TravelRole: a Carpooling/ Physical Social Network Creator

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ABSTRACT

This paper describes a system that extends concepts of social networking application to create a physical social network, with the extra advantage of also working to save energy. TravelRole is a system that helps people choose to use their commute time to fulfill work, educational and recreational goals. The system matches people to rides that allow them to link carpooling with a personal goal such as practicing their French, talking about rebuilding an engine, discussing religion, and so on.

TravelRole's interface encourages people to focus on reasons they would like to get together with other people to see how these connections could happen in their otherwise solitary commute time. Commitment is designed to be progressive, starting with exploring and finding suitable rides, before actually registering and committing to the systems.

The scenario was tested with a group of people that work in the same place but have very different schedules. People made more selections when they were given a chance to define reasons to ride as well as times and places to go. We expect that in addition to personal value, the energy savings will improve peoples' perceptions of carpooling and their willingness to participate.

Keywords: carpool, social network,

1. INTRODUCTION

Online social networks have become a popular way of building communities of people who are interested in exploring new or common interests and activities. New forms of communication - Internet, instant messaging (IM), and cell phones - have become ubiquitous and so called social-networking is a growing trend [1]. Social networks have become popular because of the basic human need of people to connect with other people. Social networks have become more popular than e-mail: "Two-thirds of the world's Internet population visits a social network or blogging site and the sector now accounts for almost 10% of all internet time. Member communities (67%) have overtaken personal email (65%) to become the world's fourth most popular online sector after search, portals and PC software applications"[2].

In-person interaction is the gold standard for communication. The value of using computers to bring people together is illustrated by calendar scheduling, dating and many other applications. The opportunity for giving more ways of meeting people online has taken three main directions: social networks that don't physically bring people together, dating systems that strive only to create romantic relationships and professional recruiting that help people get or change jobs. The possibilities for getting people together over everyday interests or educational needs haven't yet been fully addressed. Further, the idea of giving secondary benefits to commitments can reduce the social stigma or risk of asking to meet a new person. People traditionally join clubs, take up new sports or go to church to meet new people. Putting commute to a good use is a desire of many who spend significant time behind the wheel of a car. Recorded books, radio and sound systems, cell phones and hands-free equipment, all sell well partly because of the number of bored drivers in millions of cars per day. Having an interesting conversation with someone who you might learn with or from or who might potentially become a colleague or personal friend could be an enriching option for commuters.

People are also concerned about our environment and we are all looking for ways to reduce the use of energy and preserve the planet from global warming [3]. The number of cars on the road has a big role in global warming, which is partly due to the increased individualism that is observed in today's social life. Individual transportation dominates our way of life in

the U.S.: "HOV lanes are under-utilized: 81% of HOV detectors measure flows below 1400 vehicles per hour per lane during the PM peak hour" [4]. People tend to use their own cars which increase the number of vehicles on the road. With this increased number of cars, the use of fossil fuels and energy also increases.

So why not combine both energy saving and social networking with ridesharing? Ridesharing is sharing a ride with an individual or group, either for a planned or ad-hoc trip.

We have explored reasons that people might have to ride together and developed a system that will match people based on their interests which might lead them to share a ride. The ride match will also be based on the source and destination of participants without requiring people to register into the system.

"With cars we have speed and mobility, but we have lost community relationships"[5]. Ridesharing on a community level increases the opportunity for socializing and can lead to new relationships based on mutual interests.

Previous research finds that "Time and money-saving incentives are key features of the casual carpooling phenomenon" [6]. We have explored the possibility of limiting the money incentive in our system and now focus instead on sharing common interests to promote socializing while carpooling. Previous work states that "People do not get in cars with people they don't know for nothing" [7]. With the system developed, participants will have an opportunity to carpool with a purpose, with people they already have something in common with. The impression of carpooling with a stranger will be decreased, in the same way people chat or meet on Facebook, eHarmony, OkCupid, or LinkedIn.

The vision of this work is to create a new mechanism for: 1) saving energy, 2) introducing people to each other and 3) allowing people to pursue their educational and entertainment goals in a new venue.

2. OBJECTIVES

This research aims at providing a rideshare system that combines environmental protection (through reduction of fossil fuel usage), socialization, and security. The system we developed gives a new approach of carpooling with a focus on the social aspect and takes into consideration some of the difficulties that have been raised through previous studies and research.

It enables people to find rides based on a work, educational, or recreational goal, source and destination addresses, and departure time. Ride share participants using the system will not have to be part of any particular community; neither do they need to plan their trips in advance in order to participate in a rideshare. The use of the system will decrease a participant's concerns about riding with strangers because people tend to be more comfortable when they know that they have something in common with the people around them [8].

The first objective behind this work is to explore the effects of finding a match based on the reasons that would motivate people to share rides. The social incentives are perhaps even more important than the source and destination addresses and the departure time. Will people be more motivated to carpool if they know that they will meet people with the same interests?

The system was designed as an intermediary allowing "hitchhikers" to communicate with ride providers without prematurely revealing their identity. Such features can improve anonymity and security of potential riders.

The goal is creating incentives that are personal, thereby reducing difficulties of engagement and reducing the dangers of doing things with strangers, thereby encouraging people to participate in ridesharing, which will enhance our work, educational and recreational opportunities and reduce energy use. .

3. MOTIVATIONS

The TravelRole system provides a number of benefits to participants and the environment:

- **Fulfill educational interests by riding with someone with whom you share educational goals:** the system can suggest possible rides based on information a person has provided for reasons they would ride with someone. A menu suggests reasons of hobbies, news, vacation destinations, religion, culture, jokes, learning. In each category a person might have a variety of educational goals. The "Hobbies" category in the TravelRole for instance includes Sports, Movies, Art, Books, Music, Crafts, Puzzle/games, Technology, and other. Selecting one or more hobby you are interested talking about in could help a person find a good reason to ride with you. A ride with someone then could be predicated on a specific learning goal such as finding out about heat engines. Participants will be able to discuss and benefit from others' knowledge.

- **Choose compatible riders:** participants will be able to ride with people who others have experience with. Participants rate their partner according to several dimensions. Is their conversation style talkative, opinionated, intelligent, etc.? Is their intellectual style that of a dilettante, a professional or an academic? Is their personal style clean, polite, punctual, etc.? Participants then find themselves paired along dimensions of compatibility that will make the ride more pleasant.
- **Decrease the number of cars on roads:** the system will enable participants to get rides to their destinations without using their own cars. **"**HOV lanes increase freeway efficiency by moving more people in fewer vehicles than the full lane next to them" [9]. The more people who participate in carpooling, the fewer the number of cars on the road.
- **Schedule or ad hoc a ride:** The system provides the possibility of scheduling a ride in advance or requesting an improvised ride. For example, a user can plan a ride that will take him to the airport at a specific time and date, in this case the user will be notified about the ride that he will be involved in. TravelRole provides users with the possibility of scheduling repeating rides and avoid the inconvenience of continuous request.
- **Decrease car pollution:** Ride sharing decreases the number of cars used for transportation, therefore the emanation of exhaust from cars will also decrease.
- **Less investment from the government in road maintenance:** Heavy traffic is one of the factors responsible for the roads' wear and tear. The system will encourage ride sharing, and fewer cars on the road mean that our roads will require less maintenance.

4. METHODOLOGY

A web approach was chosen to allow users to schedule and check on rides from a desktop or smart phone.

The web application developed for offering the service that allows users to share rides is based on progressive investment with a ride that also considers users' interests along with the main reason of convenience for sharing the ride. It offers users the possibility of giving direct and indirect incentives apart from the main motive of sharing the ride for practical reasons.

The progressive investment approach used for this application is such that the more specific the user is about a ride, the more likely a ride can occur.

1) By describing the time and the place of the ride, a user is likely to find a ride that matches his source and destination addresses. In this case the user is only concerned about having a ride without a need for socializing. The rides resulting from that request provides users with a list of possible rides based on time, source and destination address. The system identifies departure time, starting place, and destination place based on a user's ride information. Users can extend their ride request by providing their interests and preferences. The system then considers a user's interests and preferences for a more specific match. Matching functionality is the most important part of the application. Based on the extent of matching, the possible rides are rated on a scale of one - to - five so as to help the user to select the best possible ride. This feature makes ride sharing an interesting activity for the user. More specific rides can result from a search based on the user's valuable characteristics.

2) Before choosing a ride, users can learn more information about the driver who offers the ride such as the extent of matching common interests and preferences. This makes a ride more likely to happen since it broadens users' choice. The participant will then choose his partner and send a request for confirmation. The driver must "Accept" before calling the ride committed.

3) When a user has decided with whom to ride with; the user can make a request for a ride. The driver who offers the ride is then notified of the request. The driver can then accept it or reject the request. If the driver accepts the request, the rider is sent a message that asks for confirmation. After the rider confirms the ride by clicking on confirm, it is considered as 'Committed' and the driver is sent a notification. This approach allows riders to make multiple requests for a ride and also allows drivers to accept multiple requests. However; only one user can confirm and commit for the specific ride and whoever confirms first gets an opportunity to share the ride.

4) The driver and rider commitment is done through an intermediary conference call number to allow them to talk without giving up privacy until they decide to do so, on their own. An alternative is to use a proxy through TravelRole to allow riders to

communicate their final arrangements and meeting through instant messaging.

5) A user can label a person for his/her future engagements and can also provide rating for the ride to help other riders make a good choice.

We developed this system using Rruby on Rails for the front-end and MySQL for the backend.

5. EVALUATION

The working prototype was pilot tested by conducting interactive survey with 20 users. We recruited 20 students and staff. From Carnegie Mellon Silicon Valley to test the systems user experience. Each user was asked to try the two versions of the application: the version that does not enable the user to specify reasons for which he/she might be willing to give or request a ride (Figure 1), and the version with the aspect of combining both ride sharing and socializing (Figure 2). Each participant used all the features of the application and answered questions related to different features to identify positive and negative aspects of both versions of the application. Each user was asked to rate those features and the system based on a Likert 5 scale. This was aimed at understanding the user's perspective so as to improve usability of the system. The results of the survey conducted are described in the next section.

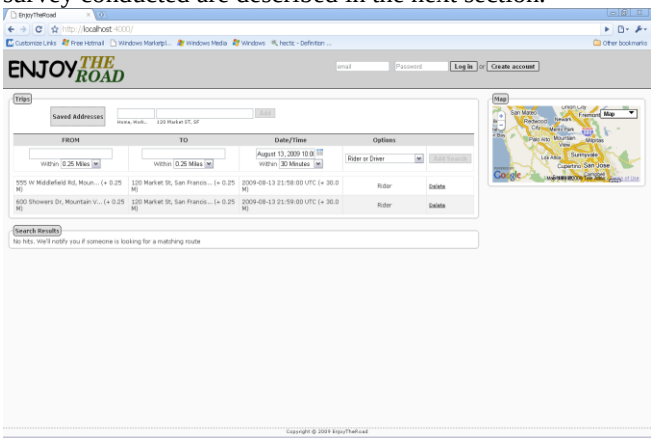

Figure 1 Standard Ride Share System

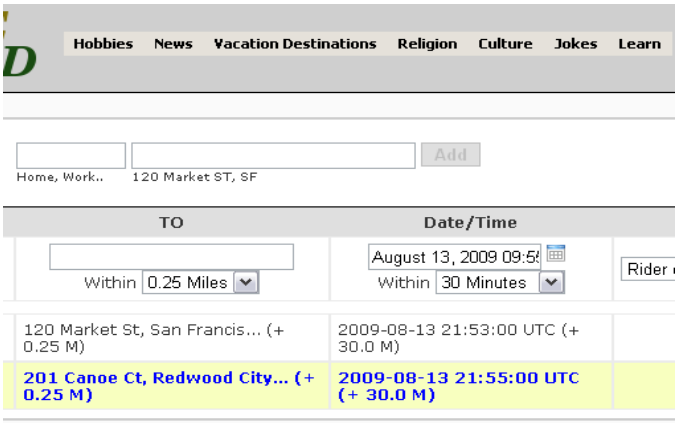

Figure 2. Menus for Reasons to Ride Together Are Shown at the Top: Hobbies, News, Vacation Destinations, Religion, Culture, Jokes, Learning.

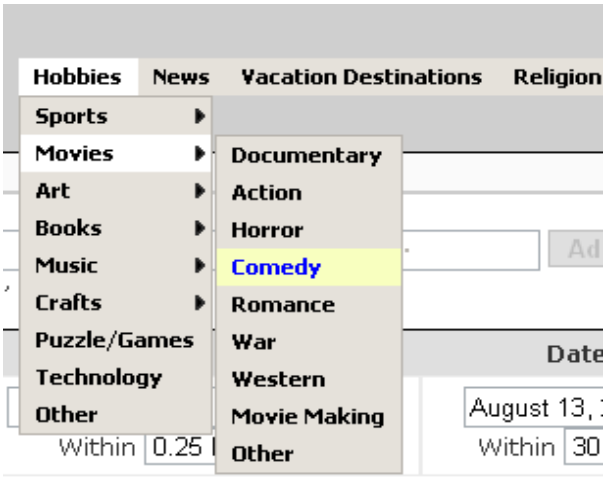

Figure 3. Selection of Reasons To Ride For Hobbies

Users were introduced to two systems with the same user experience. One had additional features which allowed the user to define reasons why they would ride with another person (Figure 3). The instructions were to understand and try to make one or more ride requests on the system. The hypothesis was that in spite of having a more complex interface they would find the reasons compelling motivation that would encourage them to feel better about their experience with the interface, spend more time exploring those options of using it and make more requests.

The subjects were first given a pretest questionnaire to assess their feelings and experience with online communities, ride sharing and energy concerns.
In a randomized study, one group started with the TravelRole system, and the other started with the standard ridesharing system. After each experience, the subjects filled out a follow-up questionnaire to assess any change in attitudes relative to the pretest, as well as to assess their experiences with the systems.

Based on the subjects' feedback, results were analyzed and are discussed in the sections that follow.

6. RESULTS

The experience consisted of a population of 20 individuals working in the same institution. All had college degrees. All live at least 1 mile from work. They were randomly chosen without any age or gender differentiation. Individuals that participated in the user experience study were given a multiple-choice questionnaire, with the multiple choices categorized on a scale from strongly disagree (1) to strongly agree (5). Results presented in this section are based on results of the questionnaire as well as comments from users.

Tables 1 and 2 show stated transportation habits and carpooling experience of the individuals that participated in the study.

Table 1. Views of Shared Transportation

	Would like to carpool to work	Use mass transportation
Strongly disagree	10 %	15 %
Disagree	15 %	30 %
Neutral	25 %	5 %
Agree	15 %	15 %
Strongly agree	35 %	35 %

Table 2. Carpool Experience

	Have carpooled
Not at all	55 %
Once or Twice	10 %
A short time	35 %
In many situations	0 %
Most trips	0 %

Stated social habits and conception of the social aspect of carpooling of the participants were also recorded in Table 3.

The individuals involved in the user experience provided their feedback on the user interface of the system developed. Table 4 depicts users' impressions of the system developed after using it.

The results show users' willingness to use the system as well as any change in users' carpooling habits.

Table 3. Social Motivation and Transportation

	Like meeting new people	Think that pooling is relaxing	Think that pooling is stressing	Like sharing	Use/Are on social networks
Strongly disagree	5 %	5 %	10 %	5 %	5 %
Disagree	20 %	30 %	10 %	15 %	5 %
Neutral	25 %	35 %	25 %	30 %	20 %
Agree	25 %	10 %	40 %	30 %	25 %
Strongly agree	25 %	20 %	15 %	20 %	35 %

7. DISCUSSION

The results showed that 70% of individuals that tried the system noticed that there's an additional social value that is added to carpooling but with no more experience than this experiment, it did not change participants' concept of carpooling.

75% of individuals that participated in the study had carpooled before and 25% don't like the idea of carpooling and having this system developed would not change their behavior regarding carpooling. The study also shows that the population that participated in the user experience does not use mass transportation; this means that they either have their own cars or have another mean of transportation. The results also show that 100% of the population that have already carpooled would be ready to use the system if it was online but it makes no difference for the other population.

The results show that more than 50% like meeting new people but perceive carpooling as a stressing activity. This was associated with the fact that carpooling is not always reliable, especially for important activities. The study also showed that 85% of the individuals that like to meet new people are more likely to carpool than people who don't like meeting new people.

If compared to the standard ridesharing system, 70% found the new system more complex, but this can be explained by the new feature added to the concept of carpooling. The selection of interests is a new feature to which users where not accustomed. After the new feature had been explained to the users, 55% of the population agreed that the new system provided more options and 65% were motivated to use the system.
This change in behavior can be explained by the fact that adding a social value to carpooling adds to its perceived value, There was an increased perception of carpooling as a fun activity rather than a waste of time; 65% of users involved in the experience confirmed that carpooling is a fun activity.

Finally, results show that 55% of users would be willing to use the system if it were online.

Results also show that the system needs additional features in order to be usable online and provide better ride results and information. Possible improvements based on users' feedback and the results are described below.

	More likely to pool	Interface more complex than standard system	The system provides more options	More likely to pool with the system	Pooling would be a time fun	Would to use the system online
Strongly disagree	15 %	5%	0 %	5 %	10 %	0 %
Disagree	20 %	15 %	30 %	5 %	15 %	20 %
Neutral	20 %	10 %	15 %	25 %	10 %	20 %
Agree	25 %	40 %	50 %	35 %	50 %	25 %
Strongly agree	20 %	30 %	5 %	30 %	15 %	35 %

Table 4: Participants Impression of the System

8. CONCLUSION AND FUTURE WORK

The system provides the functionalities of specifying different interests that one would like to share during a ride. After specifying the source and destination addresses, users provide the interests they would like to have shared with other participants of the ride. The system as developed works and is able to find rides based on users' trip information and interest preferences.

A future study should test the system with a large enough population to test the system actually arranging a variety of interest-based trips.

A complete system would include alternative travel solutions for problems that arise, and cell-phone coordination approaches to improve convenience and security.

We are especially hopeful of developing models of people's compatibility through their previous TravelRole experiences. The ridesharing system could also get users' information from an existing social network site and use them in the search algorithm.

We recommend the conception of a business model that would create economic value to the riders and the provider of the system.

The exciting goal of TravelRole is to give carpoolers a role in a conversation with a fellow traveler. Setting up a portfolio of work, educational and recreational objectives might be addressed by carpooling. We are hopeful that such a system could help reduce greenhouse emissions and improve peoples' lives while travelling to work or other venues.

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