

Car Rental Application with GPS Tracking for Mileage Detection

Koh Chia Yin, Sofia Najwa Ramli*

Faculty of Computer Science and Information Technology,
Universiti Tun Hussein Onn Malaysia, Parit Raja, 86400, MALAYSIA

DOI: <https://doi.org/10.30880/aitcs.2021.02.02.018>

Received 15 June 2021; Accepted 09 September 2021; Available online 30 November 2021

Abstract: Most of the car rental companies provide unlimited mileages in the high range on price which is not a reasonable price for some customer that may only want to rent the car for a short distance of travel. This inspired the author to propose this project for a user to choose the distance they may travel when renting a car, and for the admin to track the distance traveled by the user using a rented car based on mileage. Object-Oriented Software Development (OOSD) is used as a methodology and the system is developed using Android Studio, Java Programming Language and Firebase service. Phone-based GPS tracking is used to track the current phone location that is placed in the rented car. By retrieving the starting point and current location longitude and latitude, the distance traveled by the user using the rented car in mileage is successfully calculated. The significance of this project is to track the distance traveled by a user using the rented car. The longitude and latitude retrieved and driving license number filled in by the user are important information for admin to provide useful information to police for investigation if user using admin rental car to commit a crime. The applications have several limitations and suggestions for further improvement in the future.

Keywords: Car Rental Application, GPS Tracking, Mileage Detection, OOSD

1. Introduction

In Malaysia, most car rental companies provided unlimited mileage for renting a car. Unlimited mileage car rental gives customers more freedom in driving anywhere. Some companies also provide limited mileage limiting the mileage of the rented car from driving too far. Although unlimited mileage car rental is convenient for customers, the price is also higher than limited mileage. While limited mileage gives a flat price to customers but it charges a fee if customers drove beyond the limited mileage. This is convenient for customers who seek a short distance of travel at a reasonable price.

Some car rental companies will encounter some problem like rental car theft. A rental car can be stolen by the theft after getting the key from the owner. The owner of the car does not able to claim rental car insurance as the insurance does not cover the loss for being stolen. The stolen rental car may even be involved in many crimes such as defraud banks, burglaries, and robberies [1]. The case only be able to solve after the car rental companies found that the information provided such as driving license

*Corresponding author: sofianajwa@uthm.edu.my

2021 UTHM Publisher. All rights reserved.

publisher.uthm.edu.my/periodicals/index.php/aitcs

fake. The important customer information has to be verified when transferring the rental car to customers.

The project focuses on mileage detection application using GPS tracking that is placed inside the rental car. The applications require mobile data and the activation of Global Positioning System (GPS) in the smartphone. The proposed project is separated into three applications. The first application is user app. Users can view and book the car available in the list via the user app. Before they can view or book the car, they are required to register and login into the application first. The user can also view their booking history. Through the booking history, they are able to view the distance traveled by mileage and extra charges if exceeding the mileage limit. The second application is admin app. Admin can create and edit the car to rent. The admin able to accept or reject the booking request of user. Besides, the admin can start and stop the GPS tracking app of the currently accepted booking request. The admin can check the booking history by car in car history. Last but not the least, the GPS tracking app will be able to track the car mileage and location by longitude and latitude. The admin is required to register the booking car through this app for tracking.

The significance of this project is the mileage detection function available in the application for users and admin during the process of renting the car to the user. An extra fee will be charged if the car exceeds the mileage that the user booked. The mileage detection function is important for the admin to know whether the user has driven beyond the mileage that they have booked. This feature helps the admin to calculate the extra fee that needs to be charged to the user. Besides, the tracking app may also able to record down the traveled location based on longitude and latitude of the admin car when the user driving the rented car. The admin can check the location after the car return. Admin will know the location the car traveled previously with the date and time if the car caught on suspicious activity after returning. Users require to provide information their driving license when register for the account. Admin can request to view user driving license to verify whether is the same license number as in the booking request. By doing so, the company can prevent people without a license from renting a car.

2. Related Works

2.1 Car Rental Services

Car rental services are a kind of service that gives customers to rent a car from the owner for some time. In the past when the technology advance as nowadays, customers can only get these services through agencies or companies by phone call or face-to-face reservation. Customers now can get these services through online websites and applications first for reservations.

During the process of reserving for car rental online, the customers have to state their pick-up location and the duration of renting the car. After searching the results that match the requirements, customers can choose the car that they want to rent based on the prices of renting the car, the number of seats of the car, the brand of the car, the type of car transmission, the accessories provided, the limitation of mileage, the fuel of the car, and many more.

2.2 Outdoor Positioning

GNSS is also known as the Global Navigation Satellite System. GNSS provided geospatial data with global coverage. Many technology advance countries have developed this system like GPS developed by the USA, GLONASS by Russia, Galileo by Europe, and BeiDou navigation system by China.

2.3 Indoor Positioning

Wi-Fi is a popular wireless technology that has been widely used in the information technology field. Devices like smartphones, notepads, and laptops connecting with the wireless Internet using wireless through them a wireless card in the devices. Wi-Fi location tracking has used trilateration and triangulation in determining the location using different aspects. Trilateration technique is applied when using received signal strength indication (RSSI) and Time of Flight (ToF) as the signal for tracking. The triangulation technique is applied on locating the location based on Angle of Arrival (AoA).

RFID is also known as radio-frequency Identification. It uses radio waves to send and transmit the identity and characteristics of the objects to locate the position [2]. There are two types of RFID location tracking which are active and passive RFID system. Active RFID system allows real-time location tracking while passive RFID system does not.

2.4 Global Positioning System (GPS) for Vehicle Tracking

Global Positioning System (GPS) is a radio navigation based on satellite. It provides information on geolocation and time of a certain target to the GPS receiver. It is developed by United States (US) government originally for military navigation purposes. However, due to Korean Air Lines Flights 007 crashed incidents in 1983, GPS is opened to the public to prevent tragedy from happening. The public version of GPS may not have the accuracy of the military version of GPS [3]. According to GPS website of US on April 2019, the US has 31 operational satellites and 6 orbital planes.

Satellite-based GPS tracking uses devices to track the location. It uses satellites, receivers, transmitters, and other relevant devices to perform GPS location tracking. Using satellite-based GPS tracking does have to worry about the poor signal of GPS that will cause losing the tracking target.

GPS tracking locate the location through trilateration. The trilateration technique involves measuring the distance between the GPS receiver and the signal of GPS satellites. All the GPS satellites will broadcast a signal each until reaching through the GPS receiver. When all the signals intersected, the location of the GPS receiver will be known. Figure 1 shows the GPS trilateration technique in two-dimensional. Figure 2 shows the GPS trilateration techniques in three-dimensional [4].

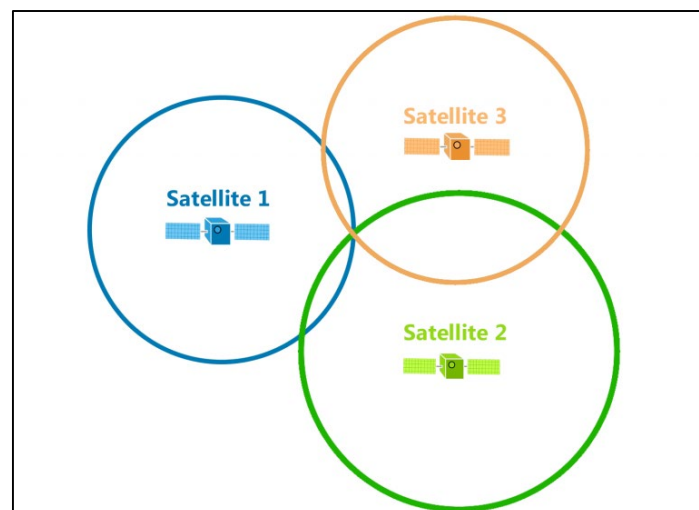


Figure 1: GPS Trilateration Technique in Two-Dimensional

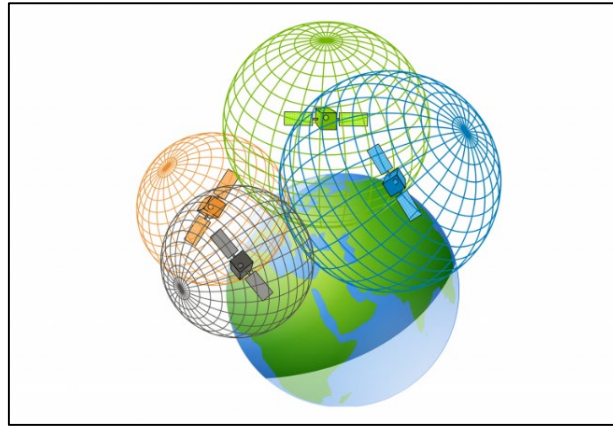


Figure 2: GPS Trilateration Techniques in Three-Dimensional

Phone-based GPS tracking with installed the suitable application and connected wireless connection able to perform location tracking services. Phone-based GPS tracking working in a best condition when it is in the range within the cell tower [5].

2.5 Android

Android is one of the mobile operating systems on a smartphone that is widely used in the world. Android Inc. was founded by Rich Miner, Nick Sears, Chris White, and Andy Rubin in Palo Alto, California. The original aim of Android was first to improve the operating system of the digital camera however being declined. Using the exact operating system that they built for the digital camera, it becoming the Android operating system for phone [6].

Android operating system developed by Google designed based on modified Linux kernel and other open source software. Android operating system is mainly developed for smartphones and tablets with touchscreen feature. Android also developed for other devices other than mobile devices, for example Android TV for digital media players and Android Auto for cars.

2.6 Study of Existing Systems

SOCAR is a car rental application that came from South Korea to Malaysia. SOCAR is a unique car rental application that rents keyless cars using the application. The keyless car is controlled by the users using SOCAR apps on their phone to lock and unlock or start the engine of the car. The rental cars of SOCAR are located in many states of Malaysia in specific zone. Customers can pick their booked car at the location selected [7]. Before the users able to start using the keyless car, the users are required to take photos of the condition of the car. Before returning the car, users are also required to take photos of the condition of the car.

Kwikcar is a car rental application that provided a platform for people to share their car for rent. This application is convenient for customers to find their suitable cars and location that is near to them. When customers found the car they wanted to rent, they can contact the owner using Kwikcar to discuss the pickup location [8]. Kwikcar has a feature that allows the communities to rent the car using the application as a platform. This allows the communities for earn some money while also helps others to provide car rental efficiently.

The proposed application has a similar feature with SOCAR that will detect the mileage traveled. This feature facilitates SOCAR to calculate and demand online payment for extra charges for late returning car and exceeding mileage limitations. However, the proposed application displays the total payment to customers and the total payment will only be paid upon returning the car to the agencies or companies.

Table 1: Study of Existing Systems

Features	SOCAR	Kwikcar	Proposed Applications
Mileage detection	Detecting the amount of mileage traveled	Not available	Detecting the amount of mileage traveled
Location tracking	Available	Not available	Available
Extra charges	Calculate the payment of extra charges for late returning car and exceeding mileage limitation	Not available	Calculate the payment of extra charges for exceeding mileage limitation
Mileage limitation	Limited mileage	Unlimited Mileage	Limited mileage based on how many miles user book
Peer-to-peer car renting	No available	Available	Not available

3. Methodology

Object-Oriented Software Development (OOSD) model is a practical method of developing the proposed application where it focuses on objects early in the development. This model is easier to operate than structured model as it can identify errors in the early phase of development. This model has four phases, requirement analysis, analysis, design, and programming and testing. During the phase of implementation and testing, it can return to the previous phase, phase of design to further improve and debug the application. Figure 3 shows the Object-Oriented Software Development (OOSD) model life cycle.

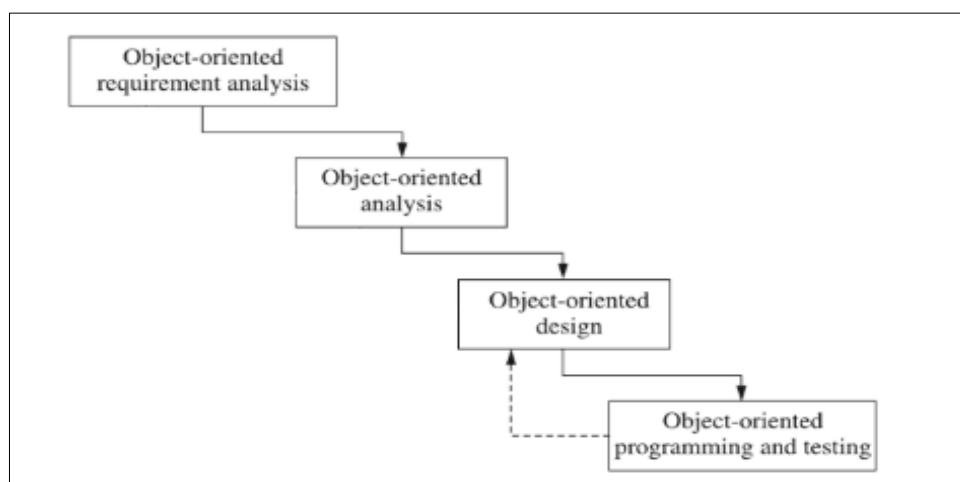


Figure 3: Object-Oriented Software Development (OOSD) model life cycle [9]

3.1 Object-Oriented Requirement Analysis Phase

The first phase of the OOSD model is the requirement analysis. In this phase, the problem statement and objectives of the project are outlined. The software of this project are Android Studio 4.2, Java Development Kit (JDK), Draw.io, and Firebase service. The hardware requirement of this project is a mobile device with Android 5.0 Lollipop and above. For developing and testing the applications, the specifications of the laptop are Intel Core i5-7200U 2.50GHz, 8 Gigabyte (GB) Random Access Memory (RAM), 1 Terabyte (TB) of hard drive.

3.2 Object-Oriented Analysis Phase

In analysis phase, several types of requirements are identified for the proposed application to ensure a quality application produced to the targeted users. The requirements included user requirement analysis, functional and non-functional requirement analysis.

Table 2: User Requirements of the Proposed Application

No.	User Requirements
1	User should be able to register and login to the application.
2	User should be able to edit their profile details.
3	User should be able to view car.
4	User should be able to make booking request.
5	User should be able to view booking history.
6	User should be able to view message of exceeding mileage limitation and extra fee charged
7	User should be able to logout the application.
8	Admin should be able to manage car.
9	Admin should be able to start and stop the tracking.
10	Admin should be able to view booking history sorted car
11	Admin should be able to view message of exceeding mileage limitation and extra fee charged.

Table 3: Functional Requirements of the Proposed Application

No.	Module	Functionality
1	Login	The application should allow user to login with correct email and password.
2	Register	The application should allow user to register as new user.
3	Edit Profile	The application should allow user to edit profile.
4	View Car	The application should allow user to view car.
5	Manage Car	The application should allow admin to manage car.
6	Booking Request	i. The application should allow user create and delete booking request.
		ii. The application should allow admin to accept or reject booking request of user.
7	Tracking	The application should allow admin to track the mileage of the car driven by user

Table 4: Non-functional Requirements of the Proposed Application

No.	Requirement	Description
1	Operational	The application is only available for Android operating system mobile devices with 5.0 version and above
2	Performance	The interaction between user and application should not exceed five seconds.
3	Security	User can access their account by with correct email and password only.

3.3 Object-Oriented Design Phase

In design phase, Unified Modelling Language (UML) diagrams are designed and illustrated to further understanding how the proposed applications are developed. Use case diagram is presented to show how the user can use the system or application to achieve the goal. It shows the interaction of the

user between the application and the functionalities of the application. The use case diagram of the proposed application is illustrated to show the interaction of user and application.

Figure 4 shows the use case diagram of the proposed application. There are two actors and 13 use cases in this diagram. The actors in the use case diagram are user and admin. The use cases include “Login”, “Registration as New User”, “Edit Profile”, “View Cars” “Manage Booking Request”, “Manage Cars”, “Update Booking Request Status”, “Car Tracking Registration”, “Control Tracking Application”, “View Booking History”, “View Car History”, “View Tracking History”, and “Logout”.

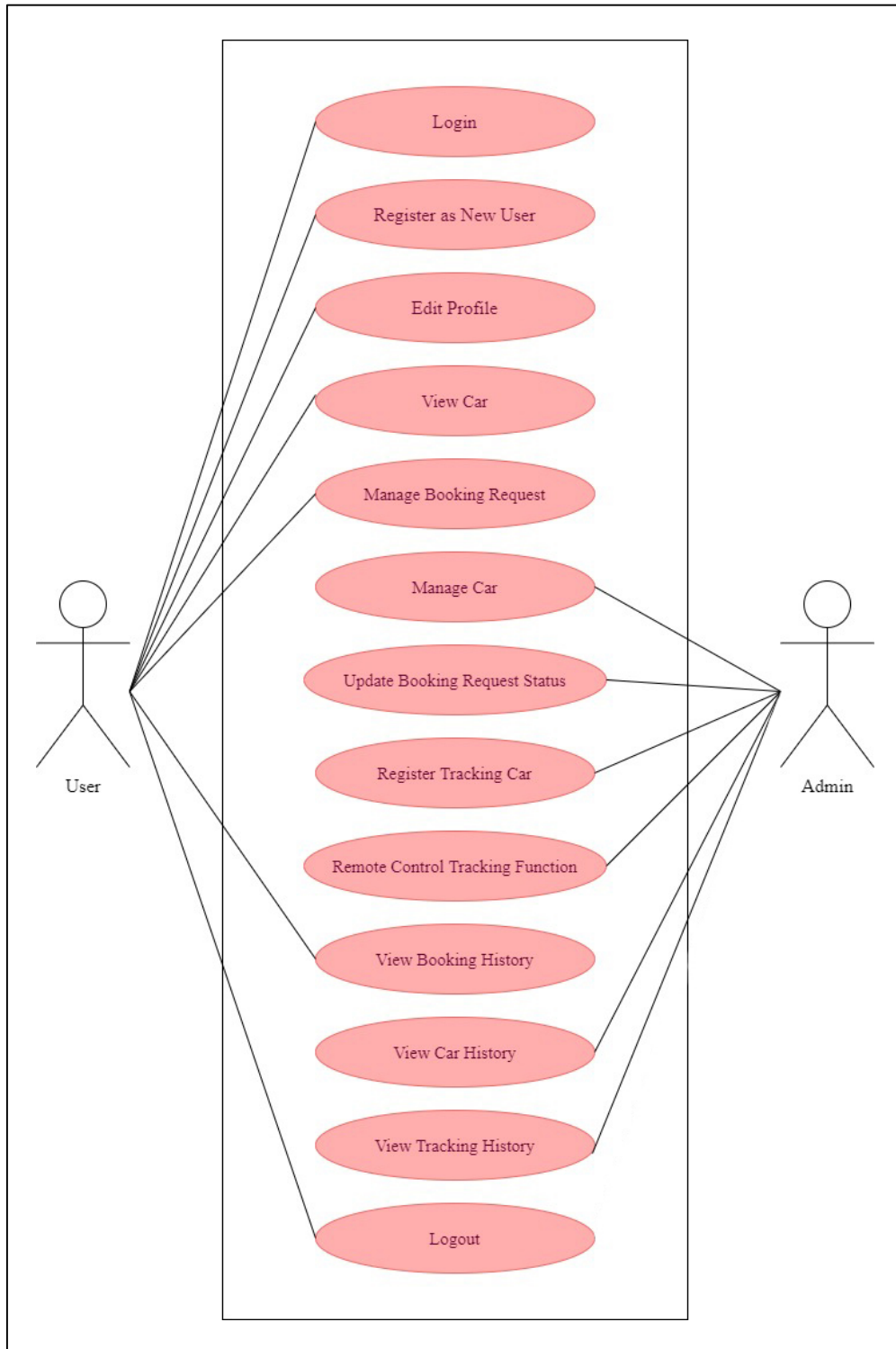


Figure 4: Use case diagram of the proposed project

The application can be accessed by the user and the admin. In “Register as New User”, a user able to register as new user with password at least 8 characters that include at least one uppercase and lowercase, number, and special character. “Login” use case requires the user to login based on the correct email and password that they have registered to access the account. “Edit Profile” use case allows the user to update their account information. Then, the user will be able to view the cars in “View Cars” use case and be able to make booking request for the car based on date and mileage or delete the request in “Manage Booking Request”.

Meanwhile, an admin can manage the available rental cars in “Manage Cars”. “Manage Cars” allows the admin to add, delete update and view the cars. “Update Booking Request Status” use case requires the admin to update the booking request made by the user whether to accept or reject the request. “Remote Control Tracking Function” use case allows the admin to star or stop tracking the mileage and location car driven by user. Before admin can track the car, “Register Tracking Car” use case needs to proceed first to register the car ID into tracking application based on the car. For “View Booking History” and “View Car History”, the user and admin able to view the booking history respectively. Admin will be able to book history based on the car. “View Tracking History” use case allows the admin to view the location travelled by car based on longitude and latitude. “Logout” use case will logout the user account.

Figure 5 shows the sequence diagram for login and signup. When user signup, the application validates the details of the user. If all the requirements are fulfilled, the application sends the user details to database and the user account is created successfully. When the user login with email and password, the user identity is authenticated from the database. If email and password matched, the user login is successful or otherwise.

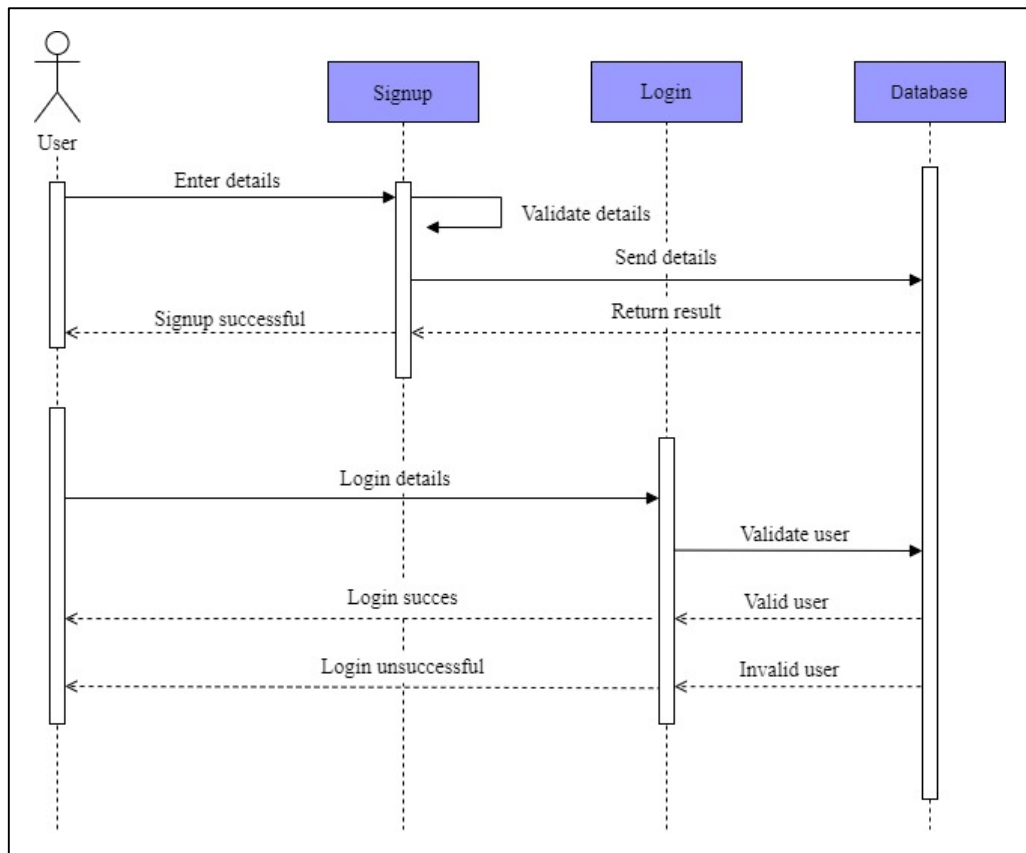


Figure 5: Sequence diagram for login and register

Figure 6 shows the sequence diagram for booking request and tracking. User able to make booking request from the application. If the user already has a booking request, another booking request will be unsuccessful. If currently does not have a booking request, the booking request made by the user can be successes. Both admin and user can view the booking request details.

Admin can register the car key to the tracking application. When the admin starts tracking in after a booking request, data like longitude and latitude of the tracking application will be fetched and the current mileage is calculated. The application can also display longitude and latitude, current mileage, and message if current mileage exceeds total mileage. The tracking stop once the admin triggers the stop tracking button.

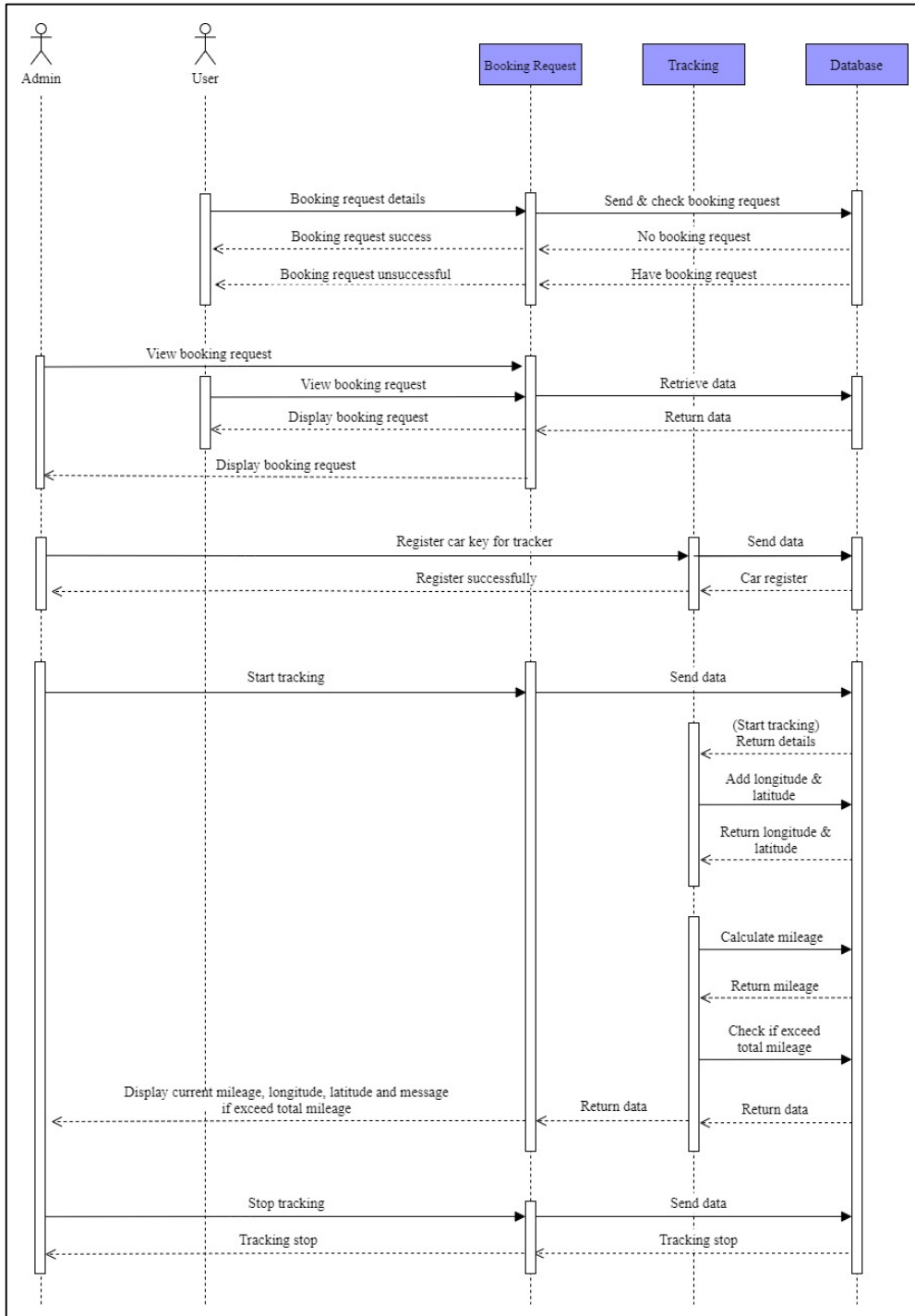


Figure 6: Sequence diagram for booking request and tracking

3.4 Object-Oriented Programming and Testing Phase

From the analysis and design phases, the applications stated to developed using Android Studio in Java programming language and Firebase Realtime Database. The applications are connected with Firebase by registering the app using the name of the packages, and adding the google-services.json file into app module root directory, and modify the Project-level and App-level build.gradle dependencies and implementation inside Android Studio. The project entered testing phase after programming phase. The functional testing is conducted to test the functionality of the applications.

4. Results and Discussion

In this section, further discussion about the implementation of this project and functional testing in Object-Oriented Programming and Testing Phase are presented.

4.1 Implementation

The project developed into three applications, which are user application, admin application, and tracking application. User application and admin application are separated instead of developing them in one application. This is to prevent unauthorized access through the admin modules. Figure 7 shows the signup and login interfaces for the user to access the user application.

In signup interface, the input will be validated. All the details are required to be filled. A message will appear show that which input fields are empty if user click sign up without fill in all the details. The application will also check the email format that user fills in whether fulfil the requirement. User must enter strong password with at least eight characters with uppercase and lowercase, number and special character. This is to prevent third party from attempt attacking the account using brute force method. User will also require to re-entering their password again in Confirm Password input field to confirm their password. User requires to read and check the checkbox to agree with the Terms of Services to sign up. All the requirements should be fulfilled including checking the Terms of Services checkbox, enter valid email address format, password and password confirmation matched, and strong password required before user can register account successfully.

In login interface, the user requires to enter their correct email address and password to login into their account. When login into the account, user email address and password will be authenticated before they can login successfully. In Firebase, all password will be hashed when store in the database. Every login successful account will be recorded down in Firebase Authentication.

The tracking application is also separated from user and admin applications. If the tracking function implemented in the user application, the application will track the user GPS location instead of the GPS car location. For example, if the user stops the car aside for a while and walking to other places that the car is not allowed to enter, the tracking function will also calculate the walking distance as the distance traveled should be the car mileage. Moreover, the retrieved location is the user location instead of the car location. Therefore, the user will get a phone that has the tracking application placed inside the car to calculate the car mileage and detect the car location. The car mileage and the tracked location are shown as in Figure 8.

Before admin can track the location, admin must register a car to the tracking application using the car key. A car key will be created when admin successfully added a car to the application. The car key is random generated key that can prevent fraud occurred. When click login, it will request for the permission to allow using location function in the phone. The location requests set the priority to `PRIORITY_HIGH_ACCURACY` to request the most accurate locations. Since Firebase cannot set database location under Malaysia, the nearest country to Malaysia, which is Singapore is selected as the database location to get the accurate location. It applied phone-based GPS tracking to get the current phone location. The tracking application will track the GPS location of car through the phone. The

longitude and latitude of the location will be recorded and displayed in tracking history including the date and time. It will update within two to four seconds. The starting location and the current location in longitude and latitude will be used to calculate the distance traveled by user using the rented car in mileage. The distance traveled in mileage will be displayed as current mileage in the interface.

The tracking application is developed to help the admin identify the distance traveled in miles by customers. This when customer drives beyond the total mileage that they book, the admin and the user will receive message of the exceed mileage limit and additional charges added in the total price. Figure 9 displays the exceeded mileage through the tracking application and the user application.

The location retrieved and date time in the tracking history can be used for police investigation if customer used the rented to commit crime. According to terms of services, customer is aware of the tracking system in the rented car, and admin has the right to disclosure the personal data to authorize third parties to eliminate or preclude any further damage. If customer used admin car for crime, admin has the right to provide the necessary information of customer, including the customer name, driving license, the car details, date and time of book and return the car, the location that they have traveled, to police to further investigation for closing the case. By providing this crucial information, the customer that is consider a suspect of the crime case will either be a wanted criminal or an innocent civilian according to the evidence and testimony of the case that police obtained.

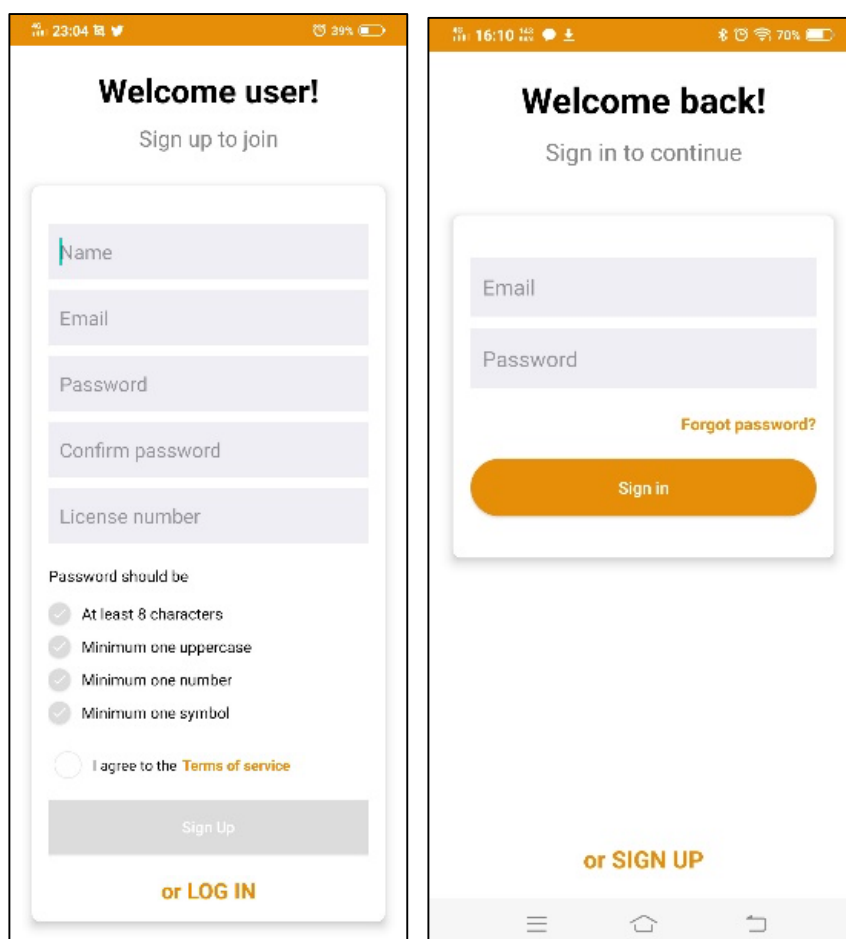


Figure 7: Signup and Login Interfaces

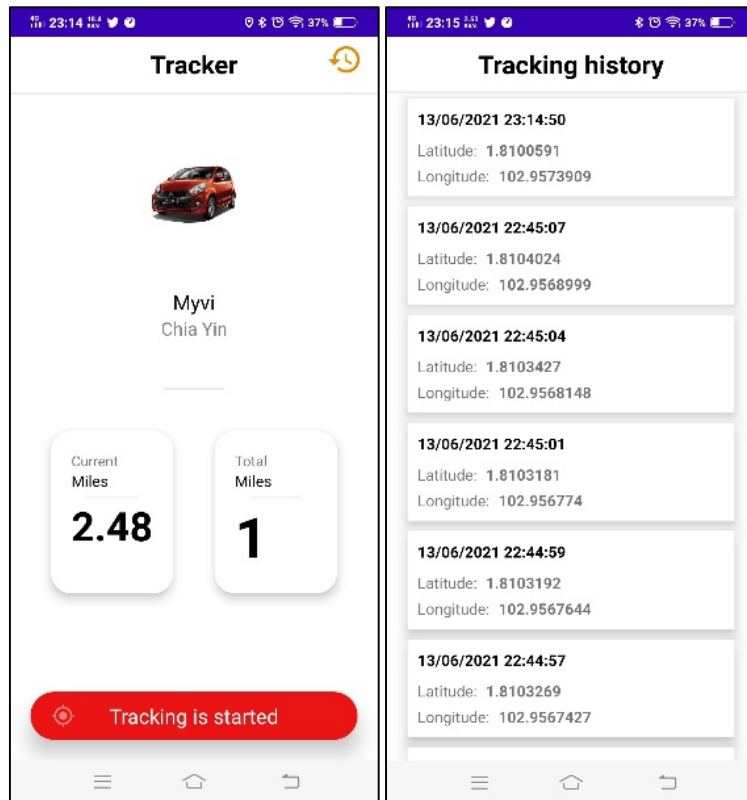


Figure 8: Tracking and Tracking History Interfaces

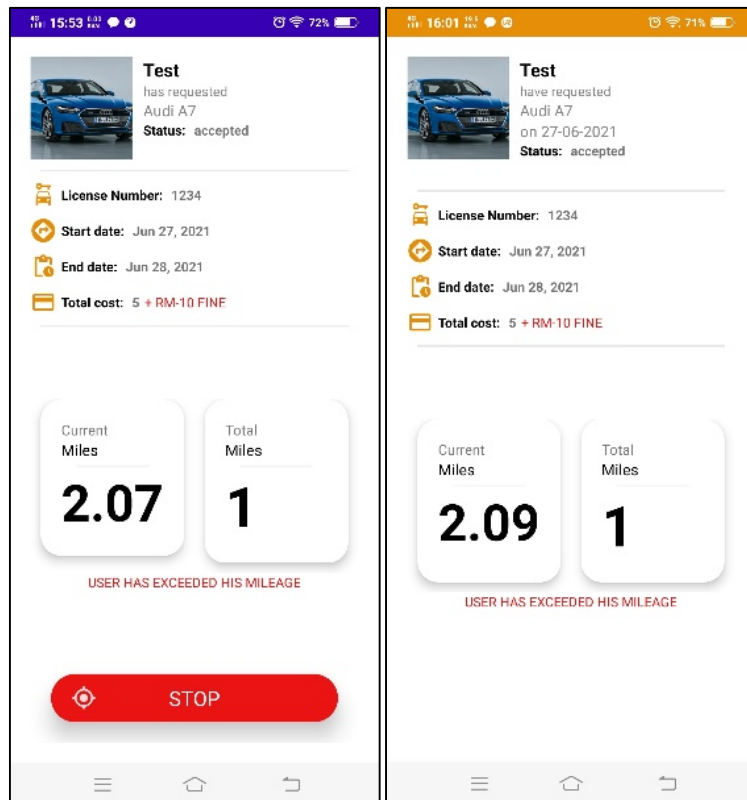


Figure 9: Exceed Mileage Message and Extra Fee Charged in Total Costs

4.2 Functional Testing

Table 5: Test for Registration Account Module

No.	Test Case	Expected Results	Results
1	Empty input field	Error message appears.	Success
2	Insufficient Password Requirement	Error message appears.	Success
3	Uncheck term of service	Error message appears.	Success
4	Fill all input field, achieve all password requirement, check term of services	Register successfully and login.	Success

Table 6: Test for Login Module

No.	Test Case	Expected Results	Results
1	Empty input field	Error message appears.	Success
2	Invalid email	Error message appears.	Success
3	Unmatched email and password	Error message appears.	Success
4	Matched email and password	Login successfully.	Success
5	Empty input field	Error message appears.	Success

Table 7: Test for Booking History Module

No.	Test Case	Expected Results	Results
1	View current mileage traveled	Display current mileage.	Success
2	View booking request details	Display booking request details.	Success
3	Exceed mileage message.	Exceed mileage and extra fee charged message appear.	Success

Table 8: Test for Manage Car Module

No.	Test Case	Expected Results	Results
1	Create, read, update and delete of car	Able to create, read, update, and delete of car.	Success

Table 9: Testing for Booking Request Status Module

No.	Test Case	Expected Results	Results
1	View booking request details	Able to view booking request details.	Success
2	Update booking request status	Update accept or reject booking request status. Tracking button appear if accept the booking request.	Success

Table 10: Test for Car History Module

No.	Test Case	Expected Results	Results
1	View current mileage traveled	Display current mileage.	Success
2	View booking request details	Display booking request details.	Success
3	Exceed mileage message.	Exceed mileage and extra fee charged message appear.	Success

Table 11: Test for tracking and tracking history module

No.	Test Case	Expected Results	Results
1	Start tracking	Tracking started when admin click start tracking button.	Success
2	Stop tracking	Tracking stopped when admin click stop tracking button.	Success
3	View current mileage	Display current mileage.	Success
4	View longitude and latitude	Display longitude and latitude.	Success
5	Register invalid car key	Error message appear.	Success
6	Register valid car key	Register car successfully.	Success

5. Conclusion

The three objectives of the Car Rental Application with GPS Tracking for Mileage Detection have been identified as to design, develop, evaluate and test the car rental application with GPS tracking for mileage detection.

The first objective of this project is to design a Car Rental Application with GPS Tracking for Mileage Detection. This objective has been achieved successfully, starting from gathering the information until designing the interfaces, database, use case diagrams, sequence diagrams and activity diagram.

The second achieved objective is developing the proposed applications with mileage detection. The tracking application able to track the distance traveled by miles using the tracking app and display it to user app and admin app. The tracking app is control remotely by admin whether to start or stop the tracking process. The admin application able to create, read, update and delete cars, update the booking request of user whether to accept or reject the request, remote control the tracker and view car history. The user application able to view and book car and check their booking history as well as edit their profile.

Last but not the least, the third objective which is testing the proposed application is also achieved. The applications are tested using Android phone that consists GPS. The applications function well in the tested android phone. The tracking application able to track the detect mileage traveled by customers by calculating using the starting location and current location in longitude and latitude and convert into miles. The longitude and latitude also able to display in Tracking History Interface.

In this project, users require to enter strong password to protect users from third parties' attacks like brute force attack. Short password or dictionary words are easy to remember but vulnerable to attacks [10]. Third parties will attempt to login to user account by trial and error on password of user account using brute force attack. Hence, strong password is a must for user to use the application in this project.

In Terms of Services, it is stated that user is aware of the existing of the tracking system in the rented car. User must read and check the checkbox to agree with the terms of services before the can register the account. The terms of services notified the user about the tracking application inside the rented car when they registered the account and agree with it to proceed the registration process. This will violate user privacy if the application does not state the tracking application. Users have the very right to know about tracking application when using the services. If user does not want to be tracked, they can choose not using the application for renting a car.

When admin transfer the rental car to user, user has to show their driving license to verify their identity based on the driving license number they have filled in in the registration. This information is important for admin if user attempt to steal the car. The driving license number and the car model and car plate can be provided to police to search and put in wanted criminal if user stole the car. The terms

of services stated that admin have the right to disclose the user necessary information if they have causes damage to their company.

There are several drawbacks identified in the application. Firstly, the tracking application results will delay if the mobile signal and data are weak in the area. The tracking application does not run at the background. When the phone auto locked, the application will stop function. Lastly, Admin Car Rental Project App does not require login to access.

Further enhancing and implementing necessary features and function can improve the application. The tracking application should be able function in the background. Admin app should include with login module.

Acknowledgement

The authors would like to thank the Faculty of Computer Science and Information Technology, Universiti Tun Hussein Onn Malaysia for its support and encouragement throughout the process of conducting this study.

References

- [1] R. Lessard, "17 cars stolen worth \$700K: Police investigating rental car theft scheme out of Manchester Airport," Ink & Link, May 22, 2020. [Online]. Available: <https://manchesterinklink.com/17-cars-stolen-worth-700k-police-investigating-rental-car-theft-scheme-out-of-manchester-airport/>. [Accessed Jul. 5, 2021].
- [2] F. Dori, E. Iadanza, R. Miniati, and G. B. Gentili, "RFID-based tracking and safety system," in IFMBE Proceedings, 2009, vol. 25, no. 12, pp. 188–191.
- [3] P. Grier, "The death of Korean air lines flight 007," Air Force Magazine, Jan. 1, 2013. [Online]. Available: <https://www.airforcemag.com/article/0113korean/>. [Accessed Oct. 10, 2019].
- [4] GISGeography, "Trilateration vs Triangulation - How GPS Receivers Work - GIS Geography," GISGeography, 2019. [Online]. Available: <https://gisgeography.com/trilateration-triangulation-gps/>. [Accessed Oct. 10, 2019].
- [5] S. Lehvävirta, S. Korpilola, and T. Virtanena, "Smartphone GPS tracking—Inexpensive and efficient data collection on recreational movement," Landsc. Urban Plan., vol. 157, Jan. 2017, pp. 608–617, 2017.
- [6] Jay Alabaster, "Android founder: We aimed to make a camera OS | PCWorld," PCWorld, Apr. 16, 2013. [Online]. Available: <https://www.pcworld.com/article/2034723/android-founder-we-aimed-to-make-a-camera-os.html>. [Accessed Oct. 10, 2019].
- [7] SOCAR, "SOCAR - Free yourself. Own the experience," 2019. [Online]. Available: <https://socar.my/>. [Accessed Oct. 10, 2019].
- [8] Kwikcar, "Discover Cars for Rent from the Community | Car-Sharing App - Kwikcar," 2019. [Online]. Available: https://kwikcar.my/index#how_it_works_page. [Accessed Oct. 10, 2019].
- [9] S. Yogesh and R. Malhotra, Object-Oriented Software Engineering. PHI Learning Pvt. Ltd., 2012.
- [10] M. Yıldırım and I. Mackie, "Encouraging users to improve password security and memorability," Int. J. Inf. Secur., vol. 18, no. 6, pp. 741–759, 2019.