

A Design of QU_Car-Pooling System

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Abstract - Carpooling has become a convenient, affordable and stress-free way to move around with increasing environmental concerns and road congestion. As students, we think there should exist more suitable transportation solutions to places where transportation networks are short. Our project, named QU_Car (Qassim University Carpooling), proposes a platform to help students to share their private vehicle with more people in order to save time and reduce costs. This paper provides an overview about Carpooling systems, discuss the proposed QU_Car system and present the design of our system.

Keywords: carpooling services; transportation; driver; passenger.

I. Introduction

Qassim University is located 20 km or more away from most of the Al-Qassim region and its governorate. The average car entrance to the university almost 30 K cars daily. There is more than one-way to transport (Buses, Peer-to-Peer ride-sharing, private transportation).

Students sometimes have a hard time conciliating their schedules because of the way they move from one location to another. We think there should exist more suitable transportation solutions to places where transportation networks are short. A carpool program is any process that simplifies a car driver giving a lift to another person, often involves arrangements between groups of people who may not initially know each other [1].

Our objective is to propose a new “QU_Car” (Qassim University Carpooling) system to help improve one’s mobility through carpooling. QU_Car will help students and faculty members of Qassim University to use their own car to share the journey with each other. The main objectives are to save time, to reduce costs and to protect the environment.

The remaining of this paper is organized as follows. Section 2 discusses the motivation and problems related to our project. Section 3 outlines a literature review of the current works for Carpooling system. Section 4 describes our proposed “QU_Car” solution. Finally, section 5 concludes this paper.

II. Problem and Motivation

The traffic congestion, the waste of fuel, the environmental pollution represents the main motivation for this project. In Qassim University, there is no parking inside the building. It will take a lot of time to find the parking outside. If the parking is finding, passengers will have to walk, which will take a long time to reach the building.

The problematic of our project can be summarized in these two main problems:

- **Time:** there are more than one-way to transport (Buses, Peer-to-Peer ride-sharing, private transportation). The bus has a specific time to go and go back. It navigates numerous students about 20 students or more. For example, if the student ends her lecture at 9:30 they cannot go back home before 3 p.m. because the bus is only moving after the university's office hours.
- **Price:** the cost of private transportation is very expensive for female students. Their prices range from 600 to 900 SR per month, which is a fixed price, however, the distance between passengers varies. In addition, there is insufficient information about the vehicle owner. The vehicle is not equipped with a security design because there are some drivers of the vehicle that removes the car seats to accommodate numerous students. There is no point or application combining vehicle owners with female students or female employees.

III. Literature Review

Carpooling has become a way to move around in a practical, inexpensive and stress-free way. Carpooling is when the driver shares with one or more passengers his own car to ride. As we have fewer cars on the road, it reduces emissions. Saving time and money is also valuable.

In this section, a related work is discussed in order to show the importance of our proposed research in the area of Carpooling. Our literature review arranged in chronological order.

In [2], authors have studied many car-pooling application in IOS. For social media, DB Navigator offers a one-stop shop for planning public transport trips in the Netherlands via media such as web, application, call center, Twitter and Facebook. Therefore, the brand remained very strong: more than 500,000 trips are planned annually [2]. For the price Qixxit application allows users to choose the best and cheapest way to go and for Qixxit interface they have a unique interface. To communicate, Moovit and Mobile Ninja are considered as the best applications since they ask users to share their experience and information [2].

In [3], the authors studied how users can contact with each other without revealing their private mobile phone numbers.

In [4], Thanh & al. have provided an intelligent system for ridesharing service called i-Carpool. They have developed a software client working on the Android platform to help users to communicate to each other using their smart phones.

Prem Prakash & al. have studied carpooling system, which provide more security for female users and non-smokers. The proposed application collect all features, which are required to make sure that all provided services, are secured and efficient. [5]

In [6], Ashish & al. have studied how to cover security cases with woman travelers in mind. They propose a system and make it more secure and reliable system for females. A woman who is wanted to get ride choose "Female drivers" as filtering options, which will not only drive more woman to use this system.

In [7], System depends on the application to attract more users and help them find passengers. Users should be able to share their behavior on the social media platform. A plan for the creation of sharing trips, the registration or check-in of trips must pop up whenever the previous activities are carried out. The sharing should be allowed by the users and not automatically done by the application to spam the account of users and gain the user's confidence.

The feature of the proposed system in [8] relates to security: the user must authenticate to any fake account when the application is enabled on an android phone. All contact will be stored and a valid ID must be given by any client to allow the program to be used. In the case of an unexpected accident, details of each trip can be found on the server, if any, to trace the alleged perpetrator.

Guiliang & al. have been researching the development of a commute carpooling program based on fixed time and

routes. The creation of a carpooling data network and the functions achieved including information retrieval, information matching, mutual selection and mutual assessment [9].

Authors [10] also learned how to render the application very robust and omnipresent enough to hit a global user base successfully. Make it available on different mobile and desktop platforms as well. In addition, using real-time passenger requests coupled with the real-time vehicle leading user's 'live map' location data.

In [11], the researchers presented an overview of the Carpooling process with SMS warnings which concentrated more on solving previously encountered problems and how they could be made safer. They gave the idea of using it for inter-city as well as intra-city travel. They tried to extend their users base to the blind people who could also use speech recognition software at any time to know the exact location.

Maurizio Bruglieri and others researched the university system of using vehicles. PoliUniPool application coupled with a matching proposal between users to save time. The system provides their trips with the planned timetable. In the event of delays or adjustments, customers are notified immediately to increase the quality of the service [12].

In the following, we present a comparative study of the recent systems presented above.

TABLE 1
Comparative Study

	Modalities	Static services	Dynamic services	Various (feedback)
Kostas Kalogirou et al. (2018)	*	*	*	*
Mustafa , Ensar (2017)	*	*		*
Premprakash et al.(2016)	*	*	*	
Reda Aissaoui (2015)	*	*		*
Guiliang et al. (2014)	*		*	*

Table 1 shows the comparison between these systems using these different criteria: modalities, statistic services, dynamic services and various (feedback).

Based in our comparative study, we can conclude that:

- All proposed system takes into account the modalities.
- The majority of systems provide static services for users such as tickets and payment service, search of nearest stop service.
- Only the system proposed by Kostas Kalogirou et al. [2] take into account the modalities, static services, dynamic services and the feedback of users
- Inspiring of these systems, we think it is important to take into consideration these criteria to propose our QU-Car system. We think, also, the feedback of passengers is a very important to improve the services provided by the drivers.

IV. Proposed QU_Car System

This section is devoted to present the proposed system, its architecture and its process. In addition, to look at the appropriate technologies to use it within the proposed system.

A. Proposed theory

The proposed framework is a *QU_Car* for the students and staff. The *QU_Car* is divided into two users. The first user is a driver. She/he is who determines the course of the journey and its time. The second user is a passenger. He/she who chooses the journey. They can register in one day as a driver and on the other day as a passenger.

Accordingly, collected information about the safety and borders, design how to communicate and the environment.

B. Proposed system

After studying and review existing techniques used in carpooling, most of these carpooling is unsatisfactory to users, there is no tabular application that combines drivers and passengers. The results of these, some drivers are asking a high price for the trip. To overcome these problems, we propose to develop this project using Android application to overcome the weaknesses of other available carpooling. Choosing Android is due to the huge number of users who use Android devices and that Android is an open source operating system, thus allowing some parts of the program to be reused to create a new application. The resources are well documented and resources can be found online to learn how to implement applications for this platform.

The following figure shows the architecture of the proposed *QU_Car* system.

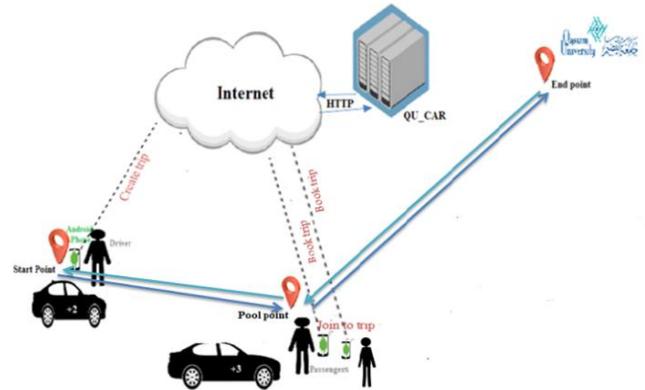


Figure 1: QU_Car system Architecture

C. Data Flow Diagram for QU_Car system

In this section, we present Data Flow Diagram (DFD) of our QU-Car system. We used this diagram to graphically represent the flow of data in our proposed system.

The following figure describes the processes that are involved in our carpooling system. It includes login process, create trip process, reservation process, book a trip process and display available trip process.

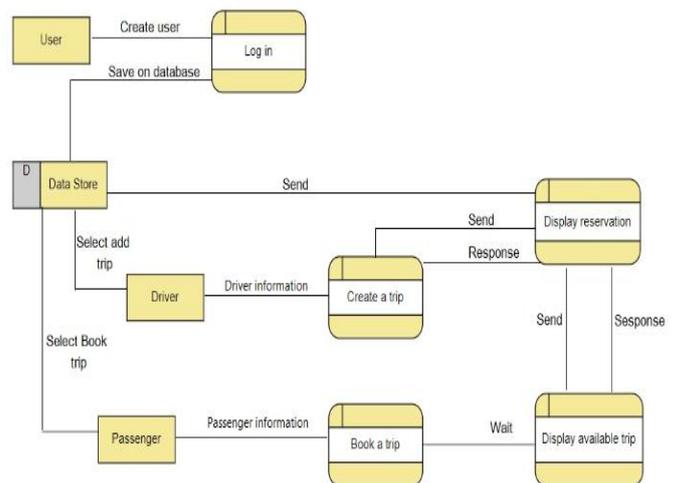


Figure 2: Data Flow Diagram of QU_Car system

V. Conclusion

In this paper, we propose a carpooling system called QU-Car (Qassim University Carpooling). The proposed platform helps in improving one's mobility through carpooling system. It is a way for car drivers to share their private vehicle with

more people with the prime goal of splitting and reducing costs.

Develop a carpooling application server and a mobile application for the students of Qassim University and its employees to access the carpooling service through their smart phones.

Currently, we start the implementation phase of the QU_Car system to be later tested and used by our Qassim University.

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