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# RIDE SHARING SYSTEM: A REVIEW AND METHODOLOGY

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## ABSTRACT

*Steps to reduce ill effects of private vehicles are extremely necessary now-a-days. Mass transit system is the best solution if provided efficiently, but many persons do not prefer it because of its lack of door to door service, longer and fixed route and less reliable schedule. So, some new facility or services should be developed to provide a comfortable and reliable service to users and to reduce hazardous effects on environment like pollution, congestion etc. Ride sharing is one of the emerging technologies adopted all over the world, in which users with same origin-destination and time of travel are matched and they share the ride. Different methods, algorithms or models designed to provide ride sharing is summarized in this paper and what changes should be made in traditional ride sharing service is described with methodology.*

***Keywords: Public Transport, GIS Technology, Ride Sharing***

## I INTRODUCTION

In majority of urban areas, two modes of transportation are widely used for day-to-day travelling: private vehicles and public/mass transit services.

Private vehicles provide flexible and comfortable ride but due to increase in population and excess use of vehicles, transport systems are facing the limits of capacity, traffic congestion due to large demand in peak hours, environmental concerns, energy security. Individual motorized traffic contributes to a substantial part to worldwide emissions and increases oil dependency and thus increases economy's dependence on fluctuating oil prices. Technical development of engines and fuels like hybrid engines could not significantly change the overall negative impacts of cars because the growth in privatization and trip distances overcompensates for engine/fuel improvements.

Mass transit system is one of the widely used and effective mode of public transport system. Although mass transit system can lower some of negative impact caused by private vehicles, they do not provide flexibility and reliability. Most of the ridership is concentrated on few routes only. It also has a disadvantage that occupancy

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per vehicle is less and most of the vehicles move empty seated during off peak hours and during peak hours, they are frequently get overloaded. So people who want a comfortable ride generally do not prefer traditional mass transit system.

Paratransit system is one of the solutions which can be adopted to reduce the drawbacks, in which users go for carpooling – group of users share a pool of car or another mode of transport which suit their need best. One more effective and efficient method is Ride Sharing System, which matches drivers with other riders who want to travel the same or a comparable route. It can either be a manually matched ride sharing in which drivers wishing to form carpool, pick up passengers waiting by the roadside or it can be a dynamic or real time ride sharing enabled by automatic matching that dynamically arranges shared rides. In dynamic ride sharing system, requests for rides are received over time, each consisting of two points, an origin and a destination. The Ride share system matches the information with other participants registered in the Database automatically and identifies potential Ride share partners. The goal is to schedule requests in real-time and to minimize the user's traveling time with service quality guarantee.

## II LITERATURE REVIEW

Some temporary solutions are always welcoming in case of temporary hindrance to traffic like resurfacing or reconstruction of a road or bridge and for that, ride matching concept is very beneficial especially when the street is very congested. Milica Šelmic [2] agreed to this theory and suggested to provide ride sharing by advanced K-means algorithm during the reconstruction of the Gazela Bridge in Belgrade. An even-odd concept is embedded in which vehicles with license plates ending in an even/odd number are only allowed on the roads on one day. So, one driver with an odd numbered license plate and one, with an even numbered license plate in each cluster are selected. In this method, according to general characteristics like origin, destination, arrival and departure time; and type of license plate, matrix is generated. Also matrix of centers is generated with initial number of centers equal to total number of passengers. Binary matrices with shortest distance/time for all passengers from all generated centers respectively are generated. After applying constraints like tolerable time and distance for passengers, binary matrices are multiplied and the matrix thus generated shows which centers are suitable for each passenger.

Blerim Ciciy [1] developed an algorithm using city-wide Call Description Records (CDRs) in densely populated urban area of Madrid, Spain. Home/work locations of mobile users were identified, when a mobile phone of these individuals makes or receives any phone call or -message during a particular time of day/night. Ride-sharing among users with nearby home and work locations are considered first and then picking up of additional passengers along the way by defining routes using Google Map is considered which can reduce the number of cars upto 67%.

This algorithm is though useful for users with sequential origin – destination (O-D) and work start – time, but pick-up and drop-off of rides to some other place is not possible. Prasuna DVG Reddy [5] observed same and so

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they developed GIS-based system, using ARC/INFO software, linked up with a ridesharing data base. Matching criteria required for this purpose include work start time, amount of flexibility in work timings, and distances drivers are willing to go out of their way to pick up and drop off riders. The software database contains street network, traffic flow and geo-coded locations for address matching. User interface was being developed comprises of three windows. The main window contains the main menu, bar menu and an icon manager from which user will enter his information. Second window will display the city street network. Last window displays all generated matches.

User interfacing can be done by voice-recognition too. Prasuna DVG Reddy [5] developed a voice operated information system (VOIS) too, in which, a dialogue controller output - questions as well as provide set of rules to the users and receives information input. The speech-recognition module then recognizes the input. Rules in rule-base module, then define the subset of total input and using these rules, input system processes user's response and returns it to dialogue controller. The cycle then repeats until user's query is fully established and then dialogue controller communicates with central processing unit to obtain solution and outputs the required information to the user by voice synthesis and an optional graphical display.

One more method to identify suitable matches automatically, between passengers and with appropriate drivers available to carpool for credits and HOV lane privileges was presented by Ali Haghani [3] through Dynamic Rideshare Matching Optimization model. This optimization model receives passengers and drivers information and preferences continuously over time and assigns passengers to drivers with respect to proximity in time, space, compatibility of characteristics and preferences among the passengers, drivers and passengers onboard. Then it secures that all the constraint for vehicle occupancy, waiting time to pickup, number of connections, detour distance for vehicles and relocation distance for passenger are satisfied. The ridesharing preferences and characteristic considered in the model are: age, gender, smoke, and pet restrictions as well as the maximum number of people sharing a ride.

There are so many methods registered using which automatic matching between passengers having same origin-destination and travel time can be matched very easily. One of the methods was developed by Yan Huang [9] named 'Noah', in which taxis and trip requests matched dynamically. Real-time response relied on three main components: fast shortest path algorithm, fast dynamic matching algorithm and spatial indexing method for fast retrieving moving taxis. D. J. Dailey [6] presented an application - Seattle Smart Traveler (SST) which used World Wide Web (WWW) Internet technology to deliver personalized ride matching information to participating individuals. Rideshare clients interact with the rideshare system using only WWW pages. Spatial and temporal trip information also collected using a series of WWW pages that performs a match using structured query language (SQL), and supports both the standard phone-based as well as email-based contact methodologies.

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The power of social media can also be used effectively to empower ride sharing. Web or mobile based application can enhance everyday user's routine travel experience through in-built social media integration. Gauresh Pandit [7] used Facebook.com which has roughly 800 million active users. Collaboration between both parties will be sorted not only through social media connectivity, but also with Geo-location tracking via a native mobile application based on Google's Android OS. Data flow takes place from level – 0, which takes driver, passenger inputs which registers rides, searches for rides, manages these rides and later gives Ride Entries and User Records as output; while level-1 contains two important physical modules, one for the website and another for the mobile terminal. These Create/request for rides, rate different users and Monitor Rides. These data flow than interact with server which has all the entries stored. The server is the one that communicates with the social media platform (Facebook) which provides user data.

It is also necessary to check whether real time ride sharing facility will be adopted by users in future and it will be financially feasible or not. For that validation, Seattle Smart Traveler (SST) application was operated in parallel to a traditional, regional rideshare system – METRO, operated by King County, for one year, and the two systems were marketed to the user on a side-by-side basis. SST and the traditional system acquired approximately the same number of new users over a nine-month test period; however, there was little overlap in the population using the two parallel systems. D. J. Dailey [6] observed that there is a user population that can be reached using Internet technologies for immediate/dynamic ride matching that is not reached by traditional ride match programs.

Security issues should be given most importance in ride sharing facilities as passengers travelling together are usually unknown to each other. Swati Tare [8] found that lack of proper security was main reason of failure of previous ride sharing systems. To deal with these issues, she used comment and rating system in which, the passenger and driver are given a provision to rate and comment each other. These details can be helpful for people who are travelling with same passenger and driver daily. The passengers can book the seats by reviewing the history and then taking final decision of whether to carpool or not. The system contains a driver - passenger module, modules for comment and rating and for Google maps. Two-way communication between driver and passenger is allowed and thus a flexible environment is developed. The passengers can book the seats by reviewing the history and then taking final decision of whether to carpool or not. Security check can be provided in case of ride matching through social media. Gauresh Pandit [7] suggested that audience that views the availability of a ride or a request to a ride should be just as public as the user wishes it to be. This is a very high level of control if provided and an apprehensive user may choose to share a ride or request with only a few selected people.

## III PROPOSED METHODOLOGY

After review of past work done on ride sharing, it is observed that real time ride sharing will be beneficial if the matching is done instantly and on demand. For that, a model will be prepared using Arc GIS software in which

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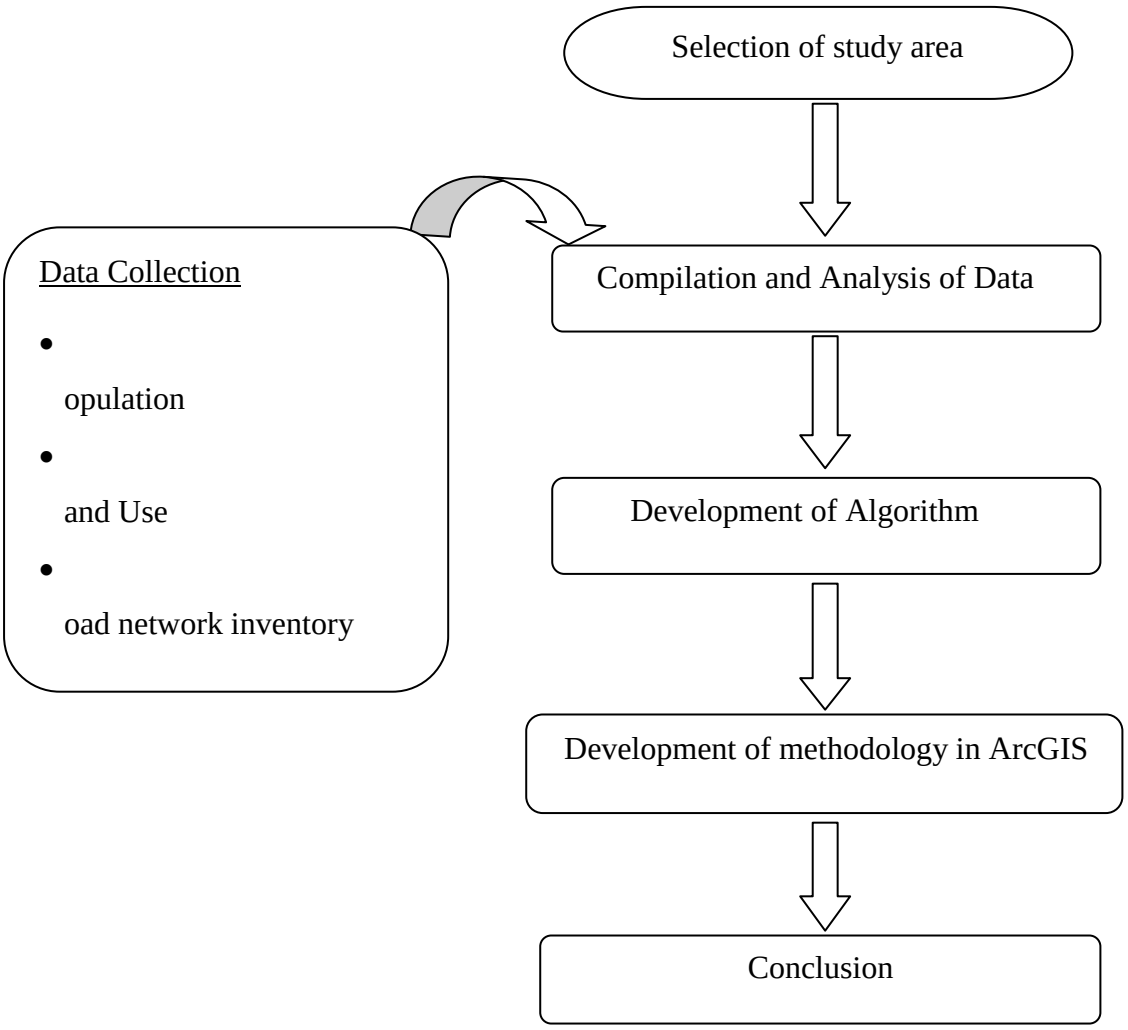
riders with approximately similar origin-destination and travel time will be selected from the database generated from user interface.

First of all, a study area will be selected from an urban area where the identified problems are likely to be occurred. The proposed methodology includes data collection regarding existing traffic conditions and inventory of areal conditions, providing a GIS technology based ride sharing application. Inventory data like population, land use, vehicular composition as well as road network will be collected in study area.

The proposed methodology involves following tasks:

1. Review of earlier study reports, existing and proposed development plans.
2. Site inspection and collection of data by carrying out surveys.
3. Automated matching and routing enabled GIS based ride sharing system application.
4. Algorithm to cater different demand.



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## IV CONCLUSION

From above reviews, it can be concluded that, a well organized ride sharing system can reduce the ill effects made by other mode of transportation. But, it would be meaningless to provide traditional ride sharing or carpooling that are quite inflexible and normally takes more waiting time of passengers. So, a dynamic ride sharing system, which is a well organized and on-demand service; and can automatically match the rides when a request is made, is necessary to provide, instead of conventional service.

Also, the algorithms developed for automated matching function are tedious and time consuming; and they can be applied to similar conditions for which they are developed. Thus, to allow instantaneous ride matching and shortest path, model should be designed using Intelligent transportation system like GIS.

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