore
505A Jurong West St 52, Singapore
EN Frozen Jurong West
Cheok Keuw Bridal
Aq Spa
Singapore Pools (West N5 Branch)

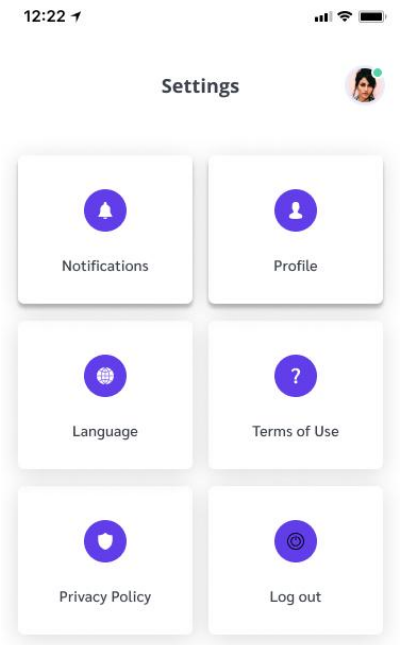

12:22
POSB ATM
Jurong West 505 Market & Food Centre
507 Jurong West St 52
Braised Kway Chap
Bee Heong Trading
The Doctor'S Laundry
Du Du Cooked (tutu kueh)
EN Frozen Jurong West
Cheok Keuw Bridal
Aq Spa

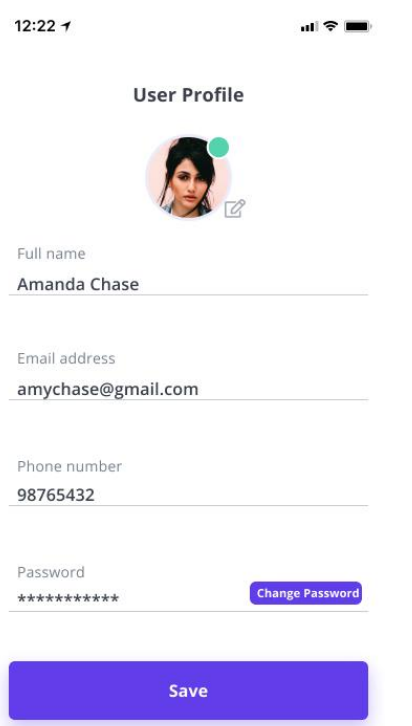

12:22
Jurong West Ave 1
Soi Thai Kitchen - Jurong West
503 Food Court
Car Park A
Hong Kah Point
Jurong West 505 Market & Food Centre
Car Park B
Kong Tai Electrical Pte
EN Frozen Jurong West
504 Food Place
Snip Avenue
Car Park B 0.3 km
Car Park A 0.6 km
Car Park C 1.8 km
Blk 511 Playground


12:22
503 Food Court
Guardian
507 Jurong West St 52
EN Frozen Jurong West
Car Park B
Spaces Available: 7
Distance to Venue: 5.6 km
Bring Me There !


12:22
History
03/02/2023
$1.20/Hr
Lekki Gardens Car Park
03/02/2023
9:00am
02/02/2023
$1.20/Hr
Car Park B
02/02/2023
12:00pm
$1.50/Hr
Car Park A
02/02/2023
02:00pm
01/02/2023
$1.20/Hr
Car Park B
01/02/2023
02:00pm


12:22
Favourite Carparks
$1.20/Hr
Lekki Gardens Car Park
$1.20/Hr
Car Park B
$1.50/Hr
Car Park A
$2.40/Hr
Ion Orchard Car Park
$1.40/Hr
Car Park C


12:22
Settings
Notifications
Profile
Language
Terms of Use
Privacy Policy
Log out


12:22
User Profile
Full name
Amanda Chase
Email address
amychase@gmail.com
Phone number
98765432
Password
****
Change Password
Save

Functional Requirements

1. Login Page
   1.1 The system must authenticate users before allowing them to log in
   1.2 The system must allow for users to sign up for an account if they do not have one.
      1.2.1 The system must request for users' username, password and phone number
         1.2.1.1 The system must issue and authenticate a verification code sent to the phone number
   1.3 The system must allow for users to reset their account passwords through a 'forgot password' button
      1.3.1 The system must be able to send a link to the user to a site to allow them to
         Reset their password
         1.3.1.1 The system must be require the user to type in the new password twice
   to ensure the accuracy of password

2. Home Page
   2.1 The system shall display user's current location
   2.2 The system must allow users to search for a location
   2.3 The system shall display user's search history
      2.3.1 The system must allow users to clear user search history
   2.4 The system must be able to display a map view of the user's current location and the surrounding area.
   2.5 The system must be able to highlight the locations of nearby car parks on the map, with a visual indicator of their availability.

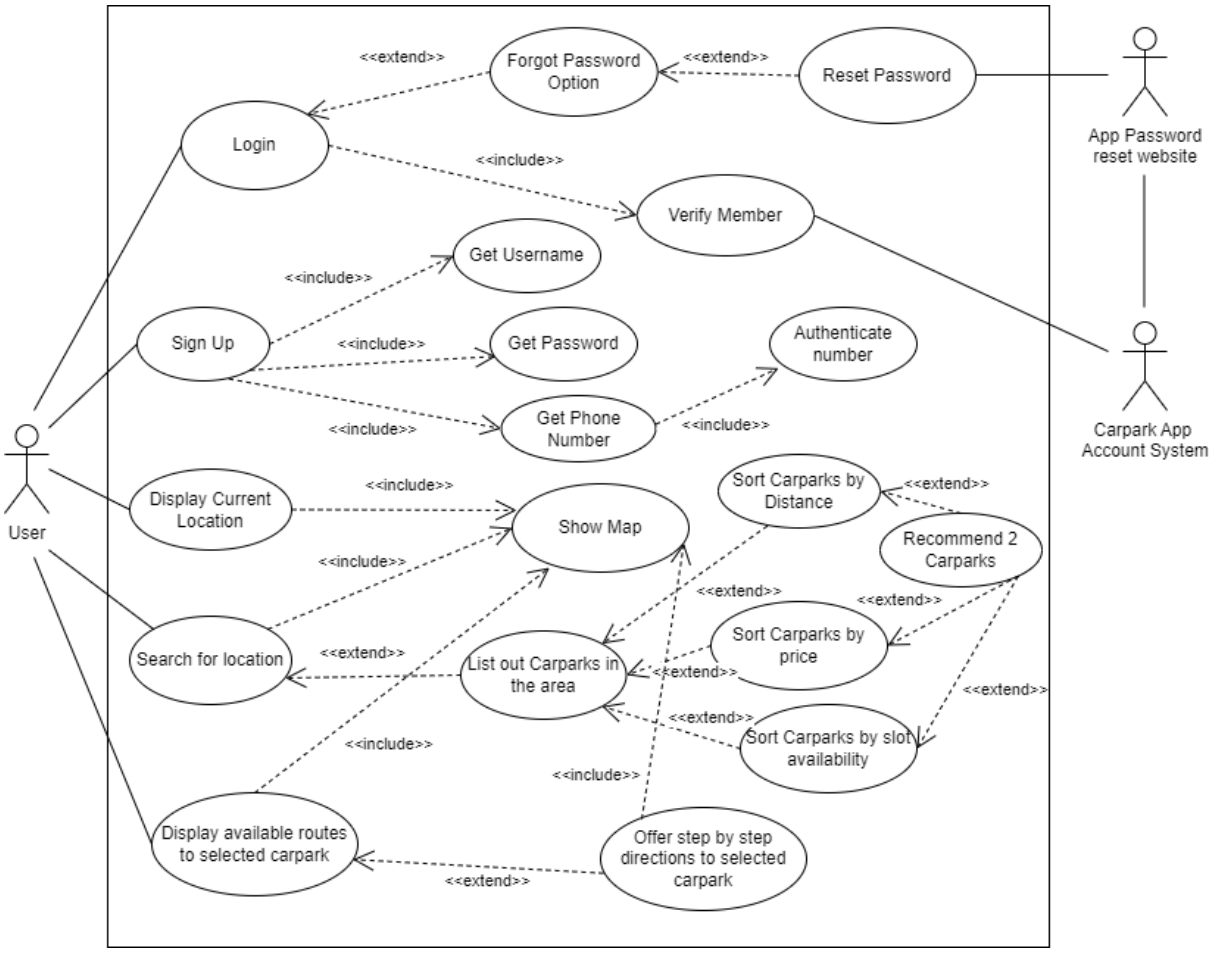
3. Car Park Comparison Page
   3.1 The system must be able to list out all car parks within a certain range of the selected location
      3.1.1 The system must be able to sort car parks by distance from location
      3.1.2 The system must be able to display the parking rates of car parks
      3.1.3 The system must be able to sort car parks by slot availability
   3.2 The system must be able to display overall recommendations of two call parks

4. Navigation Page
   4.1 The system must be able to show the available routes from the user's current location to the selected car park

Non-Functional Requirements

1. Usability
   1.1 The system shall be available in multiple languages to allow for users to have the same experience regardless of the language being used by the user.
   1.2 The system shall have visible buttons
   1.3 the app must have help and support features
      1.3.1 The system must have in-app tutorials
      1.3.2 The system must have user guides
      1.3.3 The system must have a support centre
2. Performance
   2.1 The system must be able to respond to actions within 1s
   2.2 The system must be able to support up to 10,000 users simultaneously
3. Reliability
   3.1 The system shall obtain the data from official data collection/carpark websites
   3.2 The system must use APIs from reliable resources as Google Map
   3.3 The system must recover from any failures or errors within a 3 minutes
   3.4 The system must provide accurate information on car park availability,
      3.4.1 The system must provide accurate number of available spaces in real-time
      3.4.2 The system must provide accurate prices of slots in real-time
4. Supportability
   4.1 Detailed documentation of the app and its systems must be available and regularly updated
   4.2 The system must have robust monitoring and logging systems in place, which would provide visibility into the performance and behaviour of the app
   4.3 The system must have a system for reporting and tracking errors and failures,
   4.4 The system must have a mechanism for users to report issues and provide feedback

Use Case Diagram



Use Case Descriptions

- CPK.001: Sign up
- CPK.002: Login
- CPK.003: Display current location
- CPK.004: Search for location
- CPK.005: Listing of car parks
- CPK.006: Sorting of list
- CPK.007: Display available routes

Use Case ID:	CPK.001		
Use Case Name:	Sign up		
Created By:		Last Updated By:	Boh Yang
Date Created:	09/02/2023	Date Last Updated:	30/03/2023

Actor:	App User (Initiating actor), App Account System
Description:	User signs up for an account
Preconditions:	1. User has an email address 2. User has not logged in
Postconditions:	1. User creates an account
Priority:	Essential
Frequency of Use:	Only once per user
Flow of Events:	1. User will click on Sign up option 2. User will be brought to the Sign up page 3. User will be prompted to enter an email address, username and password 4. System will send a validation email with a unique link to the user's email address. 5. User will click the link and verify his account 6. System will remember user’s account
Alternative Flows:	
Exceptions:	EX1: If email address cannot be verified 1. App does not allow for account to be created
Includes:	
Special Requirements:	1. App must respond to user’s actions within 3s 2. App Account System must store up to thousands of users account data 3. App must be able to recover from errors within 1 minute
Assumptions:	
Notes and Issues:	

Use Case ID:	CPK.002		
Use Case Name:	Login		
Created By:		Last Updated By:	Boh Yang
Date Created:	09/02/2023	Date Last Updated:	30/03/2023

Actor:	App user (Initiating actor), App Account System, App Password Reset Site
Description:	App user logs in to their account or resets their password
Preconditions:	1. App user has an account
Postconditions:	1. App user logs in to their account
Priority:	Essential
Frequency of Use:	Low, only log in once, will remain logged in unless user logs out
Flow of Events:	1. User chooses the login option 2. User enters their username and password in the login page 3. App verifies the account login information with the App Account System 4. If account information is verified, user is logged in to the app
Alternative Flows:	AF Step 2: If user forgets their account password 1. User chooses the forget password option 2. User is brought to the app account password reset screen 3. A verification link is sent to the user's registered email 4. User clicks on verification link 5. If successful, user is prompted to enter a new password 6. The password is updated and the account login information is updated in the App Account System 7. User returns to login page
Exceptions:	
Includes:	
Special Requirements:	1. App must respond to user's actions within 3s 2. App Account System must store up to thousands of users account data 3. App must recover from errors within 1 minute
Assumptions:	
Notes and Issues:	

Use Case ID:	CPK.003		
Use Case Name:	Display current location		
Created By:		Last Updated By:	Boh Yang
Date Created:	09/02/2023	Date Last Updated:	30/03/2023

Actor:	App User (Initiating actor)
Description:	App displays current location of user
Preconditions:	1. User has an app account 2. User is logged in 3. User has a GPS-enabled device
Postconditions:	1. Current location of driver is shown
Priority:	Essential
Frequency of Use:	Conditional, only when user launches app with GPS on
Flow of Events:	1. User click on display current location option 2. App will receive user's GPS information 3. App display user's current location
Alternative Flows:	
Exceptions:	EX1: User does not have GPS turned on 1. App displays message "User location is not available"
Includes:	1. Login
Special Requirements:	1. App must respond to user's actions within 3s 2. App must recover from errors within 1 minute 3. App must use a reliable API to ensure accurate data 4. App must have a error logging and feedback feature 5. App must support up to 10000 users concurrently
Assumptions:	1. GPS data is accurate
Notes and Issues:	

Use Case ID:	CPK.004		
Use Case Name:	Search for location		
Created By:		Last Updated By:	
Date Created:	09/02/2023	Date Last Updated:	09/02/2023

Actor:	App User (Initiating actor)
Description:	User searches for a location and app displays all carparks within range on the map
Preconditions:	1. User has an account 2. User is logged in to their account
Postconditions:	1. App displays all carparks within range on the map
Priority:	Essential
Frequency of Use:	High, 1-5 times a day
Flow of Events:	1. User chooses location search option 2. User searches for a location by entering address OR postal code 3. App displays carparks within a certain distance from location along with their hourly rates, distance from location and number of slots available
Alternative Flows:	
Exceptions:	EX1: If there are no carparks within distance range 1. App displays the message “No carparks within range of specified location!” 2. App returns to location search page
Includes:	1. Login
Special Requirements:	1. App must respond to user’s actions within 3s 2. App must recover from errors within 1 minute 3. App must use a reliable API to ensure accurate data 4. App must have a error logging and feedback feature 5. App must support up to 10000 users concurrently
Assumptions:	1. Carpark information is accurate
Notes and Issues:	1. Even if the APIs used are reliable, there can still be times when they go down and this will affect the app usage 1. The initial range to determine which carparks show up on the map is still to be determined

Use Case ID:	CPK.005		
Use Case Name:	Listing of Car Parks		
Created By:		Last Updated By:	
Date Created:	09/02/2023	Date Last Updated:	09/02/2023

Actor:	App user (Initiating actor)
Description:	All carparks within range of specified location are displayed in a list
Preconditions:	1. User has an account 2. User is logged in 3. User has searched for a specific location
Postconditions:	1. All carparks within range are displayed in a list along with their hourly rate, distance from specified location and slots available
Priority:	Essential
Frequency of Use:	High, 1-5 times a day
Flow of Events:	1. User chooses option to list all carparks within range 2. All carparks within range are displayed along with their hourly rates, distance from specified location and number of slots available
Alternative Flows:	
Exceptions:	
Includes:	1. Login 2. Search for location
Special Requirements:	1. App must respond to user's actions within 3s 2. App must recover from errors within 1 minute 3. App must use a reliable API to ensure accurate data 4. App must have a error logging and feedback feature 5. App must support up to 10000 users concurrently
Assumptions:	1. Carpark information is accurate
Notes and Issues:	1. Even if the APIs used are reliable, there can still be times when they go down and this will affect the app usage 2. The initial range to determine which carparks show up on the map is still to be determined

Use Case ID:	CPK.006		
Use Case Name:	Sorting of list		
Created By:		Last Updated By:	
Date Created:	09/02/2023	Date Last Updated:	09/02/2023

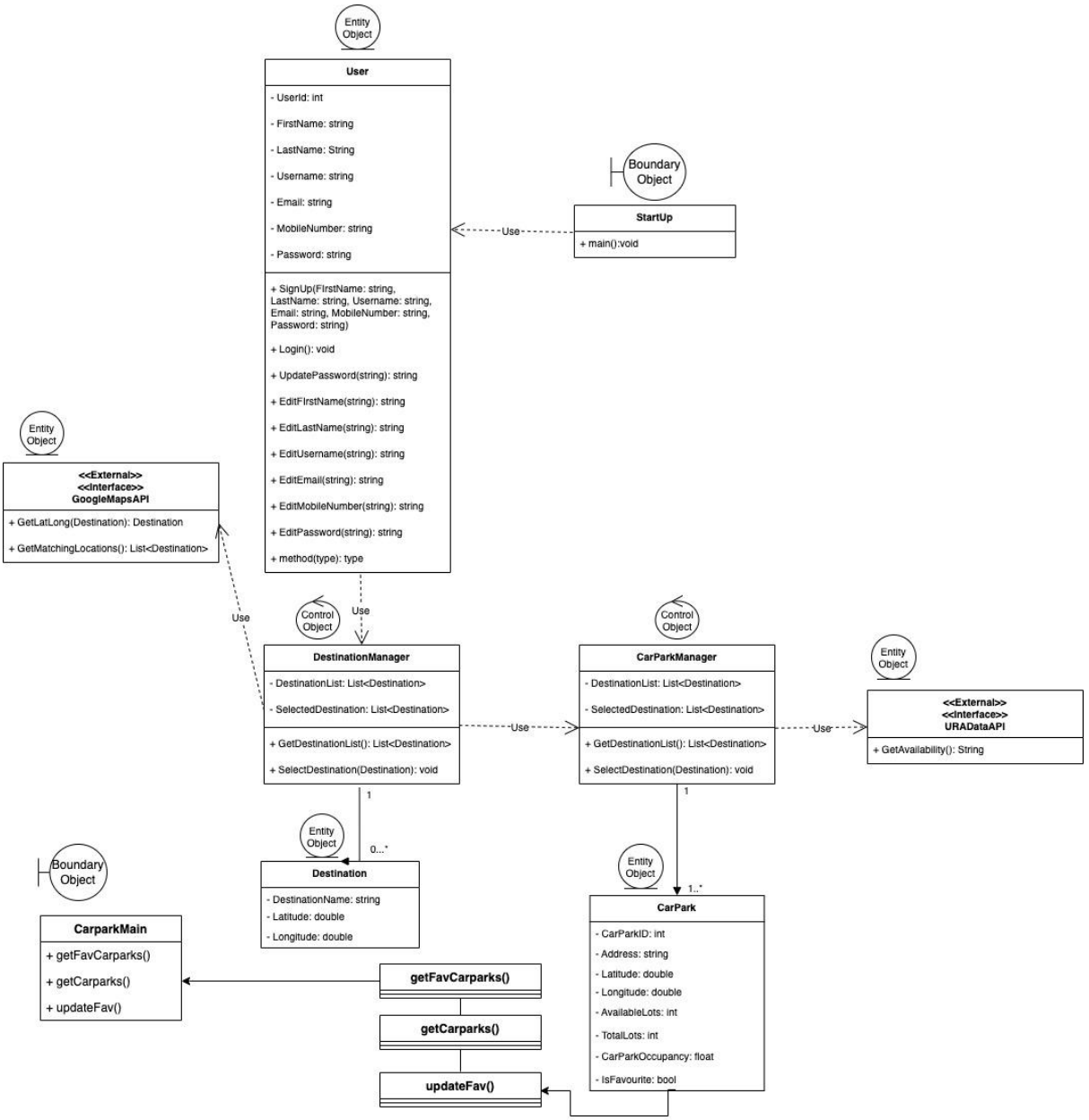
Actor:	App User (Initiating actor)
Description:	Sorts list of carparks by the selected user preference
Preconditions:	1. User has an account 2. User is logged in to their account 3. User has searched for a specific location 4. User has chosen to view all carparks within range in a list
Postconditions:	1. The list of carparks is sorted according to the user's selected preference
Priority:	Essential
Frequency of Use:	High, 1-5 times a day
Flow of Events:	1. User selects their preference for sorting, either by distance from specified location, by pricing or by number of slots available 2. App sorts and displays the list of carparks according to the selected user preference 3. App also recommends 2 carparks for user's selection based on the user's preference
Alternative Flows:	
Exceptions:	
Includes:	1. Login 2. Search for location 3. Listing of Carparks
Special Requirements:	1. App must respond to user's actions within 3s 2. App must recover from errors within 1 minute 3. App must use a reliable API to ensure accurate data 4. App must have a error logging and feedback feature 5. App must support up to 10000 users concurrently
Assumptions:	1. Carpark information is accurate
Notes and Issues:	1. Even if the APIs used are reliable, they can still have down time and this will affect the app usage 2. The initial range to determine which carparks show up on the map is still to be determined

Use Case ID:	CPK.007		
Use Case Name:	Display available routes		
Created By:		Last Updated By:	
Date Created:	09/02/2023	Date Last Updated:	09/02/2023

Actor:	App User (Initiating actor)
Description:	App displays route to carparks
Preconditions:	1. User has an account 2. User is logged into their account 3. User has searched for a specific location 4. User has chosen to view all carparks within range in a list 5. User has sorted carpark list by their preference
Postconditions:	1. App displays step by step direction to selected carpark
Priority:	Essential
Frequency of Use:	High, 1-5 times a day
Flow of Events:	1. User chooses 1 of the 2 recommended carparks based on their preference 2. User click on Display available routes 3. App receives User's GPS information 4. App receives data on selected carpark's GPS location 5. App displays all routes from User's current location to selected carpark 6. User chooses a route and app offers step by step direction to selected carpark
Alternative Flows:	AF Step 1: If user does not want to choose any of the 2 ecommended carparks OR If user already has a specific carpark in mind 1. User chooses the "back" option to return to the list of sorted carparks according to their preference 2. User chooses another carpark from the list 3. Return to step 2 AF Step 3: If user does not have GPS enabled 1. User enters their current location manually 2. Skips to step 5
Exceptions:	
Includes:	1. Login

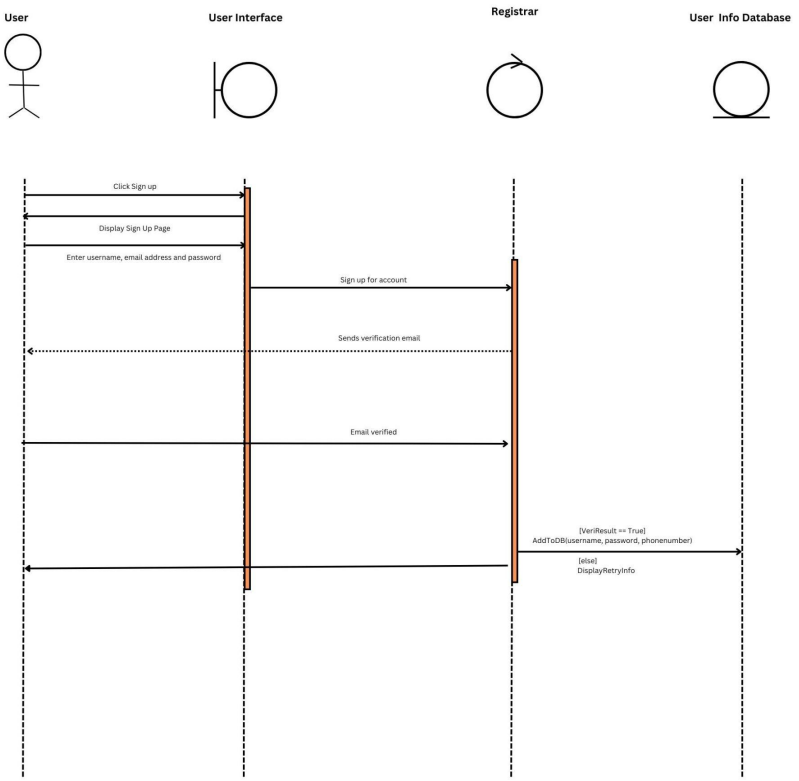
	2. Search for location 3. Listing of Carparks 4. Sorting of list
Special Requirements:	1. App must respond to user's actions within 3s 2. App must recover from errors within 1 minute 3. App must use a reliable API to ensure accurate data 4. App must have a error logging and feedback feature 5. App must support up to 10000 users concurrently
Assumptions:	1. GPS data is accurate 2. Carpark information is accurate
Notes and Issues:	1. Even if the APIs used are reliable, they can still have down time and this will affect the app usage 2. The initial range to determine which carparks show up on the map is still to be determined 3. The slot availability of carparks might change as the user is navigating to the selected carpark

Class Diagram



Sequence Diagrams

Use Case ID: CPK.001



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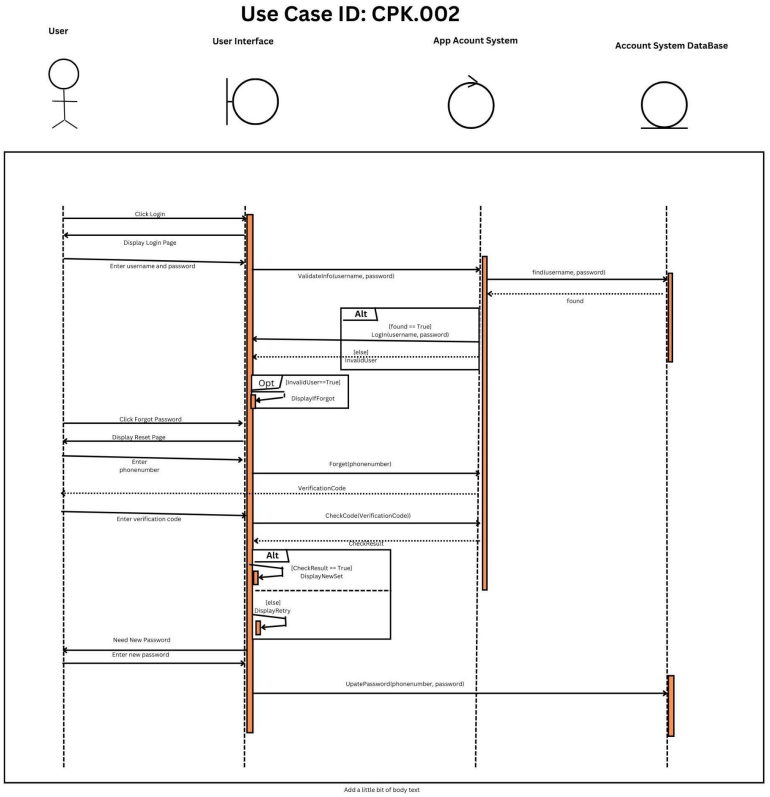
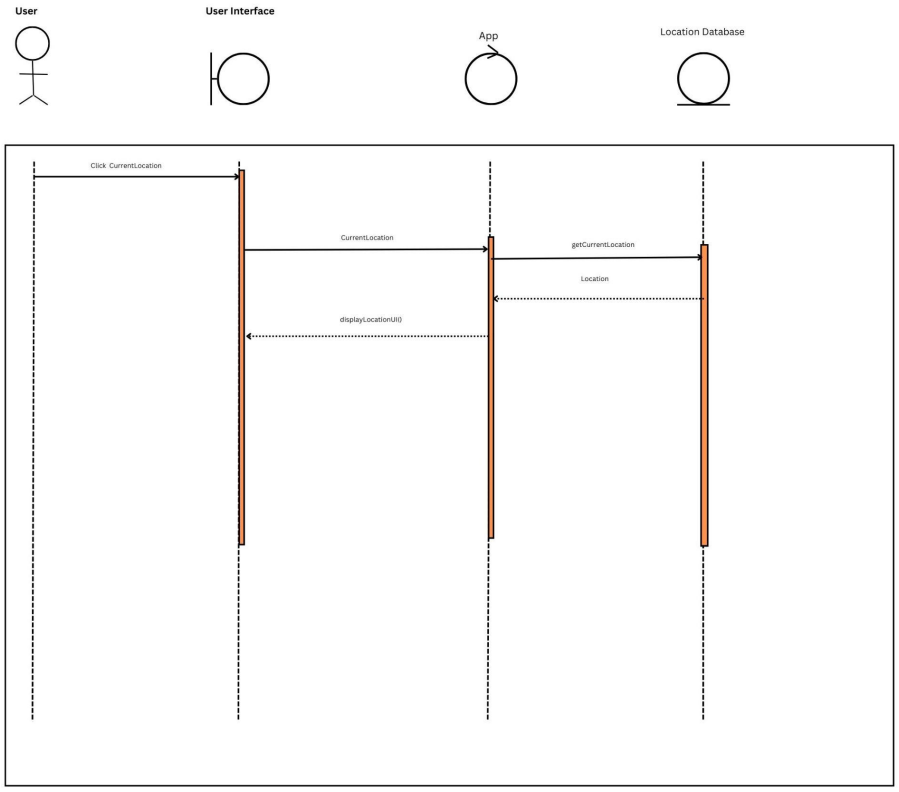


Add a little bit of body text

Use Case ID: CPK.003



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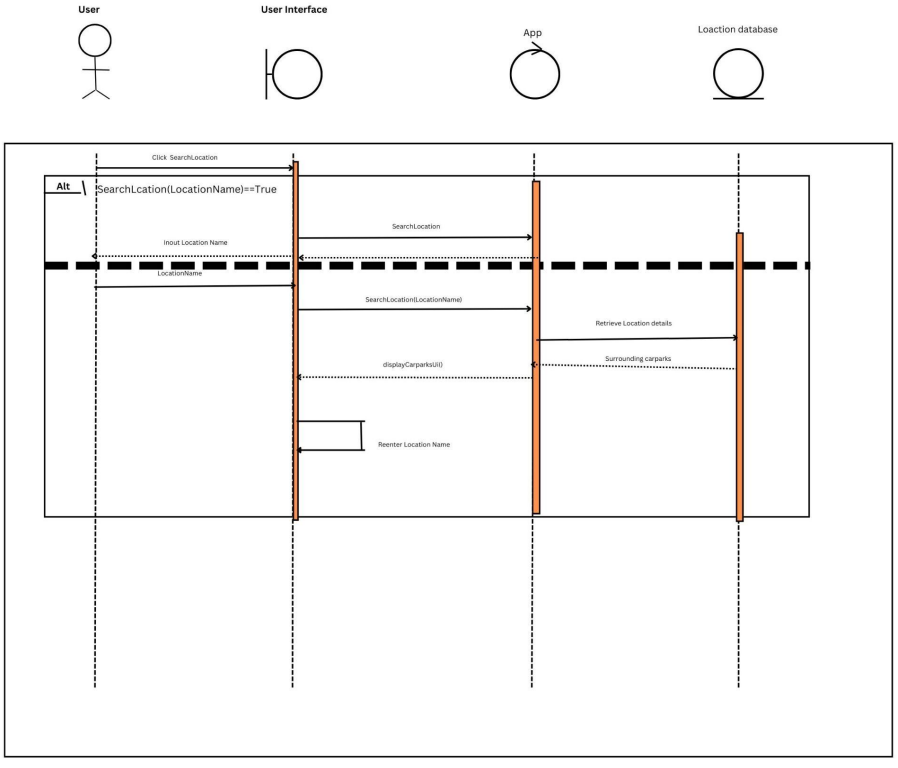
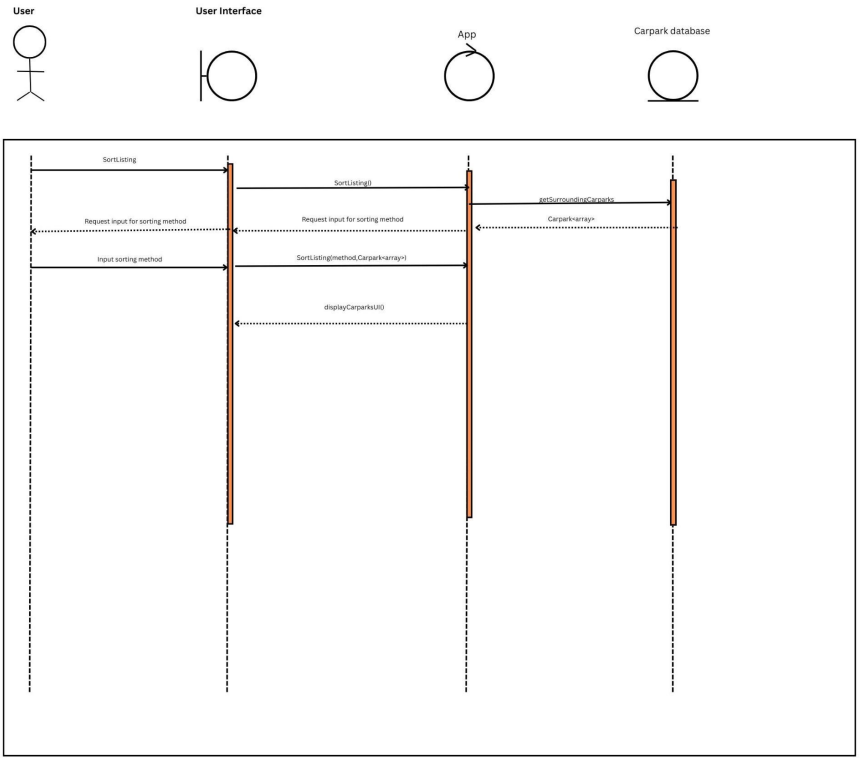
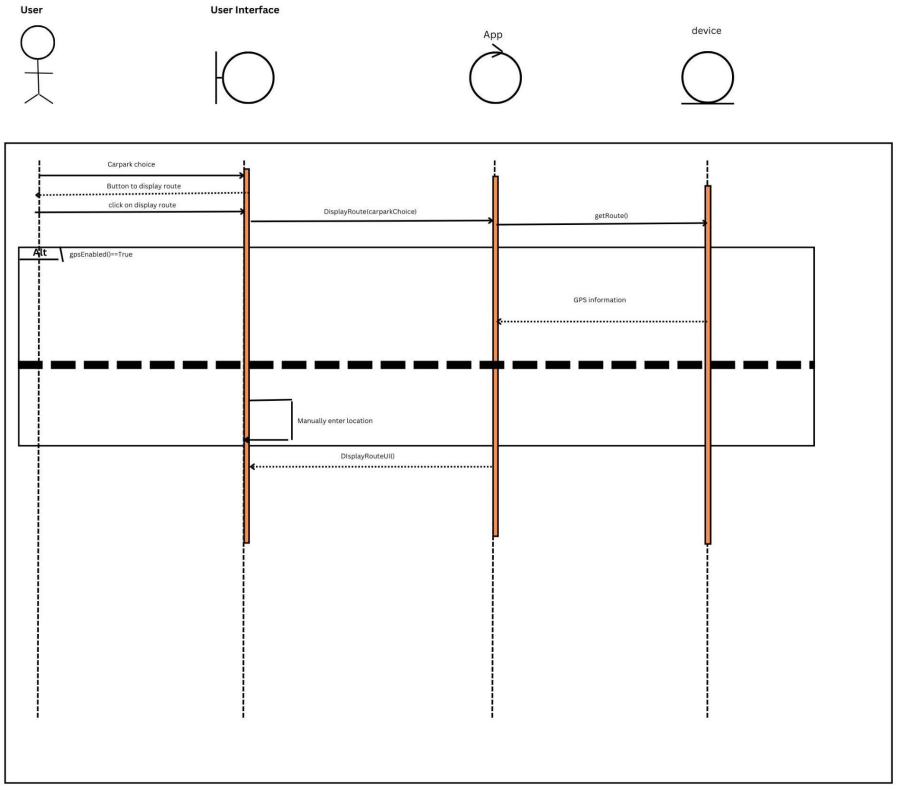


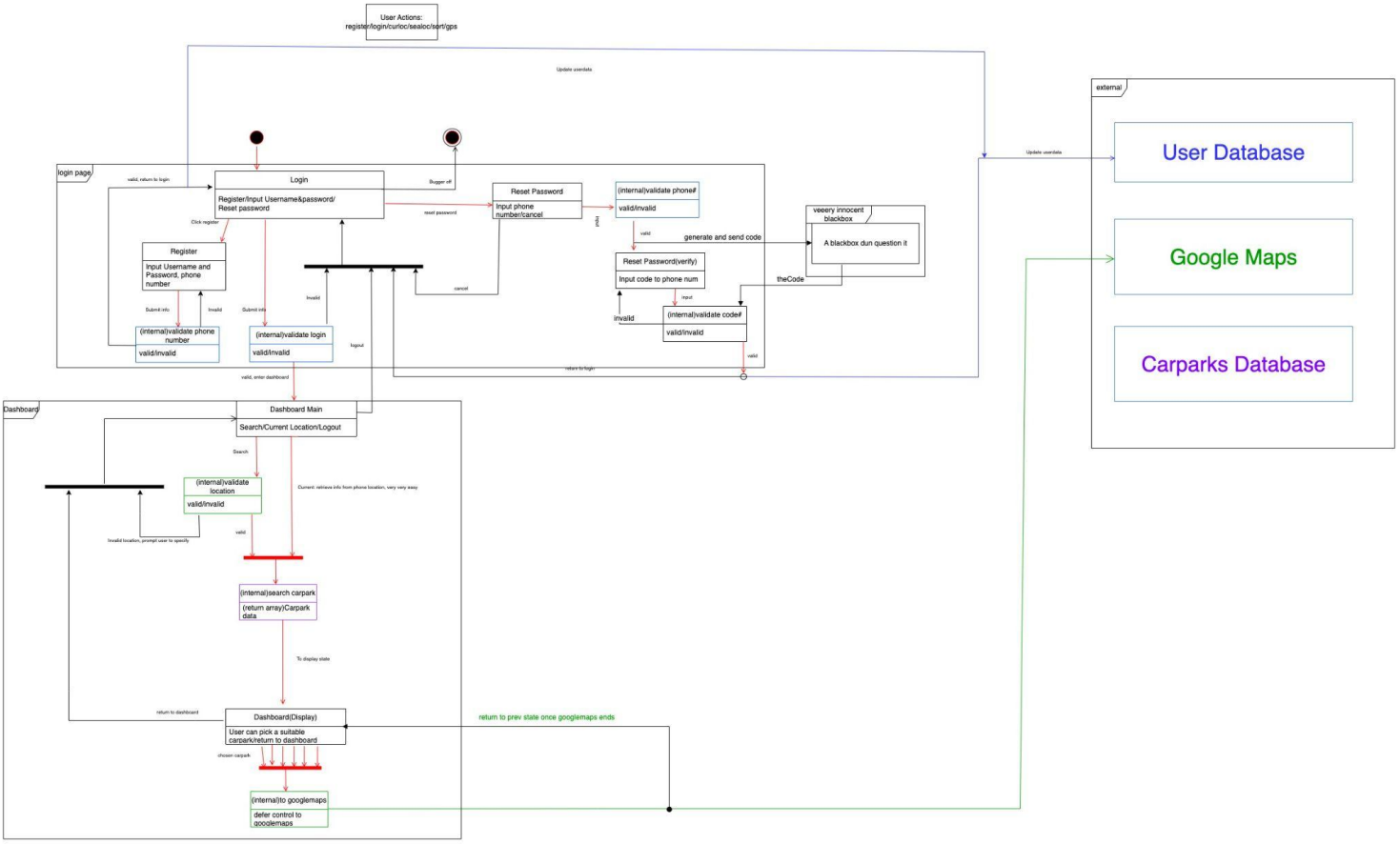
Use Case ID: CPK.006



Use Case ID: CPK.007



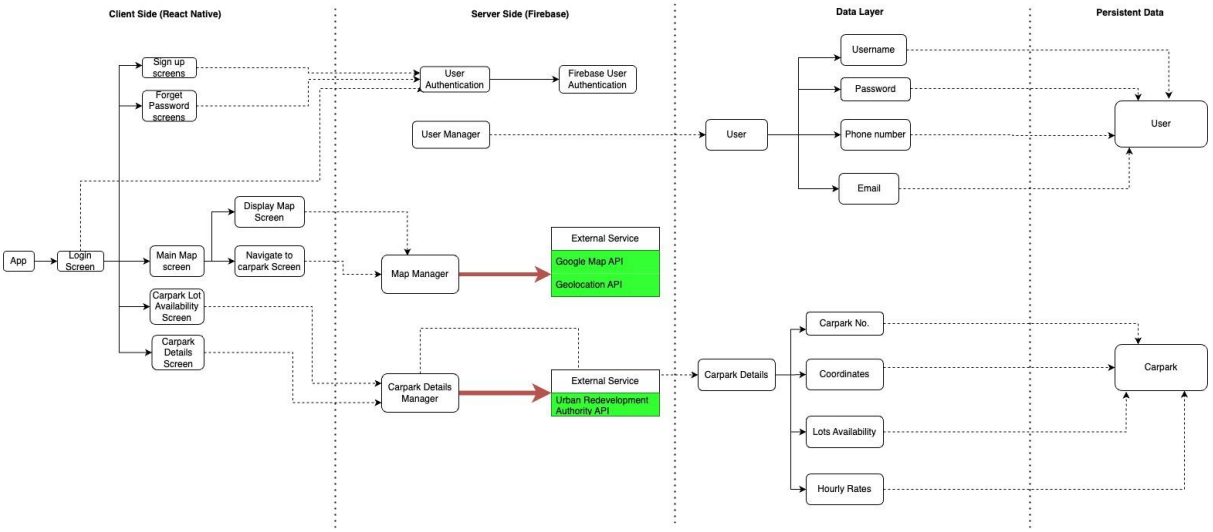
State Machine Diagram



*for now, will need to zoom in to see
*split into smaller parts

Dialog Map

System Architecture



Data Dictionary

Term	Definition
Route	A path the user can take to get from point A to point B
Car Park	An area or building where cars or other vehicles may be left temporarily.
Vehicle	A vessel used for transporting people or goods, especially on land, such as a car, motorbike, or electric vehicle
Car Park Lots	Non-occupied spots that a vehicle could be parked at, usually represented by a number
Free Parking Scheme	According to HDB, users enjoy free parking from 7.00am to 10.30pm on Sundays and Public Holidays in most HDB carparks
Season Parking	A scheme that allows users to park their vehicle at a carpark on a regular basis at a fixed monthly rate for different types of vehicles and at different season parking rates.
Short-term Parking	Scheme for users to park at a carpark without valid season pass, with differing charges for different time of day, carpark and vehicle type
Night Parking	For car parks with Night Parking Scheme, short-term parking charges are capped at $5 per night (10:30pm to 7:00am on the following day). Short-term parking is not available at car parks without the Night Parking Scheme.