

Heterogeneous Traffic Management Through Traffic Diversion

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Abstract: - Over the years traffic management in India as well as other developing countries has evolved into a puzzle that seems to have few answers. This spider web seeming traffic has brought many losses to the economy and lives of many citizens. One can find a hindrance in mobility due to traffic jams at every second traffic light of every city. We have come up with a small solution through already existing means that will not cost any government extra funds to implement. This method not only saves time but also minimizes fuel wastage. It involves including means such as traffic diversion and optimization of real time traffic data that is collected physically by running out experiments after being a part of the traffic and taking readings of cars at different times in a day. For better understanding, studying the traffic conditions in a part of the city of Indore, Madhya Pradesh, India depicts day-to-day traffic congestion and the applicability of methods of intelligent traffic management is shown in this paper. This paper explains the whole idea of traffic diversion and how it is perfect for large-scale application especially for the heterogeneous traffic that prevails many countries including India.

Keywords: - Heterogeneous traffic management, Traffic diversion, Traffic congestion control, Diversion system, Traffic analysis

I. INTRODCUTION

Traffic congestion is quite a common problem in India as it can be seen at every second square. This congestion is a result of many governing factors such as- number of vehicles, poor planning, narrow roads, etc. In this paper, we are concentrating on the diversion of traffic from one single route to many different routes depending upon the comfort and suitability of the user as the solution for traffic problems.

For better understanding of the current situation of traffic and the situation after the application of traffic diversion technique, an example of a commuter who is driving a car from her/his point of origin is quoted below-

Commuter 'A' starts from Anand bazar, Saket and is going to PIEMR, Vijay Nagar, which is a total distance of about 6 kilometers. During office hours in the morning she/he decides to take AB road enduring all the traffic signals and the morning rush. Owing to the traffic conditions, commuter 'A' ends up reaching the destination in about 33 minutes, which is the average of 5 readings recorded by us in real time. We physically noted that this delay in travel time was mainly due to the traffic light at 'Rasoma Chauraha' where a large amount of cars get piled up creating a bottle neck. Now by manually selecting 2 different routes we were able to shorten the travel time to less than half. This was done by enforcing the method of traffic diversion, not through an algorithm but manually by taking different routes.

Now if we were to use algorithms and data already available through applications such as Google Traffic and combine the system to display the data and the output on an already existing platform such as Facebook to different commuters and asking at least 10-20 cars with the same or nearby destination to constantly take these two different routes then the traffic load will decrease significantly and the density of traffic will be evenly spread to different routes. Apart from using social networking as a tool we can come up with display boards at various junctions showing the density of traffic and the alternate routes that can be taken so that the commuter gets to her/his destination with greater convenience.

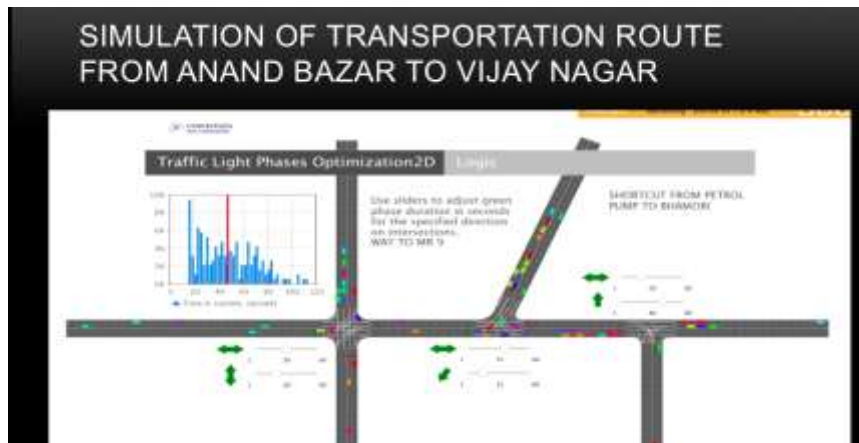
II. TRAFFIC DIVERSION SYSTEM

We aim to solve the most basic and exhausting problem experienced by almost each and every citizen at some point of time- Traffic Congestion. Our solution for this problem of traffic congestion is Traffic Diversion System. It will divert the traffic to many routes involving same origin and destination points with the involvement of optimization of real time traffic data that is collected through applications that utilize algorithms and pattern recognition to guide the traffic through all the different possible routes that are available to reach

their destination. This will help the user to choose the shortest and smoothest way to their destination. For detailed understanding of the system, we are explaining the system in 3 easy steps further in this paper.

Here are 3 Steps depicting the procedure of intelligent traffic management system:

- **Step 1:** Four Commuters start their journey from predetermined starting points. Their destination is kept the same and only the routes differ.
- **Step 2:** The purpose of this experiment is to prove that if traffic is diverted to different routes then the load on central routes in a city can be decreased using different branches that connect a main road. The starting time of each commuter is recorded along with other relevant data such as average speed maintained during the journey, average time taken to complete each journey, etc.
- **Step 3:** After all the data is recorded for the same journey for all the routes, the same experiment is repeated for 5 different days including weekdays and weekends along with festival occasions and normal working days.

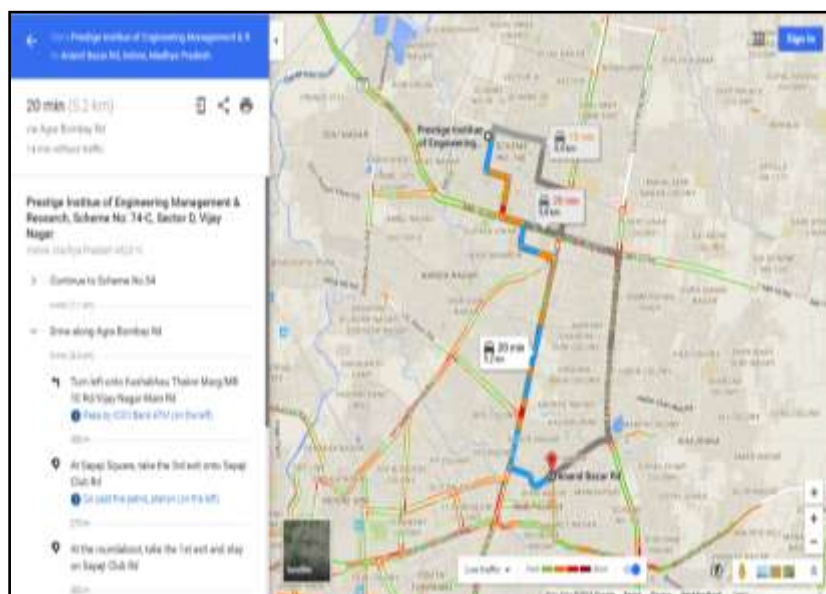


Shown below are some maps created by using Google maps for showing the different possible routes for the same origin and destination points and for also showing the traffic density on different routes.

Here, the two points are taken as- Anand Bazar, Indore, Madhya Pradesh, India and Prestige Institute of Engineering, Management and Research (PIEMR), Indore, Madhya Pradesh, India.

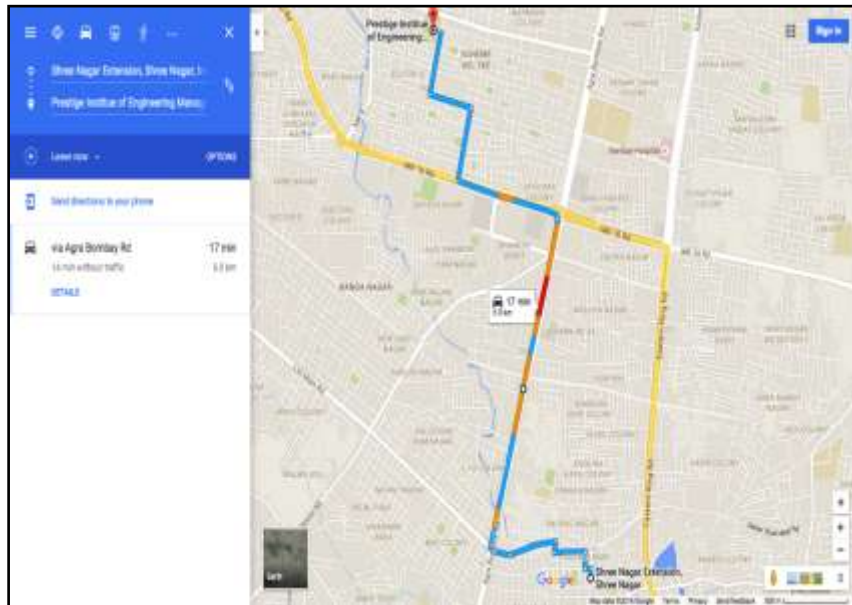
Map 1: In this map, A B Road is the decided path for the two points. It depicts both the directions and the traffic density on the route. This route involves a turn from the Rasoma Chauraha depicting the heavy traffic density at the square.

It will take the commuter 20 minutes to cover the distance, if he/she chooses this route for his/her journey. The region indicated with red color in the map represents the region of heavy traffic density and the one indicated with orange color represents the region of slow moving traffic. The net distance covered will be 5.2km, if this route is chosen.



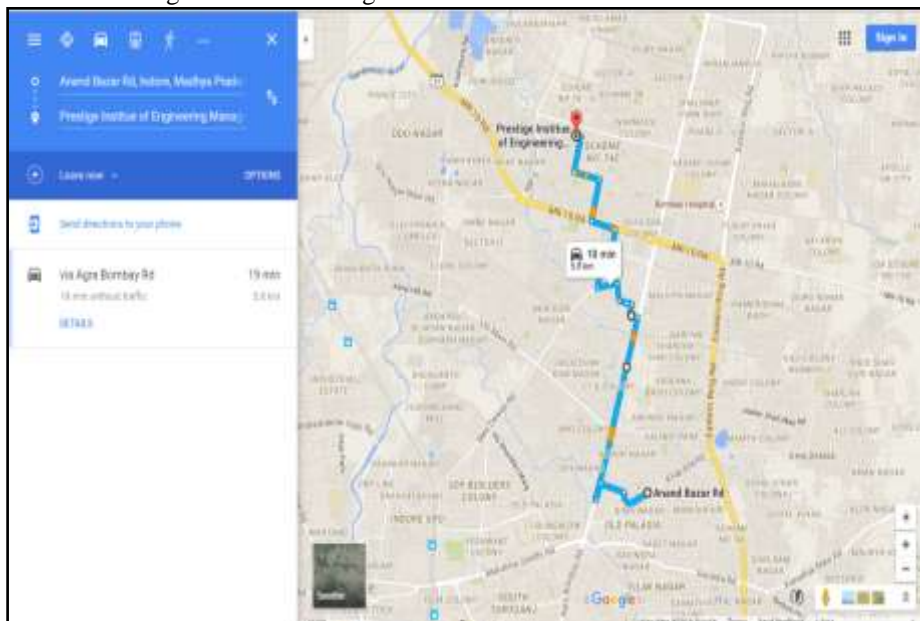
Map 2: In this map also, A B Road is decided route connecting the two points. But in this map, any turn from Rasoma Chauraha is avoided. This map shows another path of reaching the destination and also depicts the heavy traffic density on the route.

Here, the net distance covered will be 5.0 km, if the commuter chooses this route for his/her journey and the time taken will be 17 minutes. The region of heavy traffic density is indicated with red color and the region of slow moving traffic is indicated with orange color and the blue color indicates the region of fast moving traffic.



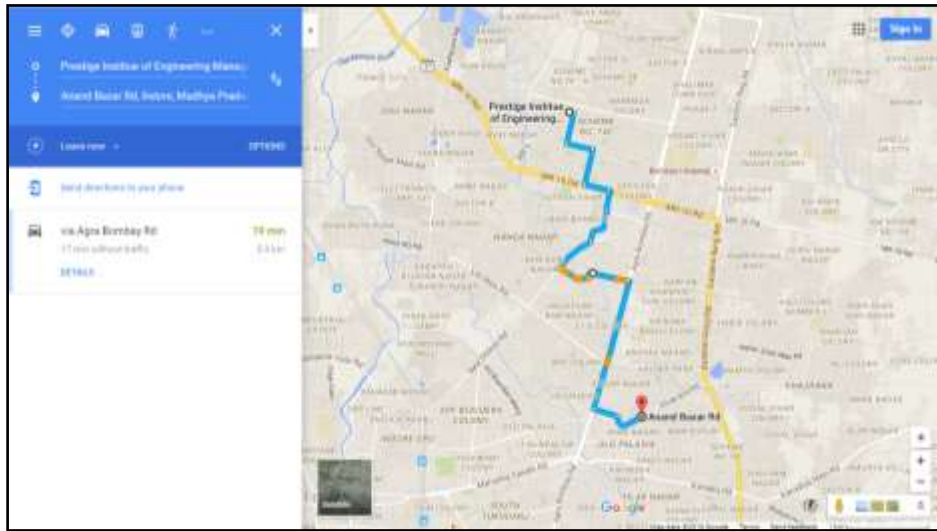
Map 3: This map shows the route via Petrol Pump for the same origin and destination points. It also depicts the traffic density on the route.

If the commuter chooses this route for his/her journey, the net distance covered will be 5.8 km and the estimated time required to complete the journey is 19 minutes. The region of slow moving traffic is indicated with orange color and the region of fast moving traffic is indicated with blue color.

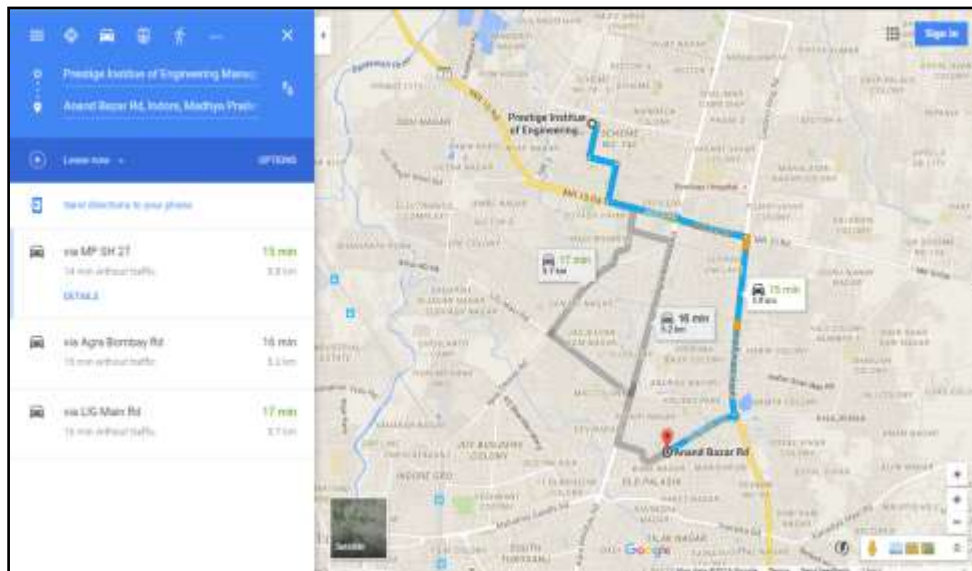


Map 4: This map shows a route via MR9 for the same origin and destination points. It also depicts the traffic density on the route.

When the commuter chooses this route, it will take him/her 19 minutes to cover the net distance of 5.9km. The region of slow moving traffic is indicated with orange color and the region of fast moving traffic is indicated with blue color.



Map 5: In this map, Ring Road is the decided route connecting the two points. It also depicts the traffic density on the route. The commuter will require an estimated time of 15 minutes to cover the net distance of 5.8 km if he/ she chooses this route to complete the journey. The region of slow moving traffic is indicated with orange color and the region of fast moving traffic is indicated with blue color.



We carried out experiments in order to know the outcome of traffic diversion from a single route to many different routes and in this process we made the following considerations-

Car Number	Route Number	Route	Net distance between origin and destination
1	1	Via A B Road	5.2 km
2	2	Via Ring Road	5.8 km
3	3	Via Petrol Pump	5.8 km
4	4	Via MR9	5.9 km

The four aforementioned routes were used and an experiment was carried out consisting of 4 cars. Car 1, car 2, car 3 & car 4 which were of the same model and specifications were allowed to start simultaneously from those routes and their timings were noted in a tabular format. We have taken the upper 25 readings for Anand Bazar, Vijay Nagar, Indore, Madhya Pradesh as origin point and PIEMR, Indore, Madhya Pradesh as destination point.

And the next 25 readings were taken for PIEMR, Indore, Madhya Pradesh as origin point and Anand Bazar, Indore, Madhya Pradesh as destination point. Considering-

Anand Bazar, Vijay Nagar, Indore = Source

PIEMR, Indore, Madhya Pradesh = Destination

A. FROM SOURCE TO DESTINATION-

Day 1(Monday) (Festival-Ganesh Chaturthi):

Reading 1:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	6:00 am	6:20 am	15.6 km/h	20 minutes
2	6:00 am	6:18 am	19.3 km/h	18 minutes
3	6:00 am	6:15 am	23.2 km/h	15 minutes
4	6:00 am	6:16 am	22.1 km/h	16 minutes

Reading 2:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:00 am	10:35 am	8.9 km/h	35 minutes
2	10:00 am	10:30 am	11.6 km/h	30 minutes
3	10:00 am	10:18 am	19.3 km/h	18 minutes
4	10:00 am	10:25 am	14.2 km/h	25 minutes

Reading 3:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	2:00 pm	2:30 pm	10.4 km/h	30 minutes
2	2:00 pm	2:25 pm	13.9 km/h	25 minutes
3	2:00 pm	2:22 pm	15.8 km/h	22 minutes
4	2:00 pm	2:23 pm	15.4 km/h	23 minutes

Reading 4:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	7:00 pm	7:45 pm	6.9 km/h	45 minutes
2	7:00 pm	7:40 pm	8.7 km/h	40 minutes
3	7:00 pm	7:25 pm	13.9 km/h	25 minutes
4	7:00 pm	7:30 pm	11.8 km/h	30 minutes

Reading 5:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:00 pm	10:20 pm	15.6 km/h	20 minutes
2	10:00 pm	10:18 pm	19.3 km/h	18 minutes
3	10:00 pm	10:15 pm	23.2 km/h	15 minutes
4	10:00 pm	10:18 pm	19.7 km/h	18 minutes

Day 2 (Tuesday-Regular Working day):

Reading 6:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	6:00 am	6:18 am	17.3 km/h	18 minutes
2	6:00 am	6:20 am	17.4 km/h	20 minutes
3	6:00 am	6:15 am	23.2 km/h	15 minutes
4	6:00 am	6:16 am	22.1 km/h	16 minutes

Reading 7:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:05 am	10:38 am	9.4 km/h	33 minutes
2	10:05 am	10:35 am	11.6 km/h	30 minutes
3	10:05 am	10:25 am	17.4 km/h	20 minutes
4	10:05 am	10:27 am	16.1 km/h	22 minutes

Reading 8:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	2:10 pm	2:45 pm	8.9 km/h	35 minutes
2	2:10 pm	2:45 pm	9.9 km/h	35 minutes
3	2:10 pm	2:30 pm	17.4 km/h	20 minutes
4	2:10 pm	2:35 pm	14.2 km/h	25 minutes

Reading 9:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	7:00 pm	7:45 pm	6.9 km/h	45 minutes
2	7:00 pm	7:42 pm	8.3 km/h	42 minutes
3	7:00 pm	7:20 pm	17.4 km/h	20 minutes
4	7:00 pm	7:34 pm	10.4 km/h	34 minutes

Reading 10:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:03 pm	10:28 pm	12.5 km/h	25 minutes
2	10:03 pm	10:30 pm	12.9 km/h	27 minutes
3	10:03 pm	10:18 pm	23.2 km/h	15 minutes
4	10:03 pm	10:25 pm	16.1 km/h	22 minutes

Day 3 (Thursday):

Reading 11:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	06:01 am	6:20 am	16.4 km/h	19 minutes
2	06:01 am	6:20 am	18.3 km/h	19 minutes
3	06:01 am	6:15 am	24.9 km/h	14 minutes
4	06:01 am	6:21 am	17.7 km/h	20 minutes

Reading 12:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:00 am	10:32 am	9.8 km/h	32 minutes
2	10:00 am	10:33 am	10.5 km/h	33 minutes
3	10:00 am	10:20 am	17.4 km/h	20 minutes
4	10:00 am	10:22 am	16.1 km/h	22 minutes

Reading 13:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	2:05 pm	2:40 pm	8.9 km/h	35 minutes
2	2:05 pm	2:37 pm	10.9 km/h	32 minutes
3	2:05 pm	2:26pm	16.6 km/h	21 minutes
4	2:05 pm	2:33pm	12.6 km/h	28 minutes

Reading 14:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	7:02 pm	7:50 pm	6.5 km/h	48 minutes
2	7:02 pm	7:48 pm	7.6 km/h	46 minutes
3	7:02 pm	7:22pm	17.4 km/h	20 minutes
4	7:02 pm	7:30 pm	12.6 km/h	28 minutes

Reading 15:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:05 pm	10:28 pm	13.6 km/h	23 minutes
2	10:05 pm	10:30 pm	13.9 km/h	25 minutes
3	10:05 pm	10:22 pm	20.5 km/h	17 minutes
4	10:05 pm	10:25 pm	17.7 km/h	20 minutes

Day 4 (Friday):

Reading 16:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	6:05 am	6:23 am	17.3 km/h	18 minutes
2	6:05 am	6:24 am	18.3 km/h	19 minutes
3	6:05 am	6:21 am	21.8 km/h	16 minutes
4	6:05 am	6:23 am	19.7 km/h	18 minutes

Reading 17:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:00 am	10:30 am	10.4 km/h	30 minutes
2	10:00 am	10:33 am	10.5 km/h	33 minutes
3	10:00 am	10:20 am	17.4 km/h	20 minutes
4	10:00 am	10:27 am	13.1 km/h	27 minutes

Reading 18:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	2:05 pm	2:33 pm	11.1 km/h	28 minutes
2	2:05 pm	2:35 pm	11.6 km/h	30 minutes
3	2:05 pm	2:21 pm	21.8 km/h	16 minutes
4	2:05 pm	2:27 pm	16.1 km/h	22 minutes

Reading 19:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	7:00 pm	7:50 pm	6.2 km/h	50 minutes
2	7:00 pm	7:45 pm	7.7 km/h	45 minutes
3	7:00 pm	7:23 pm	15.1 km/h	23 minutes
4	7:00 pm	7:29 pm	12.2 km/h	29 minutes

Reading 20:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:03 pm	10:28 pm	12.5 km/h	25 minutes
2	10:03 pm	10:26 pm	15.1 km/h	23 minutes
3	10:03 pm	10:20 pm	20.5 km/h	17 minutes
4	10:03 pm	10:21 pm	19.7 km/h	18 minutes

Day 5 (Sunday-Weekend):

Reading 21:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	6:02 am	6:19 am	18.4 km/h	17 minutes
2	6:02 am	6:19 am	20.5 km/h	17 minutes
3	6:02 am	6:15 am	26.8 km/h	13 minutes
4	6:02 am	6:17 am	23.6 km/h	15 minutes

Reading 22:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:10 am	10:45 am	8.9 km/h	35 minutes
2	10:10 am	10:43 am	10.5 km/h	33 minutes
3	10:10 am	10:28 am	19.3 km/h	18 minutes
4	10:10 am	10:35 am	14.2 km/h	25 minutes

Reading 23:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	2:00 pm	2:30 pm	10.4 km/h	30 minutes
2	2:00 pm	2:29 pm	12 km/h	29 minutes
3	2:00 pm	2:20 pm	17.4 km/h	20 minutes
4	2:00 pm	2:26 pm	13.6 km/h	26 minutes

Reading 24:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	7:00 pm	7:38 pm	8.2 km/h	38 minutes
2	7:00 pm	7:39 pm	8.9 km/h	39 minutes
3	7:00 pm	7:21 pm	16.6 km/h	21 minutes
4	7:00 pm	7:29 pm	12.2 km/h	29 minutes

Reading 25:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:06 pm	10:29 pm	13.6 km/h	23 minutes
2	10:06 pm	10:30 pm	14.5 km/h	24 minutes
3	10:06 pm	10:23 pm	20.5 km/h	17 minutes
4	10:06 pm	10:25pm	18.6 km/h	Minutes

B. FROM DESTINATION TO SOURCE-

Day 1(Monday) (Festival-Ganesh Chaturthi):

Reading 26:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	06:01 am	6:21 am	15.6 km/h	20 minutes
2	06:01 am	6:23 am	15.8 km/h	22 minutes
3	06:01 am	6:15 am	24.9 km/h	14 minutes
4	06:01 am	6:23 am	16.1 km/h	22 minutes

Reading 27:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:00 am	10:34 am	9.2 km/h	34 minutes
2	10:00 am	10:35 am	9.9 km/h	35 minutes
3	10:00 am	10:23 am	15.1 km/h	23 minutes
4	10:00 am	10:26 am	13.6 km/h	26 minutes

Reading 28:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	2:10 pm	2:46 pm	8.7 km/h	36 minutes
2	2:10 pm	2:45 pm	9.9 km/h	35 minutes
3	2:10 pm	2:34 pm	14.5 km/h	24 minutes
4	2:10 pm	2:39 pm	12.2 km/h	29 minutes

Reading 29:

Car Number	Departure time	Arrival Time	Average Speed	Total Time
1	7:04 pm	7:52 pm	6.5 km/h	48 minutes
2	7:04 pm	7:48 pm	7.9 km/h	44 minutes
3	7:04 pm	7:27 pm	15.1 km/h	23 minutes
4	7:04 pm	7:35 pm	11.4 km/h	31 minutes

Reading 30:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:06 pm	10:32 pm	12km/h	26 minutes
2	10:06 pm	10:30 pm	14.5 km/h	24 minutes
3	10:06 pm	10:25 pm	18.3 km/h	19 minutes
4	10:06 pm	10:29 pm	15.4 km/h	23 minutes

Day 2 (Tuesday-Normal Working Day):

Reading 31:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	6:05 am	6:29 am	13 km/h	24 minutes
2	6:05 am	6:29 am	14.5 km/h	24 minutes
3	6:05 am	6:24 am	18.3 km/h	19 minutes
4	6:05 am	6:28 am	15.4 km/h	23 minutes

Reading 32:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:10 am	10:47 am	8.4 km/h	37 minutes
2	10:10 am	10:44 am	10.2 km/h	34 minutes
3	10:10 am	10:31 am	16.6 km/h	21 minutes
4	10:10 am	10:40 am	11.8 km/h	30 minutes

Reading 33:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	2:10 pm	2:40 pm	10.4 km/h	30 minutes
2	2:10 pm	2:39 pm	12 km/h	29 minutes
3	2:10 pm	2:31 pm	16.6 km/h	21 minutes
4	2:10 pm	2:36 pm	13.6 km/h	26 minutes

Reading 34:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	7:00 pm	7:49 pm	6.4 km/h	49 minutes
2	7:00 pm	7:46 pm	7.6 km/h	46 minutes
3	7:00 pm	7:23 pm	15.1 km/h	23 minutes
4	7:00 pm	7:21 pm	16.9 km/h	21 minutes

Reading 35:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:03 pm	10:28 pm	12.5 km/h	25 minutes
2	10:03 pm	10:29 pm	13.4 km/h	26 minutes
3	10:03 pm	10:21 pm	19.3 km/h	18 minutes
4	10:03 pm	10:25 pm	16.1 km/h	22 minutes

Day 3 (Thursday):

Reading 36:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	6:02 am	6:26 am	13 km/h	24 minutes
2	6:02 am	6:25 am	15.1 km/h	23 minutes
3	6:02 am	6:17 am	23.2 km/h	15 minutes
4	6:02 am	6:23 am	16.9 km/h	21 minutes

Reading 37:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:00 am	10:34 am	9.2 km/h	34 minutes
2	10:00 am	10:33 am	10.5 km/h	33 minutes
3	10:00 am	10:21 am	16.6 km/h	21 minutes
4	10:00 am	10:23 am	15.4 km/h	23 minutes

Reading 38:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	2:00 pm	2:29 pm	10.8 km/h	29 minutes
2	2:00 pm	2:31 pm	11.2 km/h	31 minutes
3	2:00 pm	2:20 pm	17.4 km/h	20 minutes
4	2:00 pm	2:25 pm	14.2 km/h	25 minutes

Reading 39:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	7:10 pm	7:58 pm	6.5 km/h	48 minutes
2	7:10 pm	7:49 pm	8.9 km/h	39 minutes
3	7:10 pm	7:37 pm	12.9 km/h	27 minutes
4	7:10 pm	7:40 pm	11.8 km/h	30 minutes

Reading 40:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:00 pm	10:25 pm	12.5 km/h	25 minutes
2	10:00 pm	10:23 pm	15.1 km/h	23 minutes
3	10:00 pm	10:17 pm	20.5 km/h	17 minutes
4	10:00 pm	10:23 pm	15.4 km/h	23 minutes

Day 4 (Friday):

Reading 41:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	6:00 am	6:23 am	13.6 km/h	23 minutes
2	6:00 am	6:24 am	14.5 km/h	24 minutes
3	6:00 am	6:21 am	16.6 km/h	21 minutes
4	6:00 am	6:20 am	17.7 km/h	20 minutes

Reading 42:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:05 am	10:42 am	8.4 km/h	37 minutes
2	10:05 am	10:39 am	10.2 km/h	34 minutes
3	10:05 am	10:24 am	18.3 km/h	19 minutes
4	10:05 am	10:32 am	13.1 km/h	27 minutes

Reading 43:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	2:01 pm	2:32 pm	10.1 km/h	31 minutes
2	2:01 pm	2:28 pm	12.9 km/h	27 minutes
3	2:01 pm	2:20 pm	18.3 km/h	19 minutes
4	2:01 pm	2:26 pm	14.2 km/h	25 minutes

Reading 44:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	7:03 pm	7:47 pm	7.1 km/h	44 minutes
2	7:03 pm	7:46 pm	8.1 km/h	43 minutes
3	7:03 pm	7:23 pm	17.4 km/h	20 minutes
4	7:03 pm	7:30 pm	13.1 km/h	27 minutes

Reading 45:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:00 pm	10:24 pm	13 km/h	24 minutes
2	10:00 pm	10:23 pm	15.1 km/h	23 minutes
3	10:00 pm	10:18 pm	19.3 km/h	18 minutes
4	10:00 pm	10:21 pm	16.9 km/h	21 minutes

Day 5 (Sunday-Weekend):

Reading 46:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	6:02 am	6:28 am	12 km/h	26 minutes
2	6:02 am	6:27 am	13.9 km/h	25 minutes
3	6:02 am	6:17 am	23.2 km/h	15 minutes
4	6:02 am	6:22 am	17.7 km/h	20 minutes

Reading 47:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	10:00 am	10:34 am	9.2 km/h	34 minutes
2	10:00 am	10:36 am	9.7 km/h	36 minutes
3	10:00 am	10:23 am	15.1 km/h	23 minutes
4	10:00 am	10:21 am	16.9 km/h	21 minutes

Reading 48:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	2:00 pm	2:30 pm	10.4 km/h	30 minutes
2	2:00 pm	2:33 pm	10.5 km/h	33 minutes
3	2:00 pm	2:23 pm	15.1 km/h	23 minutes
4	2:00 pm	2:29 pm	12.2 km/h	29 minutes

Reading 49:

Car Number	Departure Time	Arrival Time	Average Speed	Total Time
1	7:00 pm	7:44 pm	7.1 km/h	44 minutes
2	7:00 pm	7:48 pm	7.2 km/h	48 minutes
3	7:00 pm	7:23 pm	15.1 km/h	23 minutes
4	7:00 pm	7:36 pm	9.8 km/h	36 minutes

Reading 50:

Car Number	Departure Time	Arrival time	Average Speed	Total time
1	10:05 pm	10:28 pm	13.6 km/h	23 minutes
2	10:05 pm	10:29 pm	14.5 km/h	24 minutes
3	10:05 pm	10:22 pm	20.5 km/h	17 minutes
4	10:05 pm	10:24 pm	18.6 km/h	19 minutes

III. RESULT OF THE EXPERIMENT

A. From Source to Destination-

• **Car 1:**

Average time for 5 readings taken by Car 1 at 6 am: $92/5 = 18.4$ minutes
 Average time for 5 readings taken by Car 1 at 10 am: $165/5 = 33$ minutes
 Average time for 5 readings taken by Car 1 at 2 pm: $158/5 = 31.6$ minutes
 Average time for 5 readings taken by Car 1 at 7 pm: $226/5 = 45.2$ minutes
 Average time for 5 readings taken by Car 1 at 10 pm: $116/5 = 23.2$ minutes
 Average of these readings = 30.28 minutes

• **Car 2:**

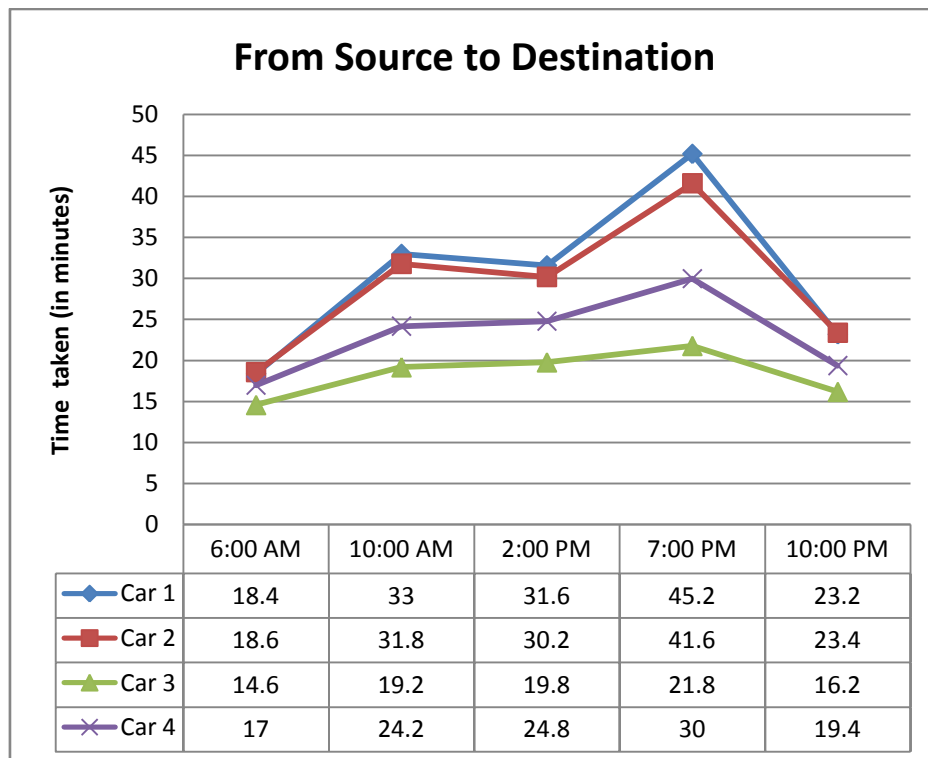
Average time for 5 readings taken by Car 2 at 6 am: $93/5 = 18.6$ minutes
 Average time for 5 readings taken by Car 2 at 10 am: $159/5 = 31.8$ minutes
 Average time for 5 readings taken by Car 2 at 2 pm: $151/5 = 30.2$ minutes
 Average time for 5 readings taken by Car 2 at 7 pm: $208/5 = 41.6$ minutes
 Average time for 5 readings taken by Car 2 at 10 pm: $117/5 = 23.4$ minutes
 Average of these readings = 29.12 minutes

• **Car 3:**

Average time for 5 readings taken by Car 3 at 6 am: $73/5 = 14.6$ minutes
 Average time for 5 readings taken by Car 3 at 10 am: $96/5 = 19.2$ minutes
 Average time for 5 readings taken by Car 3 at 2 pm: $99/5 = 19.8$ minutes
 Average time for 5 readings taken by Car 3 at 7 pm: $109/5 = 21.8$ minutes
 Average time for 5 readings taken by Car 3 at 10 pm: $81/5 = 16.2$ minutes
 Average of these readings = 18.32 minutes

Car 4:

Average time for 5 readings taken by Car 4 at 6 am: $85/5 = 17$ minutes
 Average time for 5 readings taken by Car 4 at 10 am: $121/5 = 24.2$ minutes
 Average time for 5 readings taken by Car 4 at 2 pm: $124/5 = 24.8$ minutes
 Average time for 5 readings taken by Car 4 at 7 pm: $150/5 = 30$ minutes
 Average time for 5 readings taken by Car 4 at 10 pm: $97/5 = 19.4$ minutes
 Average of these readings = 23.08 minutes



B. From Destination to Source-

• **Car 1:**

Average time for 5 readings taken by Car 1 at 6 am: $117/5 = 23.4$ minutes
 Average time for 5 readings taken by Car 1 at 10 am: $176/5 = 35.2$ minutes
 Average time for 5 readings taken by Car 1 at 2 pm: $156/5 = 31.2$ minutes
 Average time for 5 readings taken by Car 1 at 7 pm: $233/5 = 46.4$ minutes
 Average time for 5 readings taken by Car 1 at 10 pm: $123/5 = 24.6$ minutes
 Average of these readings = 30.16 minutes

• **Car 2:**

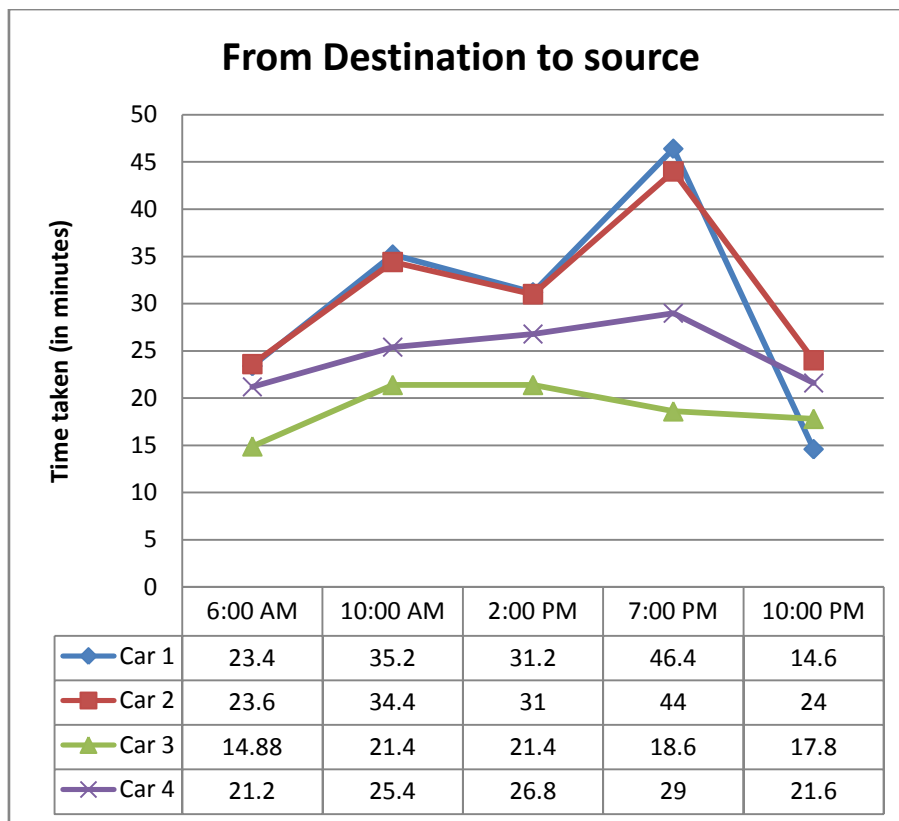
Average time for 5 readings taken by Car 2 at 6 am: $118/5 = 23.6$ minutes
 Average time for 5 readings taken by Car 2 at 10 am: $172/5 = 34.4$ minutes
 Average time for 5 readings taken by Car 2 at 2 pm: $155/5 = 31$ minutes
 Average time for 5 readings taken by Car 2 at 7 pm: $220/5 = 44$ minutes
 Average time for 5 readings taken by Car 2 at 10 pm: $120/5 = 24$ minutes
 Average of these readings = 31.4 minutes

• **Car 3:**

Average time for 5 readings taken by Car 3 at 6 am: $84/5= 14.8$ minutes
 Average time for 5 readings taken by Car 3 at 10 am: $107/5= 21.4$ minutes
 Average time for 5 readings taken by Car 3 at 2 pm: $107/5= 21.4$ minutes
 Average time for 5 readings taken by Car 3 at 7 pm: $93/5= 18.6$ minutes
 Average time for 5 readings taken by Car 3 at 10 pm: $89/5= 17.8$ minutes
 Average of these readings = 18.8 minutes

• **Car 4:**

Average time for 5 readings taken by Car 4 at 6 am: $106/5= 21.2$ minutes
 Average time for 5 readings taken by Car 4 at 10 am: $127/5= 25.4$ minutes
 Average time for 5 readings taken by Car 4 at 2 pm: $134/5= 26.8$ minutes
 Average time for 5 readings taken by Car 4 at 7 pm: $145/5= 29$ minutes
 Average time for 5 readings taken by Car 4 at 10 pm: $108/5= 21.6$ minutes
 Average of these readings = 24.8 minutes



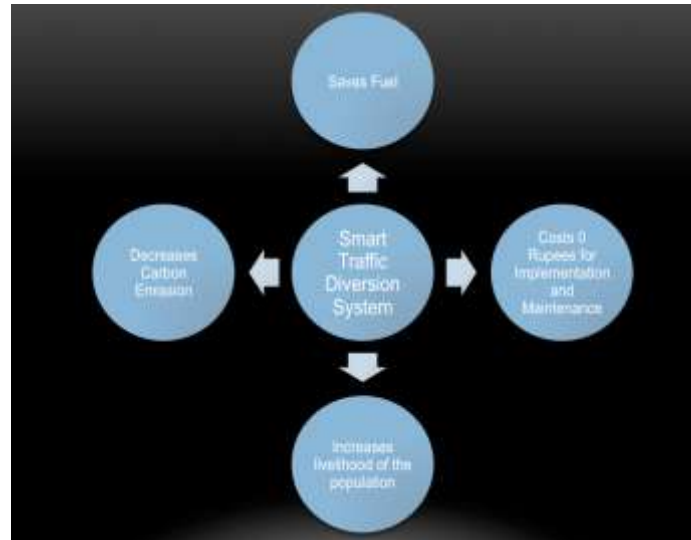
The results show that:

- Average time taken by Car 3 is the least in all cases, which means that this route is the best out of the 4 different routes in the case study. We observed that even though this was the best route to commute from the source to the destination, commuters did not use this path, as it was not well known. Increasing traffic in this route will decrease the load on the main Agra-Bombay road.
- Average time taken by Car 1 is the most, which means that this clearly is the worst route out of all the routes as all the commuters most frequently use it. Traffic load on this route clearly needs to be decreased and can be diverted to other directions to increase efficiency in traffic movement.
 There are many alternative routes available for commuters, which they can access and decrease the load on the central or main roads of a city. This clearly supports our theory that if traffic is diverted to different routes then the load on the main AB road can be easily distributed onto its supported branches thus leading to a greater efficiency in the flow of traffic.

IV. CONCLUSION

Occam's Razor, which is a problem solving principle, supports the solution of diversion of traffic through all available routes. It states that, "Among competing hypotheses, the one with the fewest assumptions should be selected." Our method involves very few assumptions, the primary among which is the availability of multiple routes for every destination and every traveler. The collection of data clearly shows that there is a huge potential for improving the lethargic traffic movement in not only India but other cities as well. We have efficiently concluded that our method is feasible and can be used to improve the traffic conditions in not only our country but other countries as well.

This is a chart showing the extra advantages of traffic diversion system other than intelligent management of traffic.



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