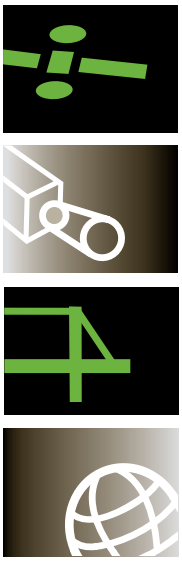

EXPLORATORY ADVANCED RESEARCH

U.S. Department of Transportation
Federal Highway Administration

Federal Highway Administration

Initial Stage Reference Search

The initial stage investigation is the beginning step in the Exploratory Advanced Research (EAR) Program process for exploring ideas across traditional and nontraditional fields of research and stimulating new approaches to problem solving. The process starts with a literature review and reference scanning to get a better understanding of active research in a particular topic area. The EAR Program annually explores 20 or more topics.

The EAR Program literature and reference scanning activity provides background information that aims to increase researchers' knowledge and understanding in a particular field or topic area, and contributes to the process of identifying priorities and opportunities for strategic investment in further research. The EAR Program reference librarian uses various selection criteria, such as authority, relevance, and timelines, and will scan information that has not been published, such as presentations, papers, and grant awards.

For more information about the Federal Highway Administration Research Library, visit http://www.fhwa.dot.gov/research/library/index.cfm. For more information about the EAR Program, visit http://www.fhwa.dot.gov/advancedresearch/about.cfm.

Real-time ridesharing

Identification of published literature between 2006 and the present, focusing on the use of dynamic ridesharing and behavioral economics to encourage participation in dynamic ridesharing and to make modest personal adjustments that improve the functioning of a dynamic ridesharing system. The use of technology is also included, for example, increased use of cell phones has enabled new types of models for promoting shared transportation resources.

TOPIC

CONTENTS

REFERENCE RESULTS

Mobility crowdsourcing: Toward zero-effort carpooling on individual smartphone

Author(s): Liu, Nianbo;[1] Feng, Yong;[2] Wang, Feng;[1] Liu, Bang;[1] Tang, Jinchuan[1]
Year: 2013
Source: International Journal of Distributed Sensor Networks, vol. 2013
Publisher: Hindawi Publishing Corporation
Author affiliation:
[1]School of Computer Science and Engineering, University of Electronic Science and Technology of China, Chengdu 611731, China, http://www.oice.uestc.edu.cn/en/
[2]Yunnan Key Laboratory of Computer Technology Applications, Kunming University of Science and Technology, Kunming 650500, China, http://english.kmust.edu.cn/

In current carpooling systems, drivers and passengers offer and search for their trips through available mediums, for example, accessing a carpool Web site by smartphone to find a possible match for a journey. Although efforts have been made to achieve fast matching for known trips, the need for accurate mobile tracking for individual users still remains a bottleneck. For example, drivers may be too impatient to input their routes before driving, or centralized systems may have difficulty tracking a large number of vehicles in real time. In this study, the authors present the idea of Mobility Crowdsourcing (MobiCrowd), which leverages private smartphones to collect individual trips for carpooling without any explicit effort on the part of users. The authors' scheme generates daily trips and mobility models for each user and then makes carpooling "zero-effort" by enabling travel data to be crowd-sourced instead of tracking vehicles or asking users to input their trips. With prior mobility knowledge, one user's travel routes and positions for carpooling can be predicted according to the location of the time and other mobility context. On the basis of a realistic travel survey and simulation, the authors show that their scheme can provide efficient and accurate position estimation for individual carpools.

Ridesharing: The state-of-the-art and future directions

Author(s): Furuhata, Masabumi;[1] Dessouky, Maged;[2] Ordóñez, Fernando;[3] Brunet, Marc-Etienne;[4] Wang, Xiaoqing;[2] Koenig, Sven[1]
Year: 2013
Source: Transportation Research Part B: Methodological, vol. 57, pp. 28–46
Publisher: Elsevier
Author affiliation:
[1]Department of Computer Science, University of Southern California, Los Angeles, CA 90089, United States, http://www.cs.usc.edu/
[2]Department of Industrial and Systems Engineering, University of Southern California, Los Angeles, CA 90089, United States, http://ise.usc.edu/
[3]Industrial Engineering Department, Universidad de Chile, Santiago, Chile, http://www.dii.uchile.cl/
[4]Department of Electrical and Computer Engineering, McGill University, Montreal, QC H3A 0C6, Canada, https://www.mcgill.ca/ece/

Although ridesharing can provide a wealth of benefits, such as reduced travel costs, congestion, and pollution, a number of challenges have restricted its widespread adoption. In fact, even at a time when improved communication systems provide real-time detailed information that could be used to facilitate ridesharing, the share of work trips that use

ridesharing has decreased by almost 10 percent in the past 30 years. In this paper, the authors present a classification to facilitate understanding of the key aspects of existing ridesharing systems. The objective was to present a framework that can help identify key challenges in the widespread use of ridesharing and thus foster the development of effective formal ridesharing mechanisms that would overcome these challenges and promote massification.

Dynamic ridesharing and information and communications technology: Past, present, and future prospects

Author(s): Siddiqi, Zarar;[1] Buliung, Ron[1]
Year: 2013
Source: Transportation Planning and Technology, vol. 36, no. 6, pp. 479–498
Publisher: Taylor and Francis Ltd.
Author affiliation:
[1]Department of Geography, University of Toronto at Mississauga, Mississauga, ON L5L 1C6, Canada, http://www.utm.utoronto.ca/geography/

By using a case study approach situated historically, the authors examined how dynamic ridesharing (DRS) has evolved through time in tandem with changes in information and communication technologies. The authors then offer informed speculation on the future of DRS. A chronological review of a sample of DRS systems reveals the strengths and weaknesses of various technologies. Recent shifts in the software development industry's business and technical models have changed the type of applications being created, development processes, and uses. The prospects of these changes on DRS are discussed, focusing on the issues of security, privacy, and adoption. The roles of old and new stakeholders, such as automobile manufacturers, software developers, and end users, are also discussed. The increasing technical confidence and competence of the end user is identified as essential to the success of any contemporary DRS application.

Full article can be accessed at http://www.tandfonline.com/doi/abs/10.1080/03081060.2013.830895#preview

T-share: A large-scale dynamic taxi ridesharing service

Author(s): Ma, Shuo; [1, 2] Zheng, Yu;[2] Wolfson, Ouri[1, 2]
Year: 2013
Source: Proceedings—International Conference on Data Engineering, pp. 410–421
Publisher: IEEE
Author affiliation:
[1]University of Illinois at Chicago, Chicago, IL 60680, United States, http://www.uic.edu/uic/
[2]Microsoft Research Asia, Beijing, China, http://research.microsoft.com/en-us/labs/asia/

Taxi ridesharing can be of significant social and environmental benefit, for example, by saving energy consumption and satisfying commuters' needs. Despite this great potential, taxi ridesharing, especially with dynamic queries, is not well studied. In this paper, the authors formally define the dynamic ridesharing problem and propose a large-scale taxi ridesharing service. The proposed service efficiently serves real-time requests sent by taxi users and generates ridesharing schedules that reduce the total travel distance significantly. In their method, the authors first propose a taxi-searching algorithm by using a spatio-temporal index to quickly retrieve candidate taxis that are likely to satisfy

a user query. A scheduling algorithm is then proposed. It checks each candidate taxi and inserts the query's trip into the schedule of the taxi, which satisfies the query with minimum additional incurred travel distance. To tackle the heavy computational load, a lazy shortest path calculation strategy is devised to speed up the scheduling algorithm. The authors evaluated their service by using a GPS trajectory dataset generated by over 33,000 taxis during a period of 3 months. By learning the spatio-temporal distributions of real user queries from this dataset, the authors built an experimental platform that simulates user real behaviors in taking a taxi. Tested on this platform with extensive experiments, the authors' approach demonstrated its efficiency, effectiveness, and scalability. For example, the authors' proposed service serves 25 percent additional taxi users while saving 13 percent travel distance compared with no ridesharing (when the ratio of the number of queries to that of taxis is 6).

Optimization of dynamic ridesharing systems

Author(s): Di Febbraro, A;[1] Gattorna, E.;[1] Sacco, N.[1]
Year: 2013
Source: Transportation Research Record: Journal of the Transportation Research Board, vol. 2359, pp. 44–50
Publisher: Transportation Research Board
Author affiliation:
[1]Department of Mechanical Engineering, Energetics, Management, and Transportation, University of Genoa, 16145 Genoa, Italy, http://www.unige.it/

Internet-enabled technologies are becoming more widespread: Users are constantly connected to the network in every place and engage in daily Internet activity. Access to transportation-related features—mobile payment systems, Global Positioning System connections, real-time public transit timetables, or traffic congestion information and so on—is easy. This access results in new ways to plan mobility. In the innovative mobility systems implemented and developed with these technologies, the new real-time capabilities of dynamic ridesharing, an extended version of traditional ridesharing, can play a key role if the relevant performance is improved. In other words, although ridesharing is not a new idea, recent technological advances should increase its popularity. In this paper, the authors propose a ridesharing system that considers the interactions between drivers or riders and the system manager and the interactions between drivers and riders. The authors omitted from the study the positions and speeds of the shared vehicles and the traffic flows in which such vehicles travel. To optimize the performance of the ridesharing system, the authors propose a discrete event, dynamic, pickup-and-delivery model that represents the considered dynamics and an optimal matching problem that optimally allocates an empty seat in a vehicle to a rider. The dynamic model represents the behavior of the ridesharing system and computes the relevant performance; the optimization problem finds the best match and path in the considered transportation network to minimize the difference between the desired departure and arrival times. In this study, after introducing the ridesharing model and discussing the solution to the optimal matching problem, the authors describe a simulation model and present and discuss a real-world case study.

Noah: A dynamic ridesharing system

Author(s): Tian, Charles;[1] Huang, Yan;[1] Liu, Zhi;[1] Bastani, Favyen;[2] Jin, Ruoming[3]
Year: 2013
Source: Proceedings of the ACM SIGMOD International Conference on Management of Data, pp. 985–988
Publisher: Association for Computing Machinery
Author affiliation:
[1]University of North Texas, Denton, TX 76203, United States, http://www.unt.edu/
[2]Massachusetts Institute of Technology, Cambridge, MA 02139, United States, http://web.mit.edu/
[3]Kent State University, Kent, OH 44242, United States, http://www.kent.edu/

This demonstration presents Noah, a dynamic ridesharing system. Noah supports large-scale, real-time ridesharing with a service guarantee on road networks. Taxis and trip requests are dynamically matched. The system differs from traditional systems in that a taxi can have more than one customer on board provided that all waiting-time and service-time constraints of trips are satisfied. Noah's real-time response relies on three main components: (1) a fast shortest-path algorithm with caching on road networks, (2) fast dynamic matching algorithms to schedule ridesharing on the fly, and (3) a spatial indexing method for fast retrieval of moving taxis. Users are able to submit requests from a smartphone and to choose specific parameters such as number of taxis in the system, service constraints, and matching algorithms to explore the internal functionalities and implementations of Noah. The system analyzer shows the system performance including average waiting time, average detour percentage, average response time, and average level of sharing. Taxis, routes, and requests are animated and visualized through a Google Maps™ application programming interface. The demonstration is based on the trips of 17,000 Shanghai taxis for 1 day (May 29, 2009); the dataset contains 432,327 trips. Each trip includes the starting and destination coordinates and the start time. An iPhone application is implemented to allow users to submit a trip request to the Noah system during the demonstration.

Optimization for dynamic ridesharing: A review

Author(s): Agatz, Niels;[1] Erera, Alan;[2] Savelsbergh, Martin;[3] Wang, Xing[2]
Year: 2012
Source: European Journal of Operational Research, vol. 223, no. 2, pp. 295–303
Publisher: Elsevier
Author affiliation:
[1]Rotterdam School of Management, Erasmus University, 3000 DR Rotterdam, Netherlands, http://www.rsm.nl/home/
[2]School of Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta, GA 30332, United States, http://www.isye.gatech.edu/faculty-staff/profile.php?entry=ae58
[3]School of Mathematical and Physical Sciences, University of Newcastle, Callaghan, NSW 2308, Australia, http://www.newcastle.edu.au/

Dynamic rideshare systems aim to bring together travelers with similar itineraries and time schedules on short notice. These systems may provide significant societal and environmental benefits by reducing the number of cars used for personal travel and improving the utilization of available seat capacity. Effective and efficient optimization technology that matches drivers and riders in real time is one of the necessary components for a successful dynamic rideshare system. The authors systematically

outline the optimization challenges that arise when developing technology to support ridesharing and survey the related operations research models in the academic literature. The authors hope that this paper will encourage more research by the transportation science and logistics community in this exciting, emerging area of public transportation.

Smart logistic service for dynamic ridesharing

Author(s): Smirnov, Alexander;[1] Shilov, Nikolay;[1] Kashevnik, Alexey;[1] Teslya, Nikolay[1]
Year: 2012
Source: Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), vol. 7469 LNCS, pp. 140–151
Publisher: Springer Verlag
Author affiliation:
[1]St. Petersburg Institute for Informatics and Automation RAS (SPIIRAS), 199178 St. Petersburg, Russia, http://www.spiiras.nw.ru/index.php?newlang=english

The paper describes a service-based approach to dynamic ridesharing based on the smart space concept. The presented system allows a tourist to plan museum visits and finds a driver for reaching the museums. The authors apply an approach to assisting tourists in a certain area (e.g., in a given city) that was presented at FRUCT 11 (Finnish–Russian University Cooperation in Telecommunications 2012 conference). The Smart-M3 information platform is used as a smart space infrastructure for the presented approach. The service is based on the Smart-M3 ontology, which is formed by ontology slices of users' mobile devices. The authors present an algorithm for finding appropriate fellow travelers for drivers as well as defining acceptable pickup and drop-off points for them.

A cloud computing framework for real-time carpooling services

Author(s): Lin, Chih-Hsiang;[1] Jiau, Ming-Kai;[1] Huang, Shih-Chia[1]
Year: 2012
Source: Proceedings—2012 6th International Conference on New Trends in Information Science, Service Science and Data Mining (NISS, ICMIA and NASNIT), ISSDM 2012, pp. 266–271
Publisher: Advanced Institute of Convergence Information Technology
Author affiliation:
[1]Department of Electronic Engineering, National Taipei University of Technology, Taipei 106, Taiwan, http://english.ntpu.edu.tw/bin/home.php

Traffic congestion is a serious problem in many urban areas around the world. It causes a multitude of negative impacts, from producing air pollution and carbon dioxide emissions to wasting fuel and increasing travel time, among many others. Carpooling is one of the most effective solutions to traffic congestion and involves decreasing the number of cars on a roadway by increasing vehicle occupancy. In this paper, the authors propose an intelligent carpool system called BlueNet. The proposed system provides a real-time carpool service by involving two significant proposed modules: the Mobile Client module and the Cloud Global Carpool Services module. In the authors' proposed Mobile Client module, users can use their smartphones or other devices to find carpool matches by utilizing the proposed Cloud Global Carpool Services module via the mobile communication network. The Cloud Global Carpool Services module is then used to deal with carpool requests and generate suitable carpool match results through the proposed real-time carpool-matching algorithm. To develop a carpool service that can be used around the world, the authors integrated the open geographical information system with abundant global geographical

information into the proposed Cloud Global Carpool Services module. The experimental results show that the proposed real-time carpool-matching algorithm dramatically reduces the processing time required to generate the carpool-matching results. This is accomplished by dynamically adjusting the random ratio value.

A push service for carpooling

Author(s): Fougères, Alain-Jérôme;[1] Canalda, Philippe;[2] Samaali, Ali;[2] Ecarot, Thibaud;[2] Guglielmetti, Laura[2]
Year: 2012
Source: Proceedings—2012 IEEE International Conference on Green Computing and Communications, (GreenCom 2012), pp. 685–691
Publisher: IEEE
Author affiliation:
[1]ESTA, School of Business and Engineering, Laboratory IRTES-M3M, UTBM, Belfort, France, http://www.utbm.fr/en/utbm.html
[2]DISC/FEMTO-ST, UMR CNRS 6174, Université de Franche-Comté, Montbéliard, France, http://www.femto-st.fr/

Carpooling is a social service par excellence. Solidarity between people or within identified groups, contracting service and confidence in service when hazards can occur, safety of the service provided (not only the information and communications technology information provided but also the operated travel when an itinerary path is computed), and sometimes confidentiality agreements or information exchanged—all these characteristics and values are features that are considered necessary to develop the use of carpooling. The use of carpooling is struggling to reach a critical mass. Furthermore, the democratization of the carpooling service faces the difficulty of access to a critical mass of offers (empty seats) to encourage requests. In this paper, the authors define and provide a push service to carpooling. This push service brings more opportunism so the instant processing of an offer or need of transportation—explicitly formulated or implicitly and partially formulated—leads to intelligent use. Log management, knowledge of the operating environment in real time, enabling the functionality of the service push—all these features make up a process of linking supply and demand as a prerequisite of all carpooling contracts. The authors present such a service in the context of a real-time carpooling service and more generally in the context of a demand-responsive transportation system. The concepts of this push service were validated through experimental service at a stadium of French Ligue 1 football during the past 2 years.

A genetic and insertion heuristic algorithm for solving the dynamic ridematching problem with time windows

Author(s): Herbawi, Wesam;[1] Weber, Michael[1]
Year: 2012
Source: Proceedings of the 14th Annual Conference on Genetic and Evolutionary Computation (GECCO '12), pp. 385–932
Publisher: Association for Computing Machinery
Author affiliation:
[1]Institute of Media Informatics, University of Ulm, Ulm, Germany , http://www.uni-ulm.de/en/in/mi.html

In this paper, the authors address the dynamic ridematching problem with time windows. Dynamic ridesharing is a special type of ridesharing in which the participants form

ridesharing on short notice. The ridematching problem is to assign riders to drivers and to define the ordering and timing of the riders' pickup and delivery. Because not all information is known in advance, the problem is dynamic. This is an optimization problem in which the authors optimize a multicriteria objective function. The authors consider minimizing the total travel distance and time of the drivers and the total travel time of the riders and maximizing the number of the transported riders. The authors propose a genetic and insertion heuristic algorithm for solving the addressed problem. In the first stage, the algorithm works as a genetic algorithm, whereas in the second stage it works as an insertion heuristic that modifies the solution of the genetic algorithm to do ridematching in real time. In addition, the authors provide datasets for the ridematching problem, derived from realistic data, to test the algorithm. Experimentation results indicate that the algorithm can successfully solve the problem by providing answers in real time, and it can be easily tuned between response time and solution quality.

Dynamic ridesharing

Author(s): Deakin, Elizabeth;[1] Frick, Karen Trapenberg;[2] Shively, Kevin[3]
Year: 2012
Source: ACCESS Magazine, no. 40, pp. 23–28
Publisher: University of California Center on Economic Competitiveness in Transportation
Author affiliation:
[1]Department of City and Regional Planning, University of California, Berkeley, CA 94720, United States, http://dcrp.ced.berkeley.edu/
[2]Transportation Center and California Partners for Advanced Transit and Highways, University of California, Berkeley, CA 94720, United States, http://www.path.berkeley.edu/
[3]Nelson–Nygaard Consulting Associates, San Francisco, CA 94103, United States, http://www.nelsonnygaard.com/

Most cars can carry at least four passengers, but the average auto occupancy rate for all trips in the United States is only 1.6 persons. Because all the empty seats in cars represent our greatest source of untapped transportation capacity, promoting ridesharing is of considerable interest. Government agencies across the country use ridesharing programs both to provide transportation at low cost and to reduce traffic congestion and the other costs of solo driving. The rigidity of conventional ridesharing arrangements, which generally require fixed travel times, presents a barrier to many people, but developments in computing and communications now allow drivers and potential passengers to match up with little advance planning and no long-term commitments. Local governments, private companies, and nonprofit organizations alike have been pursuing this "dynamic ridesharing" strategy. Participants in these programs use cell phones or computer messaging to match up "on the fly" or up to several days in advance. Travelers submit a ride offer or request, and a ridematching service automatically scans its database to identify other offers and requests for trips with similar origins, destinations, and arrival times. If a satisfactory match exists, the service notifies the driver and rider(s) so that they can confirm the trip plans.

Ad hoc ridesharing application using continuous SPARQL queries

Author(s): Mukherjee, Debnath;[1] Banerjee, Snehasis;[1] Misra, Prateep[1]
Year: 2012
Source: WWW'12 Companion—Proceedings of the 21st Annual Conference on World Wide Web, pp. 579–580
Publisher: International World Wide Web Conferences Committee
Author affiliation:
[1]TCS Innovation Labs, Kolkata, India, http://www.tcs.com/about/tcs_difference/innovation/tcs_labs/Pages/default.aspx

In the existing ridesharing scenario, the rider has to cope with uncertainties, because the driver may be delayed or may not show up due to some exigencies. The authors discuss a solution to this problem in this paper. The solution framework is based on gathering information from multiple streams, such as traffic status on the driver's routes and the rider's GPS coordinates. The framework also maintains a list of alternative drivers so as to almost guarantee a trip for the rider. This solution uses a SPARQL-based continuous query framework that is capable of sensing a fast-changing, real-time situation. The solution also has reasoning capabilities for handling the rider's preferences. The authors introduce the concept of user-managed windows, which is shown to be required for this solution. Finally, the authors show that the performance of the application is enhanced by designing the application with short incremental queries.

Comparison of multiobjective evolutionary algorithms for solving the multiobjective route planning in dynamic multihop ridesharing

Author(s): Herbawi, Wesam;[1] Weber, Michael[1]
Year: 2011
Source: 2011 IEEE Congress of Evolutionary Computation, CEC 2011, pp. 2099–2106
Publisher: IEEE
Author affiliation:
[1]Institute of Media Informatics, University of Ulm, Ulm, Germany, http://www.uni-ulm.de/en/in/mi.html

Ridesharing is considered to be a promising solution for lowering fuel consumption and reducing congestion in urban cities, hence reducing environmental pollution. Route planning is a key component for the success of ridesharing systems in which multiple objectives can be optimized. The multiobjective route-planning problem in multihop ridesharing is categorized as NP-complete. Multiobjective evolutionary algorithms have received a growing interest in solving the multiobjective optimization problems. In this work, the authors compare the behavior of different multiobjective evolutionary algorithms for solving the multiobjective route planning in dynamic multihop ridesharing. Comparison results indicate that there is no single algorithm, as in literature, that wins all the tournaments regarding all the quality indicators; however, a subset of the algorithms is recommended with better quality and runtime.

Saving time, money, and the environment—vHike, a dynamic ridesharing service for mobile devices

Author(s): Stach, Christoph[1]
Year: 2011
Source: 2011 IEEE International Conference on Pervasive Computing and Communications Workshops, pp. 352–355
Publisher: IEEE
Author affiliation:
[1]Institut für Parallele und Verteilte Systeme, 70569 Stuttgart, Germany, https://www.ipvs.uni-stuttgart.de/index1.html?__locale=en

In times of increasing traffic-related problems, such as air pollution or traffic jams, ridesharing is one of the most environmentally friendly and pleasant ways to travel. The many benefits are offset by a multitude of prejudices and fears, including security concerns and a heavy scheduling and coordinating burden. For this reason, the author introduces vHike, an easy-to-use management system for dynamic ridesharing that runs on modern smartphones. By using well-known techniques from Web 2.0 social networks, the threats and social discomfort involved in ridesharing are mitigated. With vHike, the author attempts to show that a properly designed social dynamic ridesharing system can be feasible and viable.

Software engineering for smartphone: A car-sharing system case study

Author(s): Haddad, Yoram;[1] Cohen, Yuval;[1] Goldsmith, Ronen[1]
Year: 2013
Source: The International Journal of Soft Computing and Software Engineering (JSCSE), vol. 3, no. 3, pp. 872–880. Special Issue: The Proceedings of the International Conference on Soft Computing and Software Engineering 2013 (SCSE '13), San Francisco, CA, United States
Publisher: JSCSE
Author affiliation:
[1]Jerusalem College of Technology, http://www.jct.ac.il/en

Widespread use of smartphones has opened a wide range of opportunities for new smartphone applications. To be sure, the ever-increasing use of digital information-processing and communications devices has created a commensurate increase in electricity consumption; however, researchers can also develop applications that encourage and spread ecologically friendly behavior. The authors present the design and implementation of a car ridesharing application for a mobile environment. The application enables users to share automobile transportation in an efficient and simple way. Use of this system can significantly reduce the number of private automobiles on the roads, thus yielding substantial ecological, economical, and social benefits. Because the application is designed for smartphones, the sharing facility may be implemented in realtime, from anywhere, at any time. The application is based on an algorithm for finding subroutes in a user-defined path, according to the number of matched points along that path. This application differs from existing car-sharing applications in several, crucial ways. The authors will describe both the system and its specific differences from other, existing software.

Bridging the representation and interaction challenges of mobile context-aware computing: Designing agile ridesharing

Author(s): Mirisaee, Seyed Hadi;[1] Brereton, Margot;[1] Roe, Paul[1]
Year: 2011
Source: Proceedings of the 23rd Australian Computer–Human Interaction Conference, OzCHI 2011, pp. 221–224
Publisher: Association for Computing Machinery
Author affiliation:
[1]Queensland University of Technology, Brisbane, QLD 4001, Australia, http://www.qut.edu.au/

The increasing capability of mobile devices and social networks to gather contextual and social data has led to increased interest in context-aware computing for mobile applications. The authors explore ways of reconciling two different viewpoints of context, representational and interactional, that have arisen respectively from technical and social science perspectives on context-aware computing. Through a case study in agile ridesharing, the importance of dynamic context control, historical context, and broader context is discussed. The authors build upon earlier work that has sought to address the divide by further explicating the problem in the mobile context and expanding on the design approaches.

Development of broker logic for ridesharing system on top of Smart-M3

Author(s): Smirnov, Alexander;[1] Kashevnik, Alexey;[1] Shilov, Nikolay;[1] Paloheimo, Harri;[1] Waris, Heikki;[1] Balandin, Sergey[1]
Year: 2011
Source: 2011 Baltic Congress on Future Internet Communications
Publisher: IEEE
Author affiliation:
[1]Russian Academy of Sciences, St. Petersburg Institute for Informatics and Automation RAS (SPIIRAS), 199178 St. Petersburg, Russia, http://www.spiiras.nw.ru/index.php?newlang=russian

Ridesharing is attracting more and more attention due to its high potential for applying new business models to private transportation in urban areas, reducing greenhouse gas emissions, and decreasing the amount of traffic on streets. The authors extend previously presented approaches of building sustainable logistics system that support ridesharing by applying to it principles of smart spaces, in which various electronic devices can seamlessly access all required information distributed in the multidevice system and all services are provided in a proactive manner. In particular, the authors describe the ontology and major components of the ridesharing system. An example implementation of the developed solution was performed on the Smart-M3 open source platform.

Real-time ridesharing: Opportunities and challenges in using mobile phone technology to improve rideshare services

Author(s): Amey, Andrew;[1] Attanucci, John;[2] Mishalani, Rabi[3]
Year: 2011
Source: Transportation Research Record: Journal of the Transportation Research Board, vol. 2217, pp. 103–110
Publisher: Transportation Research Board
Author affiliation:
[1]Department of Urban Studies and Planning, Massachusetts Institute of Technology, Cambridge, MA 02139, United States, http://dusp.mit.edu/
[2]Department of Civil and Environmental Engineering, Massachusetts Institute of Technology, Cambridge, MA 02139, United States, http://cee.mit.edu/
[3]Department of Civil and Environmental Engineering and Geodetic Science, Ohio State University, Columbus, OH 43210, United States, http://ceg.osu.edu/

In recent years, an innovative ridesharing service relying heavily on advanced mobile phone technologies, known as real-time ridesharing or dynamic ridesharing, has gained popularity with some groups: providers, organizations, and employers. Traditionally, rideshare arrangements between two or more unrelated individuals for commuting purposes have been relatively inflexible, long-term arrangements. The concept of real-time ridesharing attempts to add flexibility to rideshare arrangements by allowing drivers and passengers to arrange occasional shared rides ahead of time or on short notice. The addition of this service innovation not only presents opportunities to overcome existing rideshare challenges but also leads to new challenges. The overall goal of this study was to provide a foundation for further real-time ridesharing research. The aims of the study were to identify, highlight, and discuss the potential benefits of and obstacles to real-time ridesharing and to point to the next steps to better understand and possibly advance this mode of travel. The authors provide a definition of real-time ridesharing, followed by a comprehensive categorization of challenges that hinder greater rideshare participation. The information gathered suggests that the rideshare challenge, rather than being a single challenge to be overcome, is a series of economic, behavioral, institutional, and technological obstacles to be addressed. The authors highlight potential opportunities and obstacles created by real-time innovations and provide several recommendations toward next steps to understand further how rideshare participants use real-time services, focusing on the need for multiple, comprehensive trials of real-time rideshare.

PoliUniPool: A carpooling system for universities

Author(s): Bruglieri, Maurizio;[1] Ciccarelli, Diego;[2] Colorni, Alberto;[1] Lué, Alessandro[1]
Year: 2011
Source: Procedia—Social and Behavioral Sciences, vol. 20, pp. 558–567
Publisher: Elsevier
Author affiliation:
[1]Dipartimento INDACO—Politecnico di Milano, 20158 Milano, Italy, http://www.indaco.polimi.it/
[2]Poliedra—Politecnico di Milano, 20133 Milano, Italy, http://www.poliedra.polimi.it/?lang=en

Carpooling is a transport system based on a shared use of private cars. The mobility managers of the Università degli Studi di Milano and Politecnico di Milano universities are interested in promoting the use of such a system among their students and employees. The authors of this paper present an ongoing project to design, implement, and test

PoliUniPool, a carpooling service for such interested universities. The main characteristics of the PoliUniPool service are the following: (1) The use of the system is restricted to employees, faculty, and students of the two universities; (2) besides suggesting a matching among the users, the system provides the expected schedule for their trips; (3) in addition to the campus premises, users can select—as destinations for their carpooling trips—the main railway and subway stations in an effort to encourage the most environmentally friendly transportation means; (4) users are informed immediately of delays or changes so as to improve the reliability of the service; (5) the system estimates the costs for each user to let the users know how to divide the cost of the trip; (6) the system has some social network functionalities, such as drivers' ability to set partial prearranged crews, and users may indicate whether there are other riders that they would prefer to carpool with ("friends") or prefer not to carpool with ("I don't like him/her"). A Web-based software tool has been implemented to manage the matching of the users. To solve the carpooling problem, the authors used a heuristic based on a guided Monte Carlo method. The algorithm minimizes an objective function, subject to user time windows and car capacity constraints. The objective function is a weighted sum of different terms to maximize the number of served users, minimize the total route length, and maximize the satisfied user preferences (e.g., friends). The result is a matching between drivers and passengers, their schedules, and the routes to be driven by each driver. The trial of the proposed service, started in September 2011, took into account how to introduce and promote the service, identifying regulation, incentives, modalities, and marketing actions.

Real-time carpooling system

Author(s): Pukhovskiy, N.V.;[1] Lepshokov, R.E.[1]
Year: 2011
Source: Proceedings of the 2011 International Conference on Collaboration Technologies and Systems, CTS 2011, pp. 648–649
Publisher: IEEE
Author affiliation:
[1]Østfold University College, N-1757 Halden, Norway, http://www.hiof.no/english

The result of the authors' project is a designed and optimized real-time carpooling system that has an easy and friendly user interface. The authors created a system with a simple but organized route-request mechanism. In combination with a digital map, the system gives the user full immersion into each trip. According to the authors, there are no doubts about the reliability of a redundant system because of its automatic route-search and changeover systems for unforeseen situations: if the system created by the authors cannot find carpooling solutions for the user then it will instead find the nearest public transport routes as specified by the user's requested travel time. These opportunities provide the user with profound trust in the system. The user's profile contains all the information needed for traveling. Interactive credit systems (which help the carpooling system know the attitudes of each member) and cooperation with local police provide the users with a trust in the system for their safety. Unlike other research projects, the authors' system affects all aspects of carpooling: in their system all of the shortcomings of previous researchers' work were taken into account and the authors' real-time carpooling system works with the latest technologies that provides major advantages over those previous works. The use of mobile phones makes the system easy to use everywhere at every time of day.

Real-time rideshare matching problem

Author(s): Ghoseiri, Keivan;[1] Haghani, Ali;[1] Hamedi, Masoud[1]
Year: 2011
Publisher: Office of the Assistant Secretary for Research and Technology (OST-R), U.S. Department of Transportation
Author affiliation:
[1]University of Maryland, Department of Civil and Environmental Engineering, College Park, MD 20742, United States, http://www.civil.umd.edu/

The authors of this research project present a Dynamic Rideshare Matching Optimization (DRMO) model that is aimed at identifying suitable matches between passengers requesting rideshare services and appropriate drivers available to carpool for credits and HOV-lane privileges. DRMO receives passenger and driver information and related preferences continuously over time and assigns passengers to drivers with respect to proximity in time and space and compatibility of characteristics and preferences among the passengers, drivers, and passengers onboard. DRMO maximizes the total number of assignments in a given planning horizon and assures that all constraints (e.g., vehicle occupancy, waiting time to pick-up, number of connections, detour distance for vehicles and relocation distance for passenger) are satisfied. The ridesharing preferences and characteristics considered in the model are age, gender, whether they smoke, and pet restrictions, as well as the maximum number of people sharing a ride. To better understand the model, the authors present and discuss a numerical example with compromise solutions. The authors currently are working on developing solution algorithms for solving the optimization model proposed in this paper for large-scale, real-world problems.

Mobile dynamic ridematching and e-ticketing: A Carriva-based concept to integrate public transport and carpooling

Author(s): Schäfer, Marco Domenico1
Year: 2011
Source: 2011 IEEE Forum on Integrated and Sustainable Transportation Systems, FISTS 2011, pp. 264–271
Publisher: IEEE
Author affiliation:
[1]Faculty of Mechanical Transportation Engineering, Transport System Planning, and Transport Telematics Department, Technische Universität Berlin, 10587 Berlin, Germany, http://www.tu-berlin.de/menue/home/parameter/en/

As part of the European Commission's DRIVE project, the CHARM '89 proposal outlined the potential of a more efficient use of private automobiles for a number of transport and environmental policy objectives. To achieve this higher efficiency, the author identified two essential requirements: the matching technology, including communication devices, and a system of incentives for drivers and riders. In 2008, the CHARM '89 vision was realized with the launch of the Carriva project at the Frankfurt International Airport, which implemented an innovative mobile dynamic ridesharing system, including electronic matching, communication, riders' payments, and drivers' reimbursements. In all respects, the Carriva system successfully proved its potential. The author reviewed selected past and present pilots and a detailed description of the Carriva system characteristics, from which he developed a proposal that elaborates on the substantiated technology as a next step toward the integration of public transport and carpooling. The proposal focuses

on incentives as the last missing element: the private car as an integrated part of public transport. This concept emphasizes the importance of information and communications technology systems for sustainable transportation and climate protection.

Dynamic ridesharing: A simulation study in metro Atlanta

Author(s): Agatz, Niels A.H.,[1] Erera, Alan L.,[2] Savelsbergh, Martin W.P.,[3] Wang, Xing[2]
Year: 2011
Source: Transportation Research Part B: Methodological, 2011
Publisher: Elsevier
Author affiliation:
[1]Rotterdam School of Management, Erasmus University, 3062 PA Rotterdam, Netherlands, http://www.rsm.nl/
[2]School of Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta, GA 30332, United States, http://www.isye.gatech.edu/
[3]Commonwealth Scientific and Industrial Research Organization (CSIRO), Campbell, ACT 2612, Australia, http://www.csiro.au/

Smartphone technology enables dynamic ridesharing systems that bring together people with similar itineraries and time schedules to share rides on short notice. The authors consider the problem of matching drivers and riders in this dynamic setting. The authors develop optimization-based approaches that aim at minimizing the total systemwide vehicle miles incurred by system users and their individual travel costs. To assess the merits of their methods, the authors present a simulation study based on 2008 travel demand data from metropolitan Atlanta. The results indicate that the use of sophisticated optimization methods instead of simple greedy matching rules substantially improve the performance of ridesharing systems. Furthermore, even with relatively low participation rates, it appears that sustainable populations of dynamic ridesharing participants may be possible even in relatively sprawling urban areas with many employment centers.

A novel approach based on a distributed dynamic graph modeling set up over a subdivision process to deal with distributed optimized real-time carpooling requests

Author(s): Sghaier, Manel;[1] Zgaya, Hayfa;[2] Hammadi, Slim;[1] Tahon, Christian[3]
Year: 2011
Source: IEEE Conference on Intelligent Transportation Systems, Proceedings, ITSC, pp. 1311–1316
Publisher: IEEE
Author affiliation:
[1]LAGIS, Ecole Centrale de Lille, Cité Scientifique, 59650 Villeneuve d'Ascq, France, http://lagis.cnrs.fr/?lang=fr 2ILIS, 59120 Loos, France
[2]ILIS, L'Université Lille 2, 59120 Loos, France, http://ilis.univ-lille2.fr/?&L=1
[3]UVHC–LAMIH CNRS, Université de Valenciennes et du Hainaut-Cambrésis, F59313 Valenciennes Cedex, France, http://www.univ-valenciennes.fr/LAMIH/

Years ago, researchers started devoting their efforts to studying the carpooling domain, leading to many systems. Those systems that are still operating require improvement. Optimization and dynamicity tend to be lacking in these systems, and as a result, the authors were interested in establishing an optimized dynamic carpool service. Because of the high complexity of the issue, it is challenging to determine how best to develop an efficient process. The authors address this challenge based on a decentralized parallel

request process and adoption of a distributed architecture. In this context, the authors propose a subdivision principle in order to decompose the server network and establish a Distributed Dynamic Graph. The Distributed Dynamic Graph models the available information about passengers and drivers and helps to establish a distributed parallel process. In addition, the multiagent concept was adopted to set up an automated framework in which several communicating entities evolve and perform request management.

A transport-based clearing system for dynamic carpooling business services

Author(s): Arnould, Gerald;[1] Khadraoui, Djamel;[1] Armendáriz, Marcelo;[2] Burguillo, Juan C.;[2] Peleteiro, Ana[2]
Year: 2011
Source: 2011 11th International Conference on ITS Telecommunications, ITST 2011, pp. 527–533
Publisher: IEEE
Author affiliation:
[1]CRP Henri Tudor, L-1855 Luxembourg, Luxembourg, http://www.tudor.lu/fr
[2]Department of Telematic Engineering, University of Vigo, 36310-Vigo, Spain, http://www.uvigo.es/

The WiSafeCar (Wireless Traffic Safety Network between Cars) project aims to create a comprehensive wireless communication and service platform that targets vehicular networks and strives to reduce accidents and traffic congestion. Within the framework of this project, a dynamic carpooling transport system was designed, reacting in real time to events and user transport requests. To allow this system to integrate seamlessly with other transport modes, but also to encourage users to use carpooling, a clearing service has been implemented to solve the inherent compensation issues. Both the carpooling system and the underlying utility services have been prototyped, using the NetLogo simulator, to prove not only the efficiency of WiSafeCar to reduce the congestion in cities, but also to validate the business models to be implemented and, more precisely, the clearing algorithm.

A distributed Dijkstra's algorithm for the implementation of real-time carpooling service with an optimized aspect on siblings

Author(s): Sghaier, Manel;[1] Zgaya, Hayfa;[1] Hammadi, Slim;[1] Tahon, Christian[2]
Year: 2010
Source: IEEE Conference on Intelligent Transportation Systems, Proceedings, ITSC, pp. 795–800
Publisher: IEEE
Author affiliation:
[1]École Centrale de Lille, LAGIS FRE CNRS 3303, BP 48, 59651 Villeneuve d'Ascq Cedex, France, http://www.ec-lille.fr/
[2]University of Valenciennes and of Hainaut-Cambrésis, UVHC, LAMIH CNRS, 59304 Valenciennes Cedex, France, http://www.univ-valenciennes.fr/

Thanks to the important and increasing growth of the carpooling phenomenon throughout the world, many researchers have focused their efforts particularly on this concept. Research has led to many systems affording carpooling service that are not usually effective. In fact, most systems present multiple drawbacks in regard to automation, functionality, and accessibility. Only a few researchers have focused on the real-time carpooling concept, but without producing promising results. To address these gaps, the

authors introduce a novel approach called DARTiC: a distributed Dijkstra algorithm for the implementation of a real-time carpooling system based on the multiagent concept. The authors focused particularly on the distributed and dynamic aspect within the Dijkstra implementation. A new modeling of the server network highlights the distributed architecture, helping to perform decentralized parallel processing. This feature brings to light different aspects the authors should take into consideration, especially the optimization issue. Users' requests must be performed in a reasonable time, and responses should be as efficient as possible with regard to the fixed optimization criteria.

Ridesharing in North America: Past, present, and future

Author(s): Chan, Nelson D.;[1] Shaheen, Susan A.[2]
Year: 2012
Source: Transport Reviews: A Transnational Transdisciplinary Journal, vol. 32, no. 1, pp 93–112
Publisher: Taylor and Francis Ltd.
Author affiliation:
[1]Transportation Sustainability Research Center, University of California, Berkeley, CA 94704, United States, http://tsrc.berkeley.edu/
[2]Institute of Transportation Studies, University of California, Davis, CA 95616, United States, http://www.its.ucdavis.edu/

Since the late 1990s, numerous ridematching programs have integrated the Internet, mobile phones, and social networking into their services. Online ridematching systems now use a range of new strategies to create "critical mass," such as: (1) regional and large employer partnerships, (2) financial incentives, (3) social networking to younger populations, and 4) real-time ridematching services that use smartphones and automated ridematching software. Enhanced casual carpooling approaches, which focus on "meeting places," are also being explored. Today, ridesharing represents approximately 8 to 11 percent of the transportation modal share in Canada and the United States, respectively. There are approximately 613 ridematching programs in North America. Ridesharing's evolution can be categorized into five phases: (1) World War II car-sharing (or carpooling) clubs, (2) major responses to the 1970s energy crises, (3) early organized ridesharing schemes, (4) reliable ridesharing systems, and (5) strategy-based, technology-enabled ridematching. Although ridesharing's future growth and direction are uncertain, the next decade is likely to include greater interoperability among services, technology integration, and stronger policy support. In light of growing concerns about climate change, congestion, and oil dependency, more research is needed to better understand ridesharing's impacts on infrastructure, congestion, and energy/emissions.

Full article can be accessed at http://www.tandfonline.com/doi/abs/10.1080/01441647.2011.621557?tab=permissions#

Twitter-Dee-Dum: How social networking will change ridematching forever

Author(s): Martin, John W.[1]
Year: 2010
Source: TDM Review, vol. 17, no. 3, pp. 11–17
Publisher: Association for Commuter Transportation
Author affiliation:
[1]Southeastern Institute of Research, Richmond, VA 23220, United States, http://www.sirresearch.com/

This article outlines the transportation demand management (TDM) industry's mindset on social networking and how social networking is transforming ridematching. The author includes examples of best practices, including the work coming from RIDE Solutions in Roanoke, VA, and RideFinders in Richmond, VA. The author first defines the related terms and presents statistics about how social networking is becoming more popular and more entrenched in everyday life. Social networking in the realm of ridematching is defined as a way to use available technologies, such as the Internet, email, cell phones, and compatible software applications to locate friends, coworkers, and other people of interest to facilitate shared rides. Other topics explored in the article include generational differences in the use of social networking, the use of social networking among TDM program managers, third-party online ridematching services, the projected evolution of TDM's social networking market, awareness-building strategies, specific ridematching services (e.g., Zimride and NuRide), the rise of realtime applications (apps) to support ridematching, and the importance of the TDM industry looking ahead and embracing these social networking opportunities. The author concludes that social networking will change the face of ridematching forever. The technology has arrived and will continue to improve, the networks of available riders will continue to expand, and an age cohort is arriving in the workplace that is amenable to the ridesharing arrangements facilitated by social networks.

Interaction, privacy, and profiling considerations in local mobile social software: A prototype agile rideshare system

Author(s): Ghelawat, Sunil;[1] Radke, Kenneth;[1] Brereton, Margot[1]
Year: 2010
Source: ACM International Conference Proceeding Series, pp. 376–379
Publisher: Association for Computing Machinery
Author affiliation:
[1]Queensland University of Technology, Brisbane, QLD 4001, Australia, http://www.qut.edu.au/

Agile ridesharing aims to utilize the capability of social networks and mobile phones to facilitate in real time people's sharing vehicles and traveling. The application of social networking technologies in local communities to address issues of personal transport, however, faces significant design challenges. In this paper, the authors describe an iterative design-based approach to exploring this problem and discuss findings from the use of an early prototype. The findings focus on interaction, privacy, and profiling. The authors' early results suggest that explicitly entering information, such as ride data and personal profile data, into formal fields for explicit computation of matches, as is done in many systems, may not be the best strategy. It might be preferable to support informal communication and negotiation with text search techniques.

Markets for dynamic ridesharing? Case of Berkeley, California

Author(s): Deakin, Elizabeth;[1] Frick, Karen Trapenberg;[2] Shively, Kevin M.[3]
Year: 2010
Source: Transportation Research Record: Journal of the Transportation Research Board, vol. 2187, pp. 131–137
Publisher: Transportation Research Board
Author affiliation:
[1]City and Regional Planning Department, University of California, Berkeley, CA 94720, United States, http://dcrp.ced.berkeley.edu/
[2]Transportation Center and California Partners for Advanced Transit and Highways, University of California, Berkeley, CA 94720, United States, http://www.path.berkeley.edu/
[3]Nelson-Nygaard Consulting Associates, San Francisco, CA 94103, United States, http://www.nelsonnygaard.com/

Ridesharing programs are widespread across the United States. Dynamic ridesharing is a newer way to share rides on the fly or up to several days in advance by using cell phone or computer messaging to make arrangements. The authors describe research that they conducted to assess the potential for dynamic ridesharing for travel to downtown Berkeley, CA, and the University of California, Berkeley, campus. The authors provide insights about the opportunities and challenges presented by this travel option. Data were collected from statistical and geographic analysis of the downtown and campus travel markets, and surveys and focus groups were administered to employees and graduate students. The authors found that about one-fifth of commuters who drive alone to the campus would be interested in using dynamic ridesharing at least occasionally and live in areas where matches could be found. The commuters would prefer to arrange a shared ride at least the night before rather than immediately before the trip is made. Many of these travelers were unaware of current rideshare services, and some would be willing to find a regular carpool partner. Finally, if parking charges are fairly high and parking supply is limited and regulated, financial incentives and carpool parking subsidies would greatly increase interest in dynamic ridesharing.

San Francisco to Silicon Valley, CA: Instant ridesharing with transfer hub

Author(s): Raney, Steve[1]
Year: 2010
Source: Transportation Research Record: Journal of the Transportation Research Board, vol. 2143, pp. 134–141
Publisher: Transportation Research Board
Author affiliation:
[1]Cities21, Palo Alto, CA 94301, United States, http://www.cities21.org/cms/

The author provides a concept of operations for an innovative instant ridesharing service to exploit the San Francisco Bay Area's large major employer commuter flow from San Francisco to Silicon Valley in California. Although the concept of filling empty seats in cars seems obvious, 15 previous dynamic or instant ridesharing pilot programs failed to develop critical mass. The proposed service differs from past attempts because (1) it targets a large commuter flow vector rather than a two-dimensional area and results in a higher probability of ride matches, (2) it uses a mid-commute transfer hub to further increase ridematching probabilities, (3) it offers a viable business model that provides $40/day per commuter cost savings to Silicon Valley employers, (4) it uses psychological

persuasion principles to obtain higher participant commitment, (5) it uses daily financial incentives to motivate participants, and (6) through extensive participant training, it emphasizes immediate high system utilization on the first day of operation.

A multiagent system for dynamic ridesharing

Author(s): Bandara, H.A.N.C.,[1] Dias, Dileeka[1]
Year: 2009
Source: ICIIS 2009—4th International Conference on Industrial and Information Systems 2009, Conference Proceedings, pp. 199–203
Publisher: IEEE
Author affiliation:
[1]Faculty of Information Technology, University of Moratuwa, Katubedda, Moratuwa 10400, Sri Lanka, http://www.itfac.mrt.ac.lk/

The authors propose a novel method for a dynamic ridesharing mechanism by using the combination of several modern information and communication technologies. The increased personal usage of automobiles has caused several undesirable consequences: waste of time, fuel, and effort due to traffic congestion and scarcity of parking areas are the most obvious. Ridesharing for routine travelling has been an accepted practice in the developed world as a solution; however, today's travelling needs are more complex, and therefore traditional rideshare systems are no longer adequate. The concept of instant ridesharing has emerged consequently. The objective of the proposed system is to address these limitations with a novel approach of using multiagent technology for instant ridematching between drivers and riders. Interaction between dedicated agents takes care of matching rides and possible uncertainties. Effective communication of users with the service provider is achieved through their mobile devices. The architecture of this system targets a robust rideshare application, which constantly takes care of users' ride requirements without the need for frequent interventions.

Collaboration and shared plans in the open world: Studies of ridesharing

Author(s): Kamar, Ece;[1] Horvitz, Eric[2]
Year: 2009
Source: Proceedings of the Twenty-First International Joint Conference on Artificial Intelligence (IJCAI09), pp. 187–194
Publisher: International Joint Conferences on Artificial Intelligence
Author affiliation:
[1]SEAS, Harvard University, Cambridge, MA 02138, United States, http://seas.harvard.edu/
[2]Microsoft Research, Redmond, WA 98052, United States, http://research.microsoft.com/en-us/labs/redmond/default.aspx

The authors developed and tested computational methods for guiding collaboration that demonstrate how shared plans can be created in real-world settings, where agents can be expected to have diverse and varying goals, preferences, and availabilities. The methods are motivated and evaluated in the realm of ridesharing by using Global Positioning System (GPS) logs of commuting data. The authors considered challenges with coordination among self-interested people, with their focus on minimizing the cost of transportation and the impact of travel on the environment. The authors presented planning, optimization, and payment mechanisms that provide fair and efficient solutions for the ridesharing collaboration challenge. The authors evaluate different Vickrey-Clarke-Groves–based

payment schemes in terms of their computational efficiency, budget balance, incentive compatibility, and strategyproofness. The authors present the behavior and analyses provided by the Agent-Based Carpool (ABC) ridesharing prototype system. The system learns about destinations and preferences from GPS traces and calendars, and considers time, fuel, environmental, and cognitive costs. The authors review how ABC generates rideshare plans from hundreds of real-life GPS traces collected from a community of commuters and reflect about the promise of employing the ABC methods to reduce the number of vehicles on the road, thus reducing CO_2 emissions and fuel expenditures.

User reaction to car share and lift share within a transport "marketplace"

Author(s): May, A.,[1] Ross, T.,[1] Grebert, J.,[2] Segarra, G.[3]
Year: 2008
Source: IET Intelligent Transport Systems, vol. 2, no. 1, pp. 47–60
Publisher: The Institution of Engineering and Technology
Author affiliation:
[1]Ergonomics and Safety Research Institute, Loughborough University, Loughborough, Leicestershire LE11 3TU, United Kingdom, http://www.lboro.ac.uk/departments/lds/
[2]Technocentre Renault, Guyancourt Cedex 78288, France, http://www.renault.com/en/groupe/developpement-durable/fiches-sites/pages/guyancourt.aspx
[3]Renault DTSI, Le Plessis Robinson 92359, France

The authors used user-centered design methods to understand the key motivators, potential constraints, and design requirements associated with an innovative shared-vehicle scheme, offered as an integral component of a wider "transport marketplace." A set of situated user trials were used to assess attitudinal and behavioral responses to a prototype service implemented in northern France. Potential motivators included the perceived benefits of reduced cost, environmental benefit, social contact, and the provision of location-based information. The key barriers to adoption included personal security during vehicle sharing, liability, and flexibility in meeting individual transport needs. Contrary to initial indications by participants, ease of use was also a key acceptance criterion. The resulting design recommendations stress the need for maximizing service flexibility, addressing perceived barriers, and providing clarity regarding operational procedures and protocols.

Dynamic ridesharing community service on traffic information grid

Author(s): Fu, Ying;[1] Fang, Yu;[1] Jiang, Changiun;[1] Cheng, Jiujun[1]
Year: 2008
Source: 2008 International Conference on Intelligent Computation Technology and Automation, vol. 2, pp. 348–352
Publisher: IEEE
Author affiliation:
[1]College of Electronics and Information Engineering, Tongji University, Shanghai, China, http://www.tongji.edu.cn/english/themes/10/template/Academics/College%20of%20Electronics%20and%20Information%20Engineering.shtml

Traffic congestion is a severe problem in the urban areas of many countries. The adoption of intelligent transportation systems (ITS) makes commuters' travel convenient but cannot eliminate automobiles from the highways. The existing ridesharing services increase the efficiency of the transportation network, but benefits are limited by user issues. The

authors' approach to addressing such issues is a dynamic ridesharing community service architecture, which combines ITS, ridesharing, and social networking. The architecture makes use of heterogeneous and dynamic resources in the traffic information grid system to provide immediate and dynamic ridesharing service. Simultaneously, the location information collected in ridesharing helps to improve the performance of traffic services in ITS. In addition, ridesharing contributes to the formation of a travel community with an underlying physical transportation network to support it. A prototype system has been developed to demonstrate the feasibility of the architecture.

Time geography for ad hoc shared-ride trip planning in geosensor networks

Author(s): Raubal, Martin;[1, 3] Winter, Stephan;[2] Teßmann, Sven;[3, 4] Gaisbauer, Christian[2]
Year: 2006
Source: ISPRS Journal of Photogrammetry and Remote Sensing, vol. 62, no. 5, pp. 366–381
Publisher: Elsevier
Author affiliation:
[1]Department of Geography, University of California at Santa Barbara, Santa Barbara, CA 93106, United States, http://www.geog.ucsb.edu/
[2]Department of Geomatics, The University of Melbourne, VIC 3010, Australia, http://www.ie.unimelb.edu.au/
[3]Institute for Geoinformatics, University of Münster, 48149 Münster, Germany, http://ifgi.uni-muenster.de/en
[4]German Remote Sensing Data Center (DFD), German Aerospace Center (DLR), 82234 Wessling, Germany, http://www.dlr.de/eoc/en/desktopdefault.aspx/tabid-5278/8856_read-15911/

Ad hoc, shared-ride trip planning in an urban environment is a complex task within a nondeterministic transportation network. Mobile geosensor networks provide the technical environment for realizing ad hoc, shared-ride trip planning: Network nodes are autonomous agents that interact locally by ad hoc, short-range communication and arrange for shared rides. In a mobile geosensor network, communication costs are critical because of constraints regarding bandwidth, available energy, and memory. The authors introduce spatio-temporal concepts from time geography that can be used during the planning process to significantly reduce communication costs. The authors integrate network-based algorithms and different wayfinding strategies to assist both shared-ride clients and hosts in finding optimal travel assignments. Multiagent geosimulation in a real street network was used to demonstrate the applicability of the approach and to quantitatively confirm the theoretically foreseen reduction in communication costs.

ANDIAMO: A multiagent system to provide a mobile-based rideshare service

Author(s): Sottini, Francesco;[1] Abdel-Naby, Sameh;[1] Giorgini, Paolo[1]
Year: 2006
Publisher: University of Trento Department of Information and Communication Technology
Author affiliation:
[1]University of Trento Department of Information and Communication Technology, 38122 Trento, Italy, http://disi.unitn.it/

A diverse range of architectures and concepts has been proposed by researchers within the theme of carpooling. Most of these studies have attempted to tie together two major elements: the need for people to move from one place to another and the resources used to accomplish this action. Based on the use of location and available car seats, rideshare systems allow a substantial number of people to share car rides. These systems would, among other advantages, rationalize energy consumption, save money, decrease traffic jams and human stress, and, eventually make a significant improvement in human life; however, system accessibility has prevented these architectures from being widely reached. In this paper, the authors present an agent-based rideshare system that is accessible via lightweight devices (mobile phones and personal digital assistants), in which Bluetooth® technology is adopted to reflect users' locality. The authors illustrate the overall infrastructure of the system, the specific protocols it uses, and the algorithms that it implements to recognize the multiagent system negotiations.

Notice

Quality Assurance Statement

The Federal Highway Administration (FHWA) provides high-quality information to serve Government, industry, and the public in a manner that promotes public understanding. Standards and policies are used to ensure and maximize the quality, objectivity, utility, and integrity of its information. FHWA periodically reviews quality issues and adjusts its programs and processes to ensure continuous quality improvement.

What Is the Exploratory Advanced Research Program?

FHWA's Exploratory Advanced Research (EAR) Program focuses on long-term, high-risk research with a high payoff potential. The program addresses underlying gaps faced by applied highway research programs, anticipates emerging issues with national implications, and reflects broad transportation industry goals and objectives.

To learn more about the EAR Program, visit the Exploratory Advanced Research Web site at www.fhwa.dot.gov/advancedresearch. The site features information on research solicitations, updates on ongoing research, links to published materials, summaries of past EAR Program events, and details on upcoming events.

U.S. Department of Transportation
Federal Highway Administration