WolfPool: An easy way to plan your rides

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ABSTRACT

UberPOOL and LyftLine are very efficient and affordable for travelling short distances. However, for suburban areas and a majority of metropolitan cities this option is not available. This is mainly due to low number of people travelling on the same route. The connectivity and frequency of public transportation is limited in these areas. In addition to these issues, there are a lot of difficulties to communicate and plan the rides using social media platforms such as Facebook and Whatsapp. To tackle the problems mentioned above, we have devised WolfPool as a service that will specifically target to enhance communication and convenience in planning of rides.

Keywords

UberPOOL, LyftLine, Ride sharing, Google Geo-coding, Campus pooling, Planning, Car pooling, Rentals, Cost saving, Time saving, Safety, Convenience

1. INTRODUCTION

Every fall, students from all over the world apply to North Carolina State University to get admitted into their dream course to fast-track their career progression. Majority of the students that are admitted are International students who not only have to overcome what is known as a "cultural shock" and adapt to different cultural and social norms but additionally also have to face other challenges like figuring out the most cost-effective mode of transportation for their daily commute. Since, renting a personal car, or using any ride-hailing taxi application add to the expense of living, it is not a feasible option for many.

Another alternative is public transportation, more popularly known as GoRaleigh, but the frequency of the service is limited, and the travel time also significantly increases based on the distance between the pick-up point and the destination, and the number of stops between the same. Moreover, there is an absence of more economical means of transportation in Raleigh like ride-sharing application for example, "UberPOOL". Looking at the plight of students based on the results of our survey, we came upon a realization that an application, that lets students who are traveling to the same destination, or are heading the same way directly and mutually co-ordinate with each other, so as to share their ride would be more favorable, as it would help combat travel costs. Taking this into consideration, we have proposed a solution, in the form of an application that will overcome these challenges.

2. CASE STUDY

In Raleigh, if there is a bus available for a particular destination outside campus, the frequency of that bus is not so great. Furthermore, the routing is also not optimized. For example it takes more than 50 minutes to reach Crabtree Mall from NCSU main campus compared to less than 15 minutes taken by a car. This means a lot of time is wasted in the journey and waiting for the bus. Other great alternatives to public transportation are car rentals and private services like Uber or Lyft.

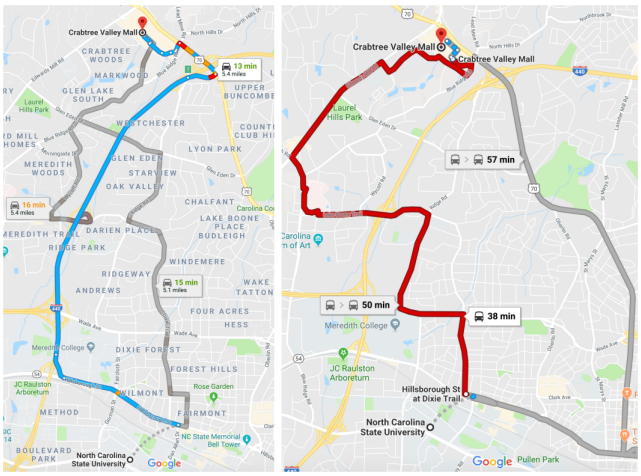

Figure 1: Map showing the time taken by publc transportation [right] versus time taken by car [left] between same source and destination

They overcome the aforementioned disadvantages of public transportation but at a greater cost. To reduce the cost factor, Uber has the pool service in a few metropolitan areas in United States and across the globe. Lyft on the other-hand has restricted their car pooling service (LyftLine) to

only United States. The existing service by Uber that is UberX provides about 40% less cost fare to users than normal taxi services. By launching UberPOOL services the prices were reduced even more. For example, UberX would cost about $10 from one place to another; UberPOOL will only cost $6 [11].

This also has a great benefit to the environment. UberPOOL in San Francisco after a year and a half after the launch made up nearly half of Uber's trips in the city. In one month alone, the service saved 120 tons of carbon dioxide emissions when compared with non-pooled trips, the equivalent to the output of over 128,000 pounds of coal [12]. LyftLine, which matches drivers with one or more passengers for a less expensive fare, is currently available in San Francisco, Los Angeles, New York City, Boston, DC, Austin, Chicago, Atlanta, and Miami, Denver, Philadelphia, San Diego, San Jose, Seattle, and Newark. It's an unsurprising expansion, given that Lyft Line represents 40% of the rides the company does in the cities where it's currently available. Launched in 2014, Uber said in April that it had passed 100 million Pool rides [10].

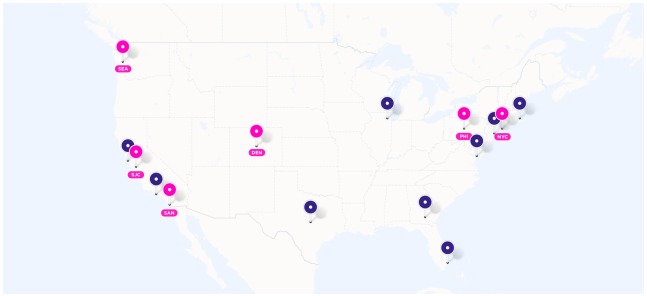

Figure 2: Map showing the cities in United States where UberPOOL and LyftLine are available in black and pink respectively [as of Apr 5, 2016]

Unfortunately a lot of college towns and campuses currently do not have these services. One of the major reason for the success of the car pool model was the heavy demand of traveling on a common route by people. This means that even if UberPOOL or LyftLine were be available in these places it would not be as efficient in college towns, as the frequency and the number of people making trips on a common route is very less, effectively beating the purpose of the pooling service. Also, in few places where the pool service is available, it is not operational during certain hours in night. Thus, we observed and personally experienced in Raleigh that a majority of the students used WhatsApp/Facebook or any other social media platforms to reach out to people to plan and share their rides. This required a lot of coordination and often led to a lot of confusion. There was no way to check if a particular ride sharing plan is still available. Confusions were also caused in deciding what the source and destination of the ride should be. To solve this sometimes special groups are created on the same social media platform but this is just a temporary solution. Also, a majority of the people were comfortable to plan a trip with someone they know. Few of the instances where a large number of students performed such planning are as follows.

- Social Security Office
- Airport Pickup/Drops
- Indian Stores (Patel Brothers, Around the World)
- Walmart/Best Buy
- Crabtree Mall
- PNC Arena (Athletic events)
- College Surplus Sale

3. USER SURVEY

In this section, we will describe all the different questions we put into our survey, the reason why we ask those questions and what we can conclude about the answers. We have used Google Forms to collect data.

Question 1: Which mode of transport do you use to visit places except college campus?

We asked this question to divide the user group into categories based on the mode of transport they use for their personal travels apart from visiting the University Campus. The options given to the users included Lyft/Uber, Public Transportation, Personal Vehicle/Car Rental (for car pooling).

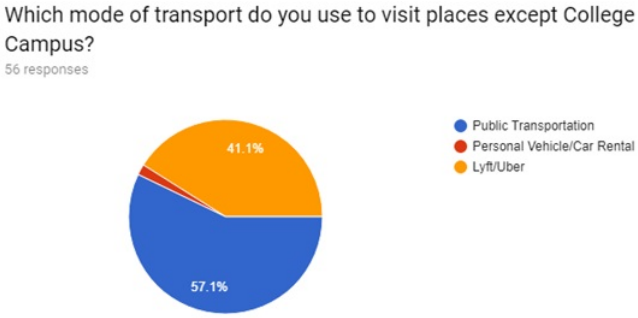

Figure 3: Responses for Question 1

Question 2: What is the frequency of such travel plans?

We asked this question to understand if there are considerable number of travels plans such that an application can be built to make those travels easy for the users.

Question 3: If Public Transportation or Personal Vehicle is not available would you like to use an application that helps you share your Lyft/Uber? (Pool option is not available in Raleigh)

We asked this question so that we could evaluate the usability and adaptability of the application in the areas where there is no option of pooling their rides through Uber and Lyft.

Figure 4: Responses for Question 2

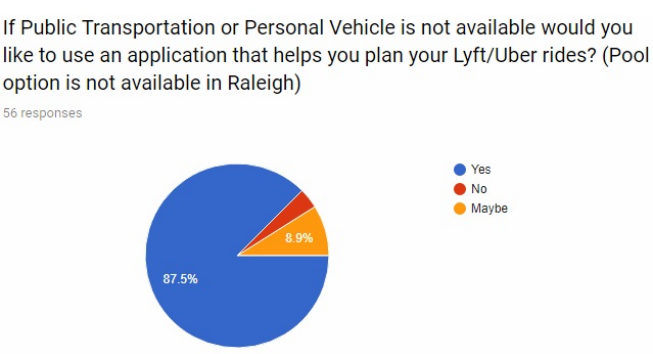

Figure 5: Responses for Question 3

3.1 Survey Conclusion

Based on the 56 responses we got from the survey we concluded that there are a large number of people who use private cab service like Uber/Lyft and/or rental cars for their personal transportation and would like to decrease the burden of cost and time associated with them. Also the responses for Question 2 indicate that the Uber/Lyft pooling model wont be effective and profitable as it is based on the idea of high number of people traveling on common routes but majority of people have a travel frequency of just 1-5 rides per month. So there is a need of an application that would help the people plan and share their rides in a convenient and safe way and be assured about it well in advance, especially in the cities where there is no Uber/Lyft pool available.

4. FEATURES

4.1 Security

WolfPool ensures complete safety of travellers by limiting the access to the application to only university affiliated personnel. This will be performed by parsing the email address of registrants to look for '.edu' in email address. Due to this, the system is accessible to members of the university whose identities are verified and trusted by the university itself. As a result of this, intruders are restricted to use our application. This ensures the legitimacy of the users and thereby, ensuring safety.

4.2 Creating and sharing travel plan

This application provides the flexibility to create and share your own travel plan. The application will ask details like source location, destination location and time slot for the trip before making it public. This feature makes it very convenient for the users to create their own plan if it is required.

4.3 Trip Matching

WolfPool uses robust algorithms to efficiently match available plans. Various factors are taken into consideration during this process including source address, destination address and departure time. The application would provide multiple matches, if exists, giving users the flexibility to choose between multiple options.

4.4 Join Existing plan

Along with creating and matching plans, the application will also provide users with an option to search for available plans. This will save time in entering details of the travel plan. The user will directly search for the plans according to his/her requirements and if it is the best possible option which matches the requirements then the user can directly add self to the list of users sharing that trip.

4.5 Email Based Notification

After matching with the available plan, the members of the plan will be notified through an email. This email will contain information about all the users in the plan, source and destination location, timings and contact details according to the set preferences. This will help the users to contact each other and discuss the detailed plan. The users can then book a car pooling or rental service from a source to destination according to everyone's convenience and in this way a solution to their problem will be provided.

4.6 Infrastructure Details

We are primarily using **Amazon Web Services**[1] for our Infrastructure needs. We compared the services offered by Google Cloud Platform and Heroku[5][4][8]. We decided to finally go with AWS because it provides a lot of configurability and control over the platform we use to host our application. Due to the extensive documentation, support and experience of working with AWS it was the obvious choice. The options for scalability in terms of processing power and availability by means of multiple server zones are varying and can be selected at a very fine level based on the cost and efficiency.

4.7 Backend computation

We are using Amazon's Elastic Beanstalk[3] which is an easy-to-use service for deploying and scaling web applications and services. Elastic Beanstalk automatically handles the deployment, from capacity provisioning, load balancing, auto-scaling to application health monitoring. For the backend framework we are using Node.js[9] v8.9.3 running on 64bit Amazon Linux 2017.09 v4.4.4. The Instance type is t1.micro and availabilty is in all zones provided by AWS.

4.8 Database

We are using Amazon's RDS[3] which provides cost efficient and resizable capacity database while automating time consuming administration tasks such as hardware provisioning, setup, patching and backups. Amongst the various database products we are using MySQL Community Edition versions 5.6.37 for fast performance, high availability, security and compatibility. The instance type is db.t2.micro with General Purpose (SSD) Storage capacity of 20 GB.

4.9 Frontend

We are using HTML, CSS, jQuery (javascript) for designing all the user interface components and webpages.The rendering be done using the express[7] framework for Node.js. The website will be responsive and optimized usage on both desktop and handheld devices.

5. EVALUATION PLAN

We have evaluated WolfPool by comparing it with the existing systems/tools that are currently available and used to plan and share trips based on the following parameters -

	1	2	3	4	5	6	7	8
uberPool	-	++	-	-	-	++	-	++
LyftLine	-	+	-	-	-	++	-	++
Carpool	++	+	+	++	+	-	++	++
Car Rental	++	+	+	+	+	-	+	+
Public Transport	+	++	+	+	+	++	--	-
Facebook Post	+	-	-	-	-	+	--	-
WhatsApp Group	++	+	-	+	+	+	-	-
WolfPool	++	+	+	++	+	++	+	+

Security(1) - In terms of vehicle and co-passenger safety
Adaptability(2) - people's adaptibility of using the service
Coordinability(3) -required with other members while planning
Trip Experience(4) - Experience during the ride
Availability(5) -scope of creating a shared ride
Cost Saving(6) - Expenses saved from the trip
Time Saving(7) - Time Saved for the trip (end to end)
Convenience(8) - How convenient it is to reach the destination

Figure 6: Assessment of various products/services

System Quality Attributes:

- Concurrent Users: The system would support 1000 users using the service at a given point of time.
- Security: The system would provide secure login and encryption of personal information.
- Scalability: The system would be able to accommodate increase in the number of user requests.
- Reliability: The system would switch to fallback server.
- Performance: Each page of the web application would load and render within 3 secs.
- Availability: The application will have no downtime for system maintenance.

6. FUTURE SCOPE

6.1 Built-in chat

A group chat interface enabling the matched travellers to communicate with each other to figure out the logistics of the travel. Travellers can meet on a common spot, or adjust the travel route to pick fellow travellers on the way. Instant messaging chats are also quicker and hassle-free, compared to email communication.

6.2 Rating and feedback

Users would have an option to rate their ride, and even fellow travellers. Thereby, every user will have a rating that will be visible to other users. Users can use this information to decide whether they want to join an existing trip, or create their own.

6.3 Expense tracking

Expense tracking apps such as Splitwise can be integrated with our system, for splitting bills such as gas, tolls or any other expense incurred during the trip.

6.4 Payments integration

Existing digital wallets such as PayPal, Venmo or Circle can be integrated for quick and easy settlements of money.

6.5 Travel Cost estimation

With the help of APIs provided by Uber[6] and Lyft[2] we can provide an estimate cost of the trip based on the type of cars available and the geospatial center for both source and destination location. This can be extended to ohter car rental services based on the availability of data/API.

7. CONCLUSION

Currently Uber and Lyft are leading the ride sharing market. However, the focus of their operations is mainly in a few selected metropolitan cities. Social media such as Facebook and Whatsapp provide a communication platform for planning a ride but they are not specifically build for this because they are not time efficient and are inconvenient to use. WolfPool service focuses on ride planning service primarily in the suburban areas and other cities with features to create and view listing of available rides. Also, WolfPool is designed keeping campuses and students in mind for security and safety concerns. Considering the disadvantages of other platforms, the features provided by WolfPool would be an ideal way to plan rides.

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