IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 6, Issue 6, June 2017

Carsharing – A Web and Mobile Application using MEAN Stack

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Abstract: Using Carsharing concept, people can share cars that are travelling to same destination. The Carsharing is a web and mobile application which will provide the best way to share rides by creating and browsing or searching rides through this application. With the help of this application number of vehicles on road will be reduced. Thus this application will help to reduce the problems of traffic jams. Fuel combustion also will be reduced. Application also helps to control the pollution and maintains green environment.

Keywords: Carpool, MEAN Stack, Efficient travel, Go-Green initiative.

I. INTRODUCTION

Nowadays, transportation is one of the major issues. One of the most used means of communication in roadways. One of the prime forms of road transport consists of the private cars. These cars are generally used with only a single rider. An overabundance of cars creates various problems which include increased traffic, increase pollution, parking congestion and many more also in recent years, the problems of global warming and the energy crisis have aroused widespread public concern [1]. There are several methods to reduce the impact were public transport, non-conventional fuel resources and walking/cycling is used to reach destination. The advantages of the above solutions are reduction in the amount of pollution as well as lowering of road congestion. However, public transport is not a well-developed system in can harness the automobiles. Our intent is to make a system which aims to remove all of the above discrepancies. We plan to create a Carsharing application India and apart from the inconvenience with respect to time, it has also been usually unreliable. Though non-conventional fuel resources attempt to stem pollution, no proper measure has been devised in a cost effective manner which gives users the same kind of flexibility that a private car gives which can reduce the number of vehicles being used at the same time. The recommended solution for reducing the harmful effects of the above problems is carpooling. This type of transportation service could make a big difference if they are organized on a large scale by government or big companies, particularly large corporations with many branches or sub companies can favour the most. Carpooling schemes are designed in such a way that they encourage commuters to share travel expenses and resources with colleagues. Carpooling is the sharing of cars by the driver and one or more passengers, usually for commuting. Carpooling arrangements and schemes involve varying degrees of formality and regularity. Car sharing aims at solving this problem by targeting all the vacant seats in the private cars [2]. Employees of the same area or the students going to the same school can carpool; this can be done because they know each other and can communicate [2]. But when going on an intercity trip you are not aware if some other person also intends to make the same journey. Thus the applications helps you in seeing people and journey schedules and make an informed decision about do you wish to travel alone or save money and travel with a safe company. Furthermore, carpooling has documented social and environmental benefits that include: It helps in reducing traffic congestion as number of vehicles on the road can be reduced significantly.

II. PROBLEM DEFINITION

To develop an application that addresses the issues such as reducing fuel consumption, cutting down the expenses, decreasing the carbon emission, hence reducing global warming and traffic congestion.

III. LITERATURE SURVEY

The growth of urbanization is propagating rapidly and hence people are preferred to travel in their own vehicle rather than using a public transport system. Therefore the problems in global warming, traffic congestion, depletion of fuel arises. A social based community for carpooling has been proposed for both the rider and the passenger in order for reduction of fuel costs by sharing among the fellow passengers [3].The implications for environment sustainability are sufficiently high [3]. The system elaborates about the usage of carpooling android application and also discusses about

the major advantages of carpooling. The System architecture for carpooling is greatly identifies and major implementation of android application relies on GPS based navigation devices, smart phones, social media for trust and accountability [3]. A proposed system for carpooling has been efficiently discussed by prototype design, route matching algorithms and it also discusses about the advantages and disadvantages of carpooling [3].
Transportation Demand Management (TDM) is concerned with policy initiatives that improve the efficiency of the urban transport system (Meyer, 1999). The initiatives traditionally concentrated largely on operational improvements (e.g., improved transit infrastructure), but expanded to include the mitigation of environmental effects (e.g., air pollution and energy conservation) (Meyer, 1999).

Meyer (1999) identified three types of TDM:
1. Creating and promoting alternative transportation options to increase occupancy in vehicles;
2. Changing the amount of travel, particularly travel during peak hours through the use of incentives; and
3. Eliminating the need for physical travel altogether (e.g., telecommuting).

Carsharing is associated with the first type of TDM (creating alternative transportation options to increase occupancy in vehicles). It uses existing transportation infrastructure to reduce the monetary and environmental costs of commuting. A number of authors (Teal, 1987; Ferguson, 1997) have critiqued the usefulness of carpooling as a TDM strategy, and Morency (2007, p.242) pointed out that "lack of unity amongst different types of (TDM) organizations is a cause for concern as there is a loss of potential carpoolers due to overlapping initiatives".

Factors encouraging carpooling:
1. Cost Incentives

A cost incentive in this case is a method used to entice potential commuters to switch from their current mode to carpooling by offering financial rewards (e.g., a cash bonus for carpoolers, lower toll rates). They are considered an important issue for policy development and a key mechanism for encouraging changes in commuting behaviour.

2. Time savings

A number of studies have stressed the role of time savings in carpooling. Fewer vehicles mean less congestion. Collura (1994) identified congestion as a primary reason for carpooling, and Benkler (2004) noted that being allowed to use High Occupancy Vehicle (HOV) lanes encouraged carpooling.

3. Environmental awareness

Some researchers have drawn attention to environmental awareness as a motivation for carpooling. This awareness may indicate a shift in societal norms. Collura (1994) identified environmental awareness as another primary reason for carpooling. Benkler (2004) also identified environmental responsibility as a motivation for carpooling.

4. Carpooling as a mode of choice

- Levin (1982) found that carpooling was more favoured for long distance commuting than for short distance commuting. (His study of university carpooling found that females did not like to travel alone for a roundtrip longer than 30 miles).
- In their study of suburban commuting in California, Cervero and Griesenbeck (1988) also found that commuters were more likely to carpool for long distance commutes than for short distance commutes. Whereas only 17 % of clerical employees who commuted 4 miles carpooled, 37 % of clerical employees who commuted 50 miles carpooled.
- Levin's (1982) study of college students pointed out that Carpooling could compete with SOV commuting because drivers and riders enjoyed cost savings benefits, and riders enjoyed the additional benefit of comfort (i.e., ability to read or nap during commute.

Factors discouraging carpooling

Factors that discourage carpooling include some aspects of transportation policy (Taylor, 2006); affluence (Rouwendal and Nijkamp, 2004); scheduling issues; problems with being unable to travel during the work day; problems with being unable to transport items (Andrey et al., 2004); lack of flexibility, inconvenience, and increased time spent commuting (Meyer, 1999; Van Vugt et al., 1996; Tsao and Lin, 1999); prevention of spontaneity and personal freedom (Andrey et al. , 2004); additional time needed to pick up or meet each rider (Levin, 1982); and incompatibility with short distance commuting (Levin, 1982; Cervero and Griesenbeck, 1988).

IV. PROPOSED SOLUTION

The users will have our developed Carsharing application installed in their android smart phones or can use web application. The carpool process will be initiated by registering the users. Then users will be able to create and share rides. These ride creation and ride searching processes involves following activities.

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1. User registration
User registers to the app with providing his/her information such as first name, last name, username, email, country, state, city, phone number, pin code etc.

2. Login module activity
Step 1: User enters the username and password to log in to the application.
Step 2: Application validates the valid username and password.

3. Carpool Creation
Step 1: Car owner will enter the source, destination, car info, date, time and available seats as input to the Carsharing application.
Step 2: This carpool creation request will be transferred to the application server.
Step 3: Now server will check for existence of route between entered source and destination and will validate the other input information.
Step 4: Now carpool is created and ride seeker are able to search and browse this carpool.

4. Search carpool
Step 1: Ride seeker will enter the source, destination, as input to the application to search and browse for rides.
Step 2: This search information will be transferred to carpool server.
Step 3: Now server will validate all inputs specified by the user.
Step 4: After validation the server will show available rides to the ride seeker. Ride seeker can send a request to anyone of these ride creators.

5. Message Functionality
This function is used to send the message to the selected user regarding the journey.

6. Feedback functionality
This function records the review and rating of the selected user.

7. Admin controls
This functionality provides user the administrator privileges such as removing users, viewing user details etc.

V. EXPECTED INPUT AND OUTPUT

Function	Input	Expected Output
User Registration	User info	Registers a user to the app.
User Authentication	Username, Password	Redirect to user's profile page under valid username & password, else display authentication error.
Carpool Creation	Source, Destination, Car info, Date, Time, Available seats	Create a carpool if all the inputs are valid, else display error messages for the wrong input fields.
Search Carpools	Destination	Search results for carpools with same destination.
Message	Text message	Send the input message to the selected user.
Feedback	Review, Rating	Records the rating and review for the selected user.
Admin Controls	Make admin, Remove user, View user details	Gives the selected user the admin privileges, Remove the selected user from the app, Displays the details of the selected user.

VI. THE MEAN STACK

Developers of dynamic web applications have been using the LAMP open-source tool stack [4] (consisting of the Linux Operating System, the Apache Web Server, MySQL as a database and PHP as the scripting language) for some time. However, a new tool stack for web-application development has emerged over the last few years — known as the MEAN Stack or just MEAN.

MEAN takes its names from the four tools that together provide both client & server-side components for interactive web applications: MongoDb which provides the object database; Express.js which provides a framework for web routing; Angular.js for web applications; and Node.js — the JavaScript engine, and web server component [5].

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All four of these tools are based around the JavaScript language — which although initially developed for client side web programming has entered into common usage for server-side programming, thanks in large part to environments such as Node.js.

A. Node.js
Although canonically listed last when referring to MEAN, Node.js (or just Node) is the most important tool of the stack. Built around Google's V8 JavaScript engine (originally written to execute client-side JavaScript, within the Chrome web browser), and implemented in C++; Node provides a high performance, asynchronous event-based server. Node can be used to build a lightweight and high-performance web server environment, ideal for constructing web-service APIs. It is used for this purpose by a number of major companies — including Walmart [6] & PayPal [7].

B. Express.js
Express.js builds on the underlying capability of Node, by providing a web application server framework. This framework provides a wrapper around a lower-level Node interface: giving the developer, a convenient means to handle routing and HTTP operations (such as GET and POST). Express.js facilitates a simplified and more elegant solution than (re-)implementing these services directly using Node.

C. MongoDb
The majority of web-services will require some sort of storage: often in the form of a database management system. Whilst traditionally that might have been provided using an SQL-based Relational Database Management System (such as MySQL or SQL Server) there is a growing trend to use a NoSQL type of database.

NoSQL (also known as "No Only SQL") databases can be used to provide a more flexible "document-oriented database" with a dynamic schema. MongoDb is a high-performance NoSQL database built around the JSON data format [8] — and as such is ideally suited to a server-side JavaScript environments such as those provided by Node. In October 2015, MongoDb was the the most popular document-oriented NoSQL database and 4th most popular Database Management System overall: as measured by the "Knowledge Base of Relational and NoSQL Database Management Systems" [9].

D. Angular.js
The last part of the MEAN stack is Angular.js (or Angular). Angular is an open-source web application framework, maintained by Google, which provides a client-side framework for MVC (Model-View-Controller) [10] single page web applications. To gain the maximum benefit from Angular, it can be combined with two other packages: Yeoman & Bootstrap.

Yeoman provides an environment which enables the use of generators: simple script-based tools that can be used to scaffold the bare-bones of a Angular web app. The Yeoman project teams describe it as a tool which "...can help developers quickly build beautiful web applications" [11].

Bootstrap is a popular Open-Source CSS framework (originally created by Twitter), which is described as "...the most popular HTML, CSS, and JS framework for developing responsive, mobile first projects on the web". [12] Bootstrap provides elegantly designed CSS elements, making it easy to design web content with a clean, modern look.

Together, the combination of these tools with the underlying logic implemented with Angular, make it very easy to create a powerful and richly designed web application, which can consume the web-services provided by the other tools in the stack.

VII. CONCLUSION

Carsharing system is very effective means to reduce pollution and the congestion of vehicles in cities. It provides an eco-friendly way to travel as well as an opportunity to meet new people. Nowadays most people prefer personal vehicle to travel due to delay caused in public transport system and luxuries provided by private vehicles. Pre-registration ensures that only identified people get into the vehicle so that trust can be established

ACKNOWLEDGMENT

We would like to thank **Dr. A.S. Deshpande,** Principal, KLS Gogte Institute of Technology, for providing an intellectually stimulating environment. We would also like to thank **Dr .S.F. Rodd,** Head of Department, Computer Science and Engineering, KLS Gogte Institute of Technology, for his valuable suggestions.

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

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Vol. 6, Issue 6, June 2017

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