Bilkent University

Department Of Computer Engineering

Senior Design Project

Carpus

Project Specification Report

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Contents

1. Introduction

Nowadays, transportation is a big part of people's lives. People can travel easily from one place to another using different types of vehicles. Some of the most popular vehicles are undoubtedly cars and motorcycles [1]. Almost 67 million cars are produced per year and the number keeps getting bigger [2]. Recently, the increase in the use of these vehicles has started to harm the environment and the resulting traffic corrupts the daily lives of individuals. A typical car emits about 4.6 tons of carbon dioxide a year [3]. In addition, most of a car's environmental impact, around 85 percent, comes from fuel consumption and emissions of air pollution and greenhouse gases [4].

Our goal in creating Carpus is to reduce both traffic and gas emissions in Ankara by allowing Bilkent University students to share vehicles alternately via a mobile application.

Description of Carpus, various constraints, professional and ethical issues related to Carpus, functional and non-functional requirements are discussed in the following sections of this report.

1.1 Description

Carpus will be designed as a mobile application for university students to use their personal vehicles together with other students to get to the university campus. Our aim in this project is to reduce the number of vehicles used, reduce carbon emissions and the resulting traffic density. By using Carpus, the vehicle owners determine the time and date they will go to the campus for each weekday. According to the provided schedule, our algorithm will create groups from 3 or 4 users who live close to each other, then assign routes for each participant in a group to pick up the other participants and go to the university campus. Since a group’s schedule is the same, next week this route will be assigned to another participant.

Active map service will be provided to the application users to keep track of where the car is. In this system, the shortest and most economical route to the campus will be provided. Also, for the safety of the users, the users must provide their university

email addresses during the registration and the face of each user must be provided as a profile picture so that group members can recognize each other.

1.2 Constraints

1.2.1 Implementation Constraints

- Git and Github will be used for seamless collaboration between team members and version control.
- Carpus will be developed as a mobile application.
- Android Studio will be used to implement Carpus.

1.2.2 Economic Constraints

- Carpus will be a free application for all users.
- To publish the application on Google Play Store, a registration fee of $25 will be paid for once [5].
- Tools that will be used to develop Carpus are available for free.

1.2.3 Sustainability Constraints

- User feedback will be taken into consideration to improve the app and satisfy users' needs.
- The application will be able to handle many user data and won’t corrupt when more users start using it.

1.2.4 Ethical Constraints

- Users will have to share their location with us.
- User information won’t be shared with third party organizations.
- Full address of a user won't be shared with other users.

1.3 Professional and Ethical Issues

- Carpus will conform to the IEEE code of ethics of engineers [6].
- Carpus will store user passwords in an encrypted form in the database.
- Carpus will not share user information with any third party software without user consent.
- Carpus will be a closed source project.
- Each team member will respect other team members and users to keep the work professional.
- All team members will share the workload and leadership.

2. Requirements

2.1 Functional Requirements

2.1.1 User Functionalities

- Users can register their cars to the system through its license plate number.
- Users can register their university ID numbers to the system.
- Users can mark their location on the map.
- Users can view other registered cars on the map.
- Users can share their destination and departure time on the map.
- Users can register for shared trips.
- Users can rate car owners which they have travelled with.
- Users which are car owners can rate other passengers.
- Users can make weekly planning in certain groups.
- Users can donate a certain amount to the vehicle owners.

2.1.2 Server Functionalities

- Server saves license plate numbers to the database.
- Server saves university ID numbers to the database.

2.1.3 University Administration Functionalities

- University administration can check whether car registered to the system is allowed to the campus or not.
- University administration can check whether the student is allowed to the campus or not.

2.2 Non-Functional Requirements

2.2.1 Accessibility

- The application should be accessible from devices which has a proper version of Android.

2.2.2 Usability

- The application should be user friendly and easily adaptable for users and university administration in terms of user interface.

2.2.3 Availability

- The system should be available and operate consistently.

2.2.4 Security

- Since only the university students are permitted to use the application, license plate number and university ID number should be verified and sensitive information such as passwords should be encrypted.

2.2.5 Scalability

- The application should operate within 10.000 users.

2.2.6 Legality

- The application should have necessary permissions from university administration to include student ID numbers.

2.2.7 Performance

- The application should operate fast in terms of launch and login time.
- The application should display available trips in at most 15 seconds.
- Battery consumption for the application should be low.

2.2.8 Response Time

- Response time for the application should be at most 5 seconds in order to improve user experience.

3. References

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