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COST SAVING ASSOCIATED TO REDUCED TRAVEL TIME BY PROVIDING DYNAMIC RIDE SHARING: CASE STUDY OF KALUPUR – INCOME TAX STRETCH

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Abstract: In case of a congested road, delay is one of the main problems. It causes queues of vehicles, environmental pollution, congestion and discomfort to the user of system. So to reduce the use of private vehicles and to provide system with flexibility which is not available in mass transit system, dynamic ride sharing system is proposed in this paper. By considering whole area of Ahmedabad city as hypothetical, one stretch where the traffic flow is heavy and the demand for this facility is high, is selected. Classified volume count survey at peak hours, willingness to shift survey and delay study is carried out at each intersection of this selected stretch. From the analysis of this data, probable travel time saving and associated cost is calculated in this paper.

Keywords: Delay, travel time, occupancy, dynamic, passenger hours



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INTRODUCTION

Private vehicles are the main factor which cause delay though it provide comfortable service and a door-to-door facility to users. Use of private vehicles is increasing rapidly now-a-days due to urbanization, increase in population and change in life styles. Lack of proper mass transit system is also a major factor of deviation from public transport.

Despite of its comfortable ride, if a user wants to travel through a congested road, private vehicles cause queues of vehicles, air and noise pollution and delay. Use of mass transit system for daily trips can reduce the hazardous effects considerably, but traditional system does not provide flexibility to users and it has fixed predefined route and less reliable schedule.

So, some new system should be provided to act as a substitute to traditional mass transit system with more flexibility and comfort; and will reduce ill effects caused by private vehicles. Dynamic ride sharing system which automatically matches drivers with other riders who want to travel the same or a comparable route, may be a very effective solutions in congested areas. It mainly aims to carry an increased number of travelers in fewer vehicles, thereby improving people-moving efficiency.

The main advantage of this ride sharing system is the deviation of users from private vehicles. This will reduce the number of private vehicles like two wheelers, cars, privately hired auto etc. and thus, congestion on a previously congested road. Reduction of delay at intersections is considerable due to less queues of vehicles and travel time saving is calculated in terms of passenger hours and money.

1. AREA SELECTION

Ten major intersections on corridor of Income tax to Kalupur is selected as study area for providing dynamic ride sharing, as it is having heavy traffic flow and during peak hours, it becomes so high that, it causes unreasonable delay, congestion and increase in travel time and causes negative environmental impact as well.

AMTS is one of the mass transit system available in this city. This can reduce the ill effects, but because they are not on-demand service, they are completely overloaded during peak hours and are empty seated during off-peak hours, causes avoidable increase in congestion.

2. METHODOLOGY

Travel time Savings:

Total cost reduced if travel time is saved, can be calculated by finding the reduction in delay due to providing ride sharing facility in given study area. This difference is found out by conducting delay survey at each proposed locations during morning peak hours of 9.00 a.m. to 11.00 a.m. Travel time taken prior to and after providing this ride sharing facility is found out and the costs associated with this travel time saving is calculated.

Location	Total No. Of vehicles Delayed	Approach Time in sec	Average Delay in sec/ vehicles
Prem Darwaja	4429	349766	78.96
Kalupur Darwaja	6772	617336	91.16
Dariyapur Darwaja	4206	321465	76.43
Khanpur Darwaja	1023	15580	15.23
Khadia cross road	1219	51856	42.54
Delhi Darwaja	4369	358522	82.06
Shahpur Cross road	2000	129926	64.94

Income tax cross road	4489	438217	97.6
Gheekanta cross road	4045	269963	66.74
Kalupur Railway station	5635	830205	147.33

Table 1: Average Delay at Each Location

Location	Two Wheeler	Auto	Car	Bus
Prem Darwaja	5287	1805	578	128
Kalupur Darwaja	4919	2974	681	132
Dariyapur Darwaja	4878	1895	473	52
Khanpur Darwaja	2089	633	138	5
Khadia cross road	1219	393	14	0
Delhi Darwaja	5288	2382	1088	99
Shahpur Cross road	3782	1284	754	61
Income tax cross road	8147	2157	2061	287
Ghee kanta cross road	4272	1093	88	3
Kalupur Railway station	2262	2061	570	82

Table 2: No of Vehicles Delayed per hour at Junction

A Willingness to shift survey was carried out at each intersections to find out Willingness to shift survey is carried out to know the number of passengers willing to shift to the facility of ride sharing, how much they can afford for the trip, number of private vehicles that can be reduced, problems during the use of transit system and users' preferable mode of travel.

Delay in vehicle hours has been calculated by multiplying the average delay per hour with the number of vehicles. Delay in passenger hours is then calculated by considering average occupancy of vehicles as shown below.

Location	Two Wheeler	Auto	Car	Bus
Prem Darwaja	761867	485528	266531	528758
Kalupur Darwaja	818276	923426	362547	629533
Dariyapur Darwaja	680407	493274	210901	207925
Khanpur Darwaja	58063	32816	12274	3984
Khadia cross road	94599	56953	3354	0
Delhi Darwaja	791928	665751	521163	425017
Shahpur Cross road	448226	283947	285765	205545
Income tax cross road	1451055	717016	1174452	1462900
Gheekanta cross road	520271	248506	34299	8729
Kalupur Railway station	608066	1034174	490002	632041

Table 3: delay in Passenger Hours

The total savings due to reduction in traffic congestion as well as delay, as shown in the table below, is obtained by considering the DMRC study report which states that travel time savings for passenger hours in case of two wheeler is Rs.67.48, for 3 wheeler is Rs. 10.23, for 4 wheeler Rs.34.81 and for Buses are Rs.10.23.

Location	Total Travel Time Saving per year (Rs.)
Prem Darwaja	71064895

Kalupur Darwaja	83724294
Dariyapur Darwaja	60428567
Khanpur Darwaja	4721837
Khadia cross road	7082912
Delhi Darwaja	82739563
Shahpur Cross road	45201240
Income tax cross road	161100376
Ghee kanta cross road	38933334
Kalupur Railway station	75134626

Table 4: Total Travel time saving

3. CONCLUSION

It is observed from above analysis that, a well-organized ride sharing system can reduce the travel time considerably. And if the cost associated with travel time and delay of each individual is calculated, it is a great amount for a highly congested road. Thus it can be concluded that, if efficient ride sharing system is provided, it will reduce no of private vehicles and thus, reduce delay and congestion.

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