

Software Development Final Project

Driving Companion App

Functional Specification

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1. Introduction

This Functional Specification Document is part of my final year project in ITCarlow Software Development Year 4. I decided to develop a mobile app called the "Driving companion app". The app will score and give feedback to drivers by monitoring their driving behavior.

The document will define various functions and architectures for this application, target user groups, design diagrams and use cases, describe each function in this application, achieve success, get inspiration, etc. This document aims to help build knowledge on the topic and facilitate the subsequent phases of the project.

Driving Companion App is a mobile phone application that analyses the user's driving behavior, obtains data from the monitoring process, and gives scores and feedback to improve driving behavior. This document is to define the various functions and architectures of the application. How the application monitors the driving, what kind of data is needed during the monitoring process, and how to give scores and feedback are all defined in detail.

By defining each function's description and role in detail, the application can be more clearly developed and established.

2. FURPS

This section is a list of detailed definitions about this application and sets a clearer development aspect:

2.1. Functionality

2.1.1 Core functionality

2.1.1.1 Monitor

The monitor function is to record and track data, including speed, time, location, environment, etc., In the backend, while the user is driving. The recorded data will be retained and provided with other functions for further data analysis. In the front end,

helpful information is also expressed to the driving user, such as the speed limit of the road section and the current position on the map, etc.

2.1.1.2 Score

The score function analyses the data obtained in monitoring driving, giving users the most straightforward understanding of the quality of their driving behavior - it is "score". A score of 100 is the highest, and a score of 0 is the lowest. For every mistake, it seems that speed up or speeds down is too fast, the max speed exceeds the road speed limit, most of the time cannot reach the average speed, etc., both are reasons for the score reduction. This function will finally give a score with a reference value, and the system can compare the user's score with other users. It will encourage users to improve their driving skills to get better scores.

2.1.1.3 Feedback

The feedback function is to perform data analysis based on the data obtained in the driving monitoring process. It will point out where the driver made a mistake and mark it on the map. And use the rating bar to show the user's level of driving ability. And also it will give comments and suggestions for improvement.

2.1.2 Secondary functionality

2.1.2.1 Authentication

This application will require the user to create a personal account and log in to obtain access to use various functions. The purpose is to record and retrieve the user's data in the database.

2.1.2.2 Profile

Users can see useful information about the account, such as average driving score, total driving time, and total distance traveled.

2.1.2.3 History

Users can retrieve previous driving records and scores and review the driving route and driving errors in detail.

2.1.2.4 Ranking

Users can compare their driving scores with other users and encourage users to improve their driving skills to improve their scores and strive for higher rankings.

2.2. Usability

This application should focus on the actual user experience because there are a lot of kind users. There may be young drivers, old drivers who may not be familiar with using mobile apps or may not have much experience using mobile apps. The positioning of this application to the user does not require complicated operation requirements. The operation must be simple and easy to understand. Creating a new account and logging in must be quick and easy. Don't make users fill their profiles with too much non-essential information. Users only need an email address and set up a password to create a new account and log in. The operation of driving monitoring must be the simplest, do not disturb the driving, all complicated data tracking will automatically continue to be done in the backend. The driver only needs to focus on driving and will view the result after the driving is completed.

2.3. Reliability

This app is reliable, stable, and compatible with older Android versions, such as Android 8 from a few years ago, for smooth and fast execution. The display must be smooth while driving, the data tracking speed and position must be accurate, the driving can continue to be monitored in the background, the execution should be stable, and the application will not crash.

2.4. Performance

Flutter was selected as the development platform for this application, which means that it can achieve high performance. It can create applications to execute at 60

frames per second of speed. The transition between pages is smooth and seamless. In developing this application program, the simplest and easiest operation is required, and the coding and algorithms are as simple as possible to complete all functions in this application. Improving the application's performance is the highest priority to provide users with a good user experience.

2.5. Supportability

This application should be able to support extended functions and subsequent updates. Flutter is used as the development platform. Since it is one of the most popular mobile application development platforms, the backend toolkit is constantly being developed, which means more new Functionality can be increased in future. Moreover, the development process of this application will ensure that the components of each function are independent and can be added and deleted without affecting other parts.

3. Use Case Diagram

This section is the simplest form of using a diagram to represent the interaction between the user and the system.

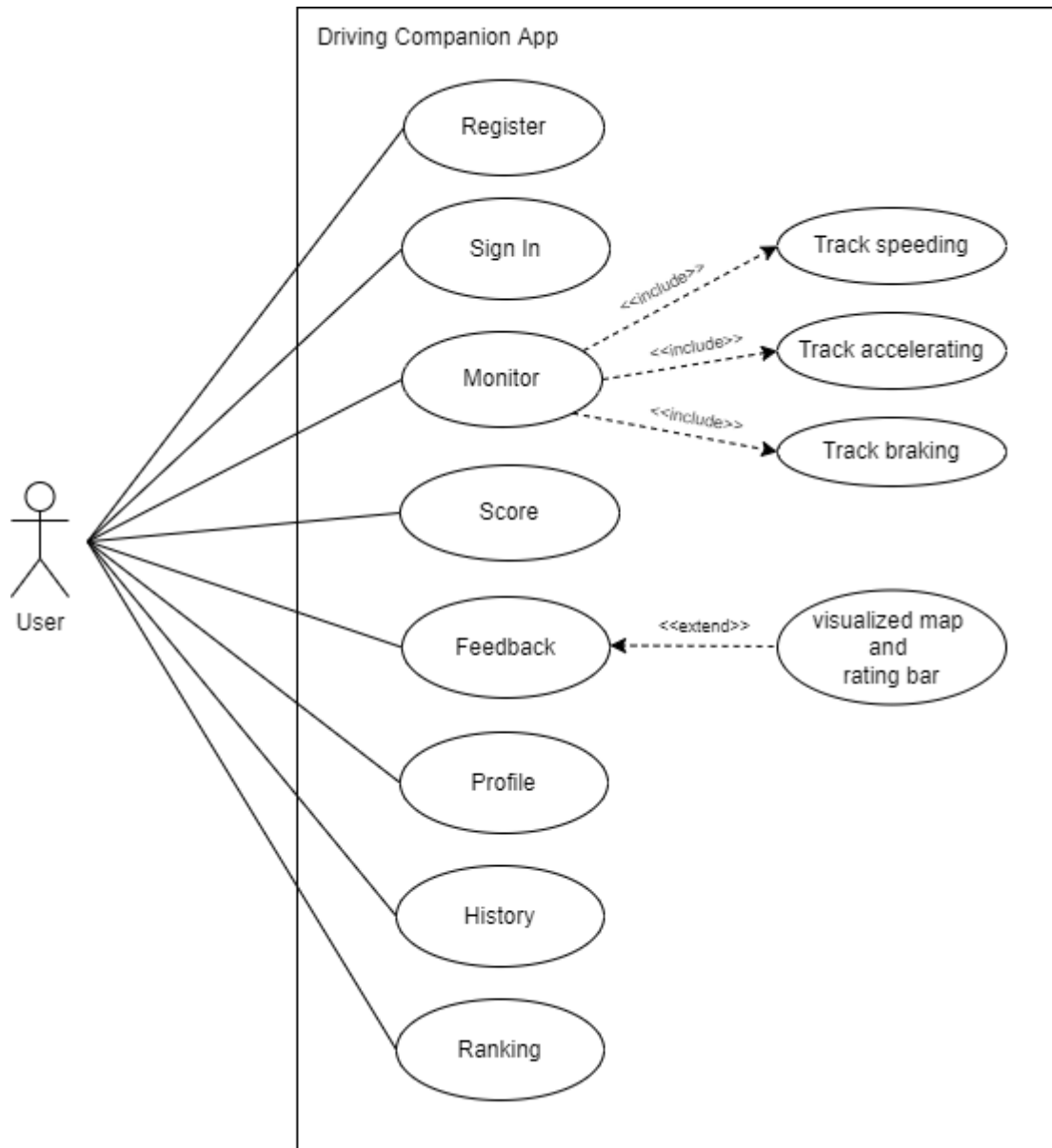


Fig 1 - Use case diagram

4. Detailed Use Case

This section is a description of the details, objects and processes of each use case.

Detailed Use Case:	Register
Primary Actors	New User
Brief Description	Register an account for new users to record user information and identify users, as well as record all user-related activities
Main Success Scenario	<ol style="list-style-type: none"> 1. User enters the homepage of the application 2. User will be asked to enter the username and password 3. New users need to press the "register" button 4. The system will display a form for the user to fill in, including the email address as the user account and set up password, and other personal information 5. Press "send" button to submit the form 6. New account is created and registration completed
Alternatives	5a. After the user pressed the "send" button, the system will check whether the username is duplicated and whether it has passed the validation of each textfield. If it fails, the system will display an error and request to fill in the form again

Detailed Use Case:	Login
Primary Actors	Registered - User
Brief Description	Users who have registered accounts, before using this program, need to enter their username and password to login, If the account name and password are correct, the user will have the authority to use the system
Main Success Scenario	<ol style="list-style-type: none"> 1. User enters the homepage of the application 2. User will be asked to enter the username and password 3. Press the "Login" button to send the username and password to the system 4. After the login is successful, the system allows users to use the functions of application
Alternatives	3a. If the username and password are wrong, the system will ask the user to enter again

Detailed Use Case:	Monitor
Primary Actors	Logged-in User
Brief Description	When the user is driving, the system will monitor the user's driving behavior. The system will track and record data such as driving speed, time and distance for further data analysis.
Main Success Scenario	<ol style="list-style-type: none"> 1. The logged-in user selects the option "Monitor" in the main menu of system 2. The system will show the "Start" button 3. When the user starts the driving who has to press the "Start" button 4. The system will track and record speeding, accelerating, and braking during driving in the backend. 5. After the user finished the driving who has to press the "Stop" button 6. The system will record the data obtained during the monitoring process for further data analysis
Alternatives	5a. If the user does not press the "Stop" button and shut down the system after finishing driving, all tracked data will not be recorded

Detailed Use Case:	Score
Primary Actors	Logged-in User
Brief Description	Users can view their driving behavior scores, and the system will analyze data based on the data obtained during monitoring driving in the past, and give scores.
Main Success Scenario	<ol style="list-style-type: none"> 1. After the user completes the driving monitoring, press the "Stop" button. 2. The data of the driving record will be analyzed by the system, and the score will be displayed to the user.
Alternatives	1a. Users can retrieve the driving record from the "History" and review the scores

Detailed Use Case:	Feedback
Primary Actors	Logged-in User
Brief Description	The system displays the obtained driving data in the form of a map to show the entire route, points out the driving error location, and demonstrates the user's driving ability in all aspects.
Main Success Scenario	1. The user presses the "Details" button on the page where the driving score is obtained

Detailed Use Case:	Profile
Primary Actors	Logged-in User
Brief Description	Users can see useful information about the account, such as average driving score, total driving time, and total distance traveled.
Main Success Scenario	1. The logged-in user selects the option "Profile" in the main menu of system 2. Information about the user will be displayed.

Detailed Use Case:	History
Primary Actors	Logged-in User
Brief Description	Users can review their previous driving records, sorted by time, from newest to oldest.
Main Success Scenario	1. The logged-in user selects the option "History" in the main menu of system 2. A list of past driving records will be displayed. 3. User selects a record and presses "Details" to view.

Detailed Use Case:	Ranking
Primary Actors	Logged-in User
Brief Description	Users can see a ranking table of all other users, including their own, ranked by driving score, from highest to lowest.
Main Success Scenario	<ol style="list-style-type: none"> 1. The logged-in user selects the option "Ranking" in the main menu of system 2. A list of ranking tables will be displayed.

5. Target Users

This application is aimed at any driver, including new learners, young people drivers, elderly drivers, and even drivers with many years of driving experience.

On the personal side, users can test their driving ability. Even a driver with many years of driving experience may follow many years of bad habits. Use this app to understand their driving behavior and make improvements.

On the commercial side, For example, the insurance industry and bank car loans can use this application to evaluate their customer's driving ability. It may help to customize insurance premiums and loan limits and reduce losses on time. The transportation industry can also conduct tests for its employees, and it may help find some potential risks early.

6. Success Metrics

This section is defined the metrics that gauge the success of the project as below:

- The app is compatible with older Android 8.0 systems and above.
- The application can access the GPS function of the phone to obtain location information.
- Users can easily create new accounts and log in easily.

- The user can simply use the monitoring function to press the "Start" button before departure and the "Stop" button to finish. The driver will not be disturbed during the monitoring.
- The application can accurately analyze the data and give trustworthy scores and feedback.

7. Precedent

On the market, there is a comparable application called DriveSmart, and the research conducted the subsequent investigation as below:

7.1 DriveSmart

DriveSmart is a free mobile app that monitors users' daily driving. It will record all user trips according to user brake, accelerate, turn, react to signals, proper speed, etc. It can analyze and give feedback to improve how users can drive comfortably and safely and become good drivers. It also includes driver certification.

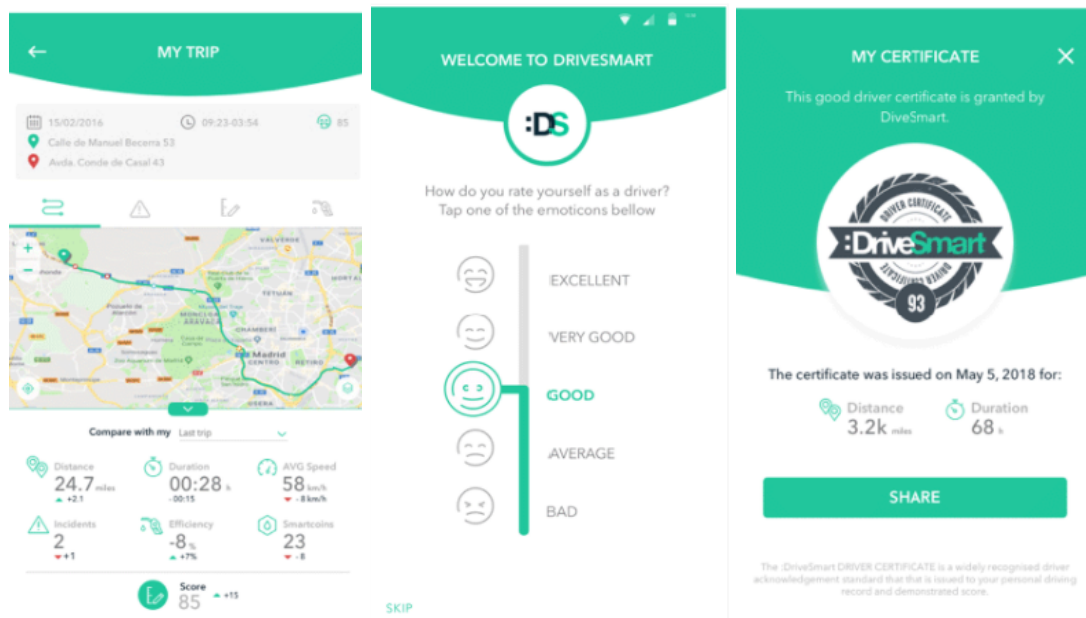


Fig 2 - DriveSmart screenshot

Features include as follows:

- Can create an account by using Google or Facebook account;

- The operation is simple, press the “Start” button before starting the trip, and press the “Stop” button after arriving at the destination;
- Rating drivers are divided into five categories “Excellent”, “Very Good”, “Good”, “Average”, “Bad”;
- Through driving to get smart coins, when users collect these coins to a certain quantity, unlock achievements and upgrade the driving level to gold, silver and bronze, etc.
- It can provide a free digital driving skill certificate for good drivers.
- Users can leave comments to the development team under support center services

Compare this project and DriveSmart:

The similarities or worthy of reference:

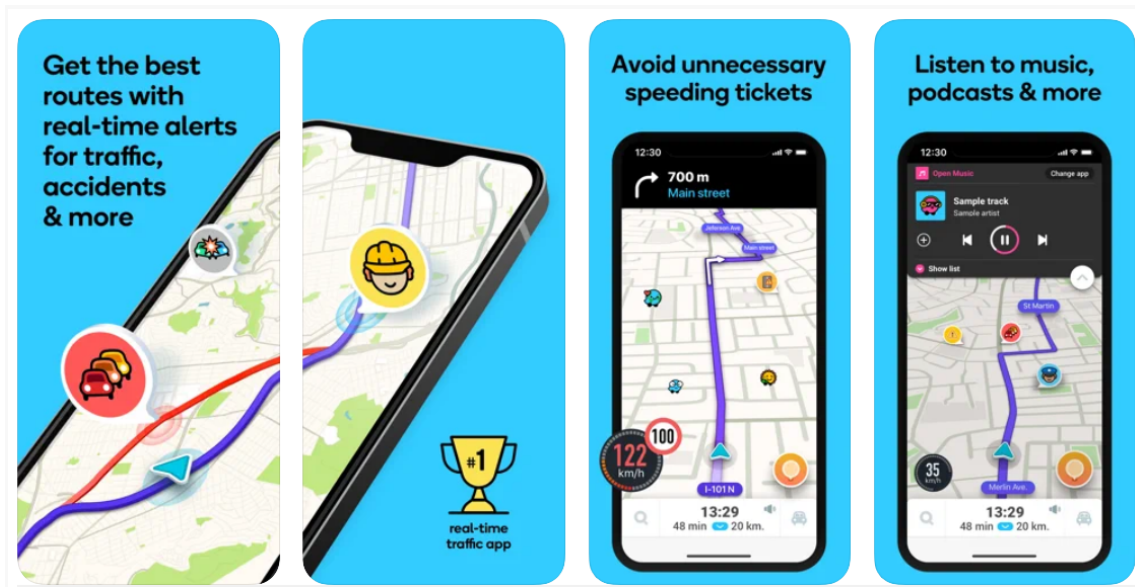
- The operation is simple "Start" and "Stop" buttons to perform drive monitoring, and users do not need to be distracted by the app while driving;
- Based on the user's driving behavior to give points, such as speed, acceleration, braking, etc.;
- Rating drivers may be very similar.

The difference:

- No gold, silver and bronze grades;
- No driving certificate;
- No support center for human resources;
- The Project App will compare scores with other drivers.

7.2 Waze

Waze is a driving navigation program; it can plan routes and provide real-time traffic conditions, speed cameras, traffic accidents, etc. Other users can report traffic congestion to effectively plan better routes for other users.



Features include as follows:

- The excellent navigation system will find the best route to the destination
- Report real-time traffic conditions and change routes in time
- Provide nearby gas station prices
- Help find the most suitable parking space
- Can display current car speed on the interface

The functions of Waze and this project are in different directions. Waze is mainly used for navigation and does not score and feedback for driving behavior. Still, its excellent map information and real-time traffic reporting functions are worthy of reference for some of the additional parts used in this project.

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