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Effect of complex traffic situation on route choice behavior and driver stress in Residential areas

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Abstract

A traffic management system is the key to better transportation in terms of economics, safety, comfortability, time saving etc. A traffic management system ensures safety of not only those who are traveling through a vehicle but also to pedestrians crossing road. The work is mainly focused in analysing the volume of traffic by the means of a software and manual count on the two types of road, i.e. broad lane and service lane. This work includes use of the software Picomixer STA (Smart Traffic Analyzer) for the traffic volume count of different types of vehicle categorized in light vehicles (Cars, SUVs etc.), medium loading vehicles (trucks, mini bus) and heavy vehicles (trailers, big trucks etc.). Due to the limitation of the software to detect the small vehicles like, auto rickshaw and motorcycles, manual counting method is also utilized. It is seen that, in day time and night time, traffic reaches its peak and in the middle day hours, it remains light and medium on the broad lane. This trend affects the rush in service lane as well and follows the similar trend. Increase in traffic and high signal halt timings makes drivers to choose the alternate path of service lane, thus increasing the rush in narrow service lane and making the risks of accidents go high. It was found that longer durations of signal halts are to be considered as the key reason to choose service lane. The reduction of signal timing can affect in the normal usage of service lane and broad lane with ease in traffic management.

Key words: Traffic management, pedestrians, Picomixer STA (Smart Traffic Analyzer), broad lane, service lane.

1. INTRODUCTION

The traffic management are strategically planned by the Ministry of Road Transport and placed across the country to suit the location they are in. The type of road to be used in a particular place is carefully thought out by them to ensure the civilians have the safest driving experience. important aspect that isn't followed by almost all road users in India is the system

of lanes. Each lane in between the road lines exists for a purpose to allow only certain types of vehicles to move over them. Sadly lane rules are rarely ever followed in our country. On our roads, people blatantly ignore all these restrictions and pretty much drive wherever they want. This is a major contributor to the increasing number of road accidents observed here especially on the highways. A broken white line gives you permission to change lanes, overtake and take U-turns. But you need to ensure beforehand that the road is clear and it is safe to perform such a manoeuvre. A continuous white line is a tad stricter .On this road, you are not allowed to overtake other vehicles or take U-turns. If you are on this type of road, just keep moving straight. Crossing the line is only allowed to avoid accidents or to take turns. These roads are mostly seen on hilly areas where there is a high probability for accidents. Continuous Yellow Line overtaking is allowed but only when you are on your side. Crossing the yellow line isn't permitted for either side. These roads are usually seen in areas with low visibility to establish that you need to stay on your side of the road.A Double Continuous Yellow line implies that crossing the line is strictly not permitted for either side. So that implies no overtaking, no U-turns or no lane changes. This pattern is usually seen on dangerous 2-lane roads where there is a high potential for disasters. Broken yellow line the most lenient one on the list. You are allowed to overtake, take U-turns and you could do both while going over the line (provided it is safe to do so).

Causes of accident

- Seat belts and child restraint systems
- Use of mobile phones
- Night driving
- Driving in tunnels
- Safety at level-crossings
- Driving under the influence of alcohol

2. Methodology

The process flow of proposed work and procedure that has been carried out in this work. First, the streets are classified into two lanes, i.e. broad lane and service lane. The traffic volume count of these two lanes was studied after a selecting a path on which these two runs parallel to a destination point. Then the traffic through a video is analyzed through Picomixer STA (Smart Traffic Analyzer). Manual counting is also performed for which the software has limitations in for counting the rickshaws and motorcycles.

Depending on these above factors, a suitable route and distance are chosen. For this, a distance from Board office square to Habibganj Railway station is considered. This distance is suitable as it includes three traffic signal stops and parallel running service lane that just ends before the destination. This route is also considered because it connects crucial places and is a part of everyday commute for a heavy traffic. Figure:1 shows the service lane with vehicles parked and in mobility.

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Figure:1 Vehicles in Service lane

Figure:2 shows the Google map image of the route considered for the study. A service lane is also visible in white parallel to it.

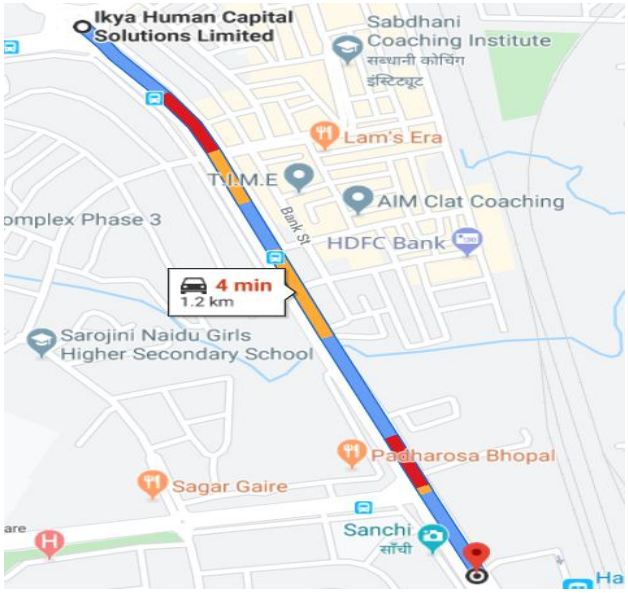

Figure:2 Route of broader lane from Board office square to Habibganj Railway Station

3. Experimental Outreach

This work is divided in two segments, one collection of data being physically present on the site and another one is to process the data collected through software of traffic management and analysis and obtain results of the work. The first segment deals with the data collection from the chosen location. A video is recorded through a camera from an angled view. This experiment is carried out in a planned manner having different criteria to fulfill. These

criteria are divided and planned based on different time slots of 2 hours to capture the varying traffic on the streets. First recording takes place from 9-11 am, and then followed by 1-3 pm, 4-6 pm and 7-9 pm. Different time slots provide different type of traffic density as similar requirement of crowd travels in similar time slots thus increasing or decreasing traffic according to time. By visual observation itself, the traffic change is classified and presented in table: 1.

Table :1 Time slots and assumed Traffic density

S. No.	Time Slots	Traffic Density
1.	9 am to 11 am	Heavy
2.	1 pm to 3 pm	Light
3.	4 pm to 6 pm	Medium
4.	7 pm to 9 pm	Heavy

Three locations at three traffic signals are selected to record the video and capture shots of the traffic. These locations are at board office square, another one at pragati petrol pump and final one at Mansarovar Complex, RTO office end. These different locations and service lanes are shown in figure: 3, figure: 4 and figure: 5.

Figure:3 Broad lane in front of Pragati Petrol Pump Square

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Figure:4 Service lane in front of Mansarovar Complex

Figure: 5 Broad Lane in front of Mansarovar Complex

4. Result

Four time slots are studied through this software and traffic results are obtained. As there is a limitation of the software that it doesn't count the motorcycles and Auto rickshaws separately, so manual counting was preferred for these two vehicles. The results of software and manual counting are being gathered.

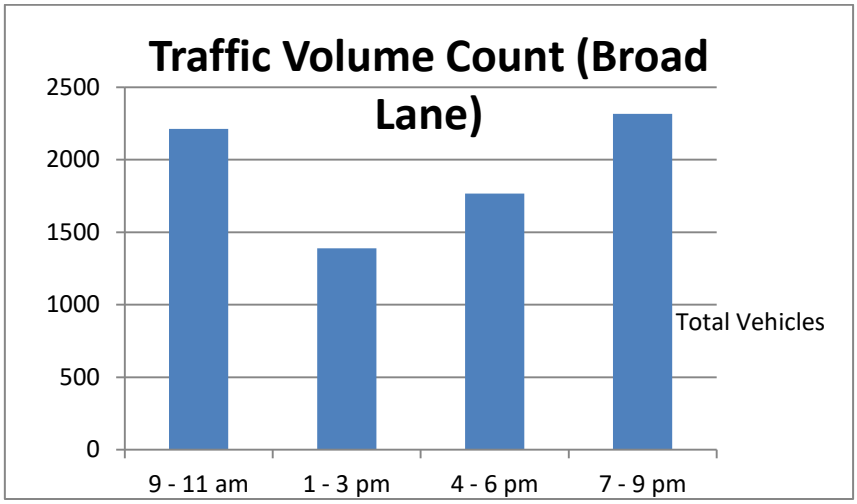

Figure: 6 Comparison of Traffic Volume Count on Broad Lane

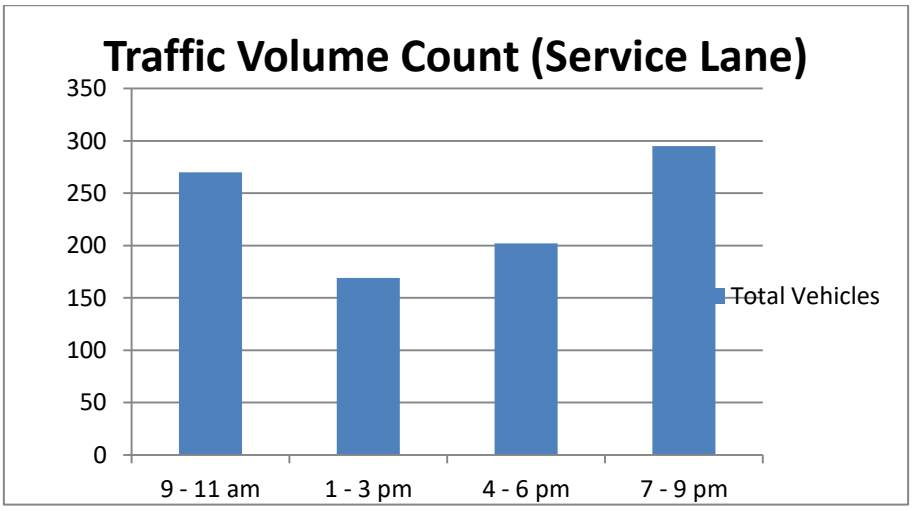

Figure: 7 Comparison of Traffic Volume Count on Service Lane

By the combined use of the software Picomixer STA (Smart Traffic Analyzer) and manual counting, following data of vehicle count is taken from the three traffic signal halts. This data is the average vehicle count of board office square signal, Pragati Petrol Pump Square Signal, and Habibganj square signal presented in table 2, table 3 and table 4 respectively.

Table: 2 Average Vehicle Count at different time slots at Board office square Signal

Time Slots	Cars	Motorcycles	Heavy Vehicles	Auto Rickshaws	TOTAL
9 – 11 am	13	14	4	11	42
1 – 3 pm	3	7	2	4	16
4 – 6 pm	7	13	3	10	33
7 – 9 pm	15	16	4	11	46
Total	38	50	13	36	137

Table: 3 Average Vehicle Count at different time slots at Pragati Petrol Pump Square Signal

Time Slots	Cars	Motorcycles	Heavy Vehicles	Auto Rickshaws	TOTAL
9 – 11 am	12	12	3	10	39
1 – 3 pm	4	6	2	5	17
4 – 6 pm	5	10	5	9	29
7 – 9 pm	15	14	3	10	42
Total	36	42	13	29	127

Table: 4 Average Vehicle Count at different time slots at Habibganj Square Signal

Time Slots	Cars	Motorcycles	Heavy Vehicles	Auto Rickshaws	TOTAL
9 – 11 am	14	16	4	9	43
1 – 3 pm	4	8	2	4	18
4 – 6 pm	6	12	3	10	31
7 – 9 pm	13	15	4	9	41
Total	37	51	13	32	133

5. Conclusion

In this work, two types of roads are selected for the study of traffic and its influence on the driver's choice of alternate path to reach the same destination. With the help of the software, Picomixer STA (Smart Traffic Analyzer), data was gathered of the traffic count on the broad lane and service lane. For this, videos and photographs are taken of the site and then uploaded in the software, and obtained the traffic volume count. The following conclusion can be obtained from this work:

- In the time slot of 9 am to 11 am, there is a heavy traffic on broad lane and traffic volume count reaches to the figure of 2212. The factors, due to which such high traffic is seen, are morning office timings, school and college timings, coaching timings etc.
- The maximum and minimum traffic count was seen in the slot of 9 am to 11 am and 7 pm to 9 pm which was 2317 and 1389 respectively.
- Highest traffic count of service lane is in the slot of 7 pm to 9 pm which is 295. And the least count is in the time slot of 1 pm to 3 pm which is 169.
- Heavy traffic and the three traffic signals affect the short route to consume more than the double time, and thus this leads to a similar trend of the traffic on service lane. The drivers choose the alternate path to avoid such a heavy traffic and thus driver stress increases because of commuting on a route where count of pedestrians dominates.
- Traffic Signal halts are way too much on this route which makes the time almost double to travel. It works as a hindrance in commuting and not as a management. A reduction in the halt timings may decrease the usage of service lane for commuting and further safety can be increased on both the lanes by reducing and managing rush.

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