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Research Study on Traffic Analysis using Uninterrupted Flow at Two Major Crowded location in Amravati

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ABSTRACT*:* Traffic flow can be divided into two primary types. Understanding what type of flow is occurring in a given situation will help you decide which analysis methods and descriptions are the most relevant. The first type is called uninterrupted flow, and is flow regulated by vehicle-vehicle interactions and interactions between vehicles and the roadway. For example, vehicles traveling on an interstate highway are participating in uninterrupted flow. The second type of traffic flow is called interrupted flow. Interrupted flow is flow regulated by an external means, such as a traffic signal. Under interrupted flow conditions, vehicle-vehicle interactions and vehicle-roadway interactions play a secondary role in defining the traffic flow. In this project various case studies are analyzed with traffic volume data and effective solutions are made using questioner survey.

KEYWORDA: Urban Traffic Network, Uninterrupted Flow, Traffic Flow

I. INTRODUCTION

Congestion of traffic is a solemn experience faced by the traffic users who travel on urban roads. Due to traffic congestion, traffic commuters spoil valuable time, fuel and money. Congestion on urban roads can be mitigated by creating additional infrastructure, however, it is sometimes not feasible or possible to create additional infrastructure due to several reasons, such as unavailability of required fund, unbreakable permanent structure and so on. However, the existing infrastructure may be slightly modified to minimize the congestion on urban roads. As for an example, creation of a bypass over a city may decrease the number of vehicles entered in the city, and thus minimizing traffic loads on urban roads. Congestion sometimes occurs due to unorganized flow of vehicles on urban roads and an organized traffic flow may lead to minimization of congestion. Information and communication technology (ICT) have been used to analyze the vehicle density on roads and can be used to minimize road traffic congestion. Wireless sensors, Mobile phone networks, Vehicular adhoc networks, GPS and GIS systems are few examples which are blended with ICT to control the traffic on urban roads. Urban Traffic Network (UTN) can be considered as a directed graph with finite number of vertices and edges. Once a UTN is represented as a graph, we can find out different paths for the graph as well for the UTN. Random distribution of traffics at different paths of an urban traffic may cause traffic breakdown at the peak hours. Therefore, an optimized allocation of paths is necessary to mitigate the traffic breakdown. A traffic stream is a group of vehicles those are to pass towards a road trough a junction. In general, the traffic stream, when flows through a junction, the flow can be categorized as free flow, merged flow and a crossing. A free flow refers the streams of vehicles without any interruption, which generally available at the left hand directions at the junctions from one road to another road. A merged flow refers to merge of two or more streams of vehicles at the road junction, which are merged together to become a single stream towards another road. However, a crossing may be described as a stream of vehicles which has to wait for another stream which is flowing through the junction.

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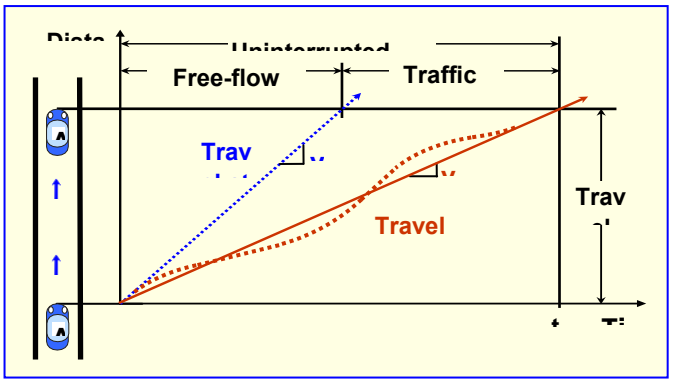


Fig 1 Definition of free-flow and uninterrupted travel speed

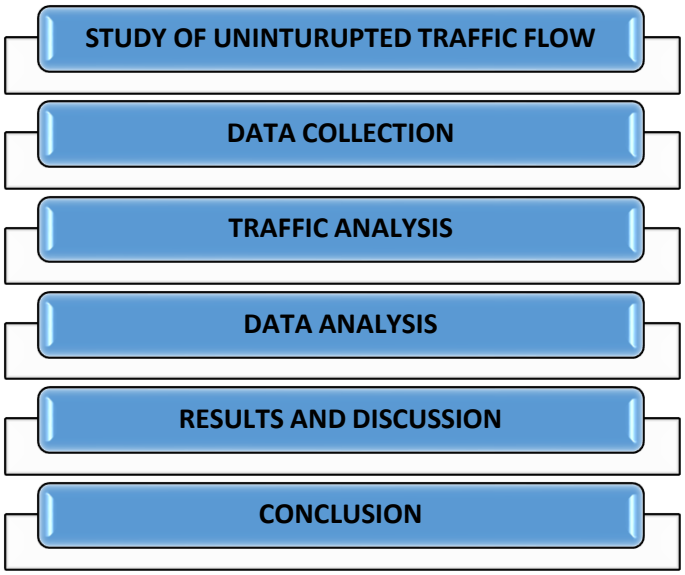
Region B in Fig 1.2 represents the forced (congested) flow conditions with flow rates reduced below capacity (q < Q) which are associated with further reduced speeds (v < vn) as observed at a reference point along the road. In this region, flow rates (q) are reduced flow rates due to forced flow conditions, not demand flow rates (qa).

Region C represents oversaturated conditions, i.e. arrival (demand) flow rates above capacity (qa > Q) which are associated with reduced travel speeds (v < vn) observed by travel through the total section (along distance Lt), e.g. by an instrumented car. In this case, the flow represents the demand flow rate which can exceed the capacity value as measured at a point upstream of the queuing section.

II. METHODOLOGY

Traffic analysis Traffic Volume Study of Amravati City

1. The Traffic Volume at Sai Nagar Square and Gandhi Chowk Amravati mid-square area
2. The traffic stream study at the mid-square area from time 09 AM to 11 AM. Furthermore evening 05 PM To 07 PM.
3. At a traffic convergence, the automobile overload is for the most part in the early morning and in night. Most traffic issues of the intersection are happened by huge vehicle and leaving and passerby, and to determine issues of traffic the flyover, tram ought to be given or the width of the street ought to be expanded.



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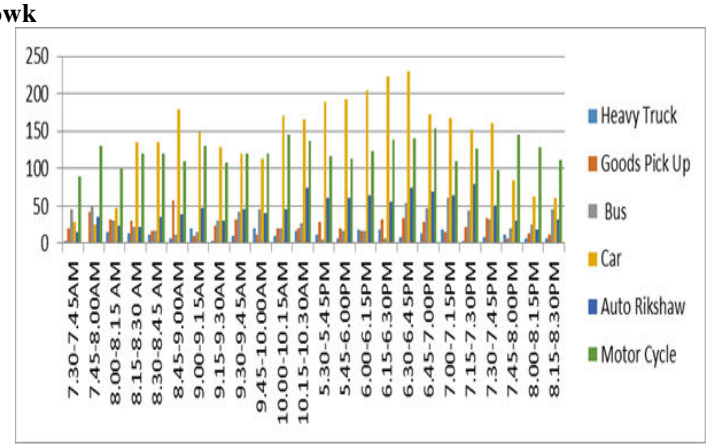
III. DATA COLLECTION AND ANLYSIS

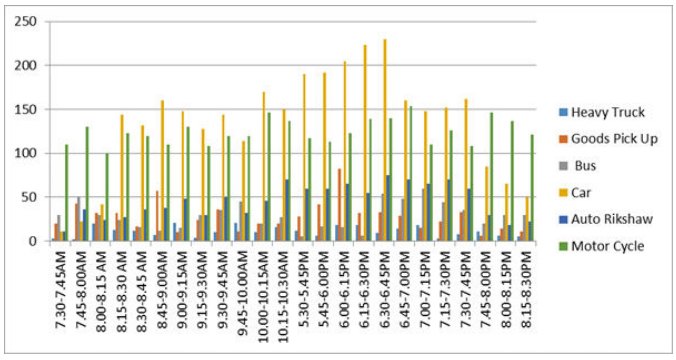
3.1 Data for Gandhi Chowk



Graph 1 Data for Gandhi Chowk

As per the traffic study the following speed and time required for the Gandhi Chowk
The average uninterrupted travel speed can be expressed as:
vu = 3600 / tu = 3600 / (tf + dtu) (1.1)
Where,
vu= uninterrupted travel speed (km/h),
tu = 190 seconds/km
tu = tf + dtu (seconds/km),
dtu = 90-100 seconds/km
tf = 90 seconds/km
tf = 3600 / vf(1.2)
vf = 30-40 (km/h)
vu = 3600 / tu = 3600 / (tf + dtu)
vu = 3600/190
vu = 18.94 (km/h)

3.2 Data for Sai Nagar Square



Graph 2 Data for Sai Nagar Square

As per the traffic study the following speed and time required for the Sai Nagar Square
The average uninterrupted travel speed can be expressed as:
$\mathbf{v_u}$ = 3600 / t_u = 3600 / (t_f + d_{tu}) (1.1)
Where,
$\mathbf{v_u}$ = uninterrupted travel speed (km/h),
$\mathbf{t_u}$ = 200 seconds/km
t_u = t_f + d_{tu} (seconds/km),
$\mathbf{d_{tu}}$ = 120 seconds/km

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$\mathbf{t_f}$ = 80 seconds/km
$\mathbf{t_f}$ = 3600 / v_f (1.2)
$\mathbf{v_f}$ = 35-45 (km/h)
$\mathbf{v_u}$ = 3600 / t_u = 3600 / (t_f + d_{tu})
$\mathbf{v_u}$ = 3600/190
$\mathbf{v_u}$ = **18** (km/h),
According to uninterrupted travel speed analysis for the Gandhi Chowk and Sai Nagar Square should have uninterrupted travel speed are around 19 (km/h) and 18 (km/h) respectively.

IV. METHODS TO REDUCE UNINTERRUPTED TRAFFIC FLOW

4.1 Types of Traffic Intersections that can use in Amaravati

Cities are growing faster than the roads can sustain. Thus, the inescapable condition of traffic congestion is rising day by day. Whether you are driving in a big city or a small one, you will certainly cross a busy intersection. These intersections are often stressful for drivers because of long backups, merging lanes, traffic signals, and rash drivers generally in a big hurry than others. So why do the roads feel more jammed up nowadays at the intersections? What can be done to reduce traffic congestion? Well, these questions can only be answered while we recognize and understand different types of road intersections prevalent across the world. Here are some common types of intersections and the way they work.

1) Signal Crossing

The most common type of crossing is a four-way intersection. It generally appears in a perpendicular angle in most of the cities. In a four-way crossing, you'll find four traffic signals at the front of each lane that turn green one by one. Thus a vehicle has to wait for all the three lanes to pass before the signal turns green. As the signal turns green the vehicle is allowed to move forward (straight) and to its right, and in certain cases it can also move left even when the signal is red.

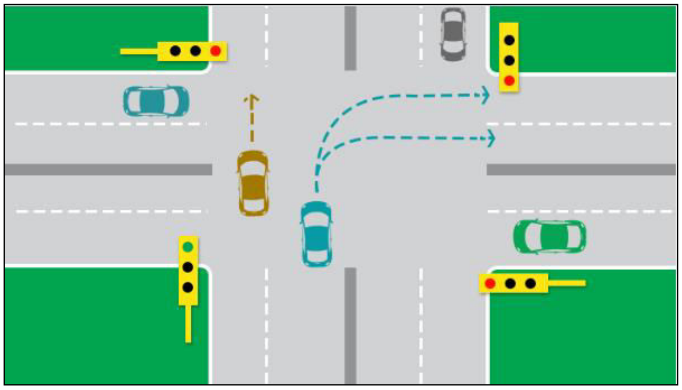

Fig 1 Signal Crossing

2) A Traffic Circle

A traffic circle is a roundabout usually found at the intersection of four or more roadways. Older-style traffic circles usually have traffic signals and stop signs to control the traffic. The traffic signals at these circles work in a similar fashion to those at the four-way crossing. When a signal turns green, a vehicle thus has to move around the circle to reach its destination lane. Traffic circles are generally larger than the four-way crossing and are designed in such a fashion to control the larger amount of traffic at the circles

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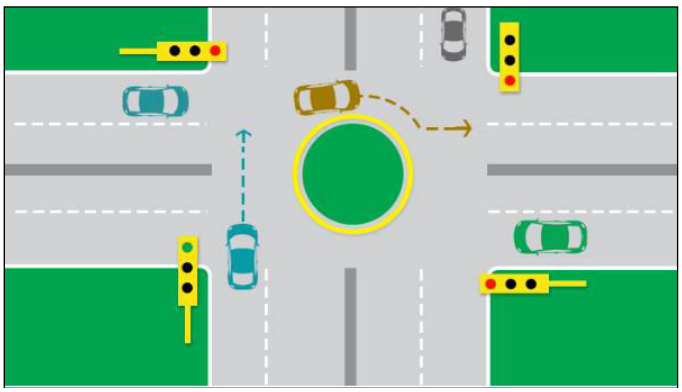

Fig 2 A Traffic Circle

3) A Modern Roundabout

This type of intersection is prevalent in many western countries like France, Australia, United States and New Zealand. A modern roundabout accommodates more traffic as compared to intersections having traffic signals. Similar to a traffic circle, modern roundabouts have a center island but they don't have any traffic signals

Fig 3 A Modern Roundabout

4) Smart Crossing for smooth flow of traffic

A new patented concept called 'Smart Crossing" is introduced by SmartUrbs to ease traffic congestion at four-way intersections. The concept is patented by the Indian Patent Office (IPO), Government of India (Patent no. 288778) and also patented in US vide (Patent No. US 10,140,860 B2). The idea behind the concept is to convert a four-way crossing into a two-way crossing without any major infrastructural development and costs. In the existing 4-phase crossing, a vehicle has to wait for all the three sides to pass before the signal turns green. This results in elongated queues and congestion at every lane

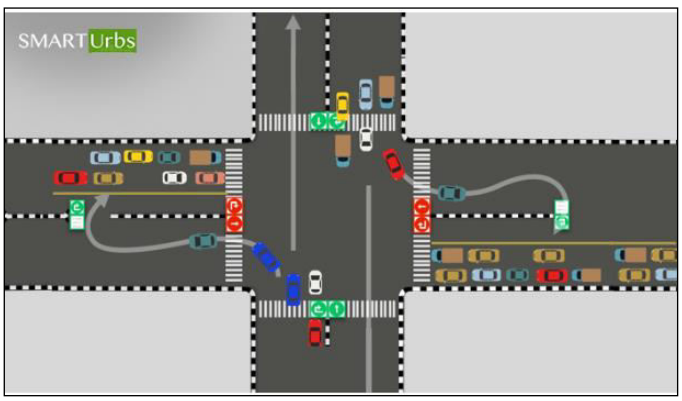

Fig 4 Smart Crossing for smooth flow of traffic

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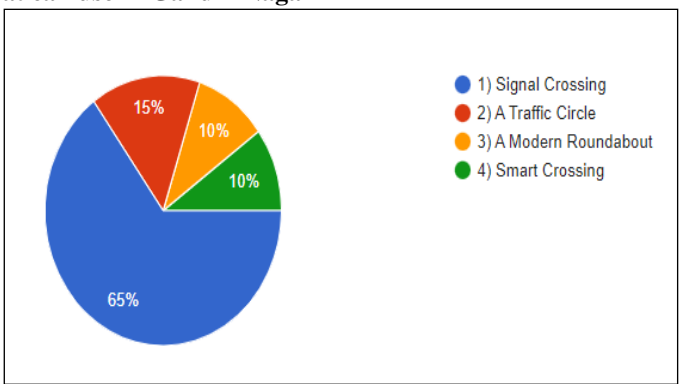
In this research, the Traffic Analysis of Amravati city are studied, the research is to understand the uninterrupted flow and interrupted flow of the Sai Nagar Square and Gandhi Chowk Amravati mid-square area and suggest effective system to control traffic interrupted flow for the particular area

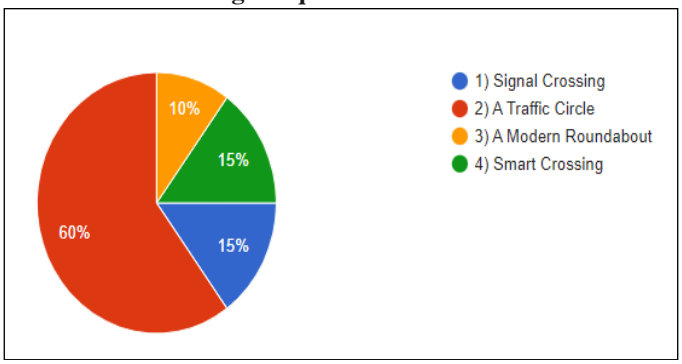
4.2 Traffic Intersections that can use in Gandhi Nagar



Graph 3 Traffic Intersections that can use in Gandhi Nagar

Survey has been taken for the where we experience maximum difficulty in traffic analysis of Amravati city. For that Gandhi Nagar location have been taken for analysis. From the above chart we conclude that maximum responses ie 65% suggest the signal crossing for the Gandhi Nagar junction for traffic free moment.

4.4 Traffic Intersections that can use in Sai Nagar Square



Graph 4 Traffic Intersections that can use in Sai Nagar Square

Survey has been taken for the where we experience maximum difficulty in traffic analysis of Amravati city. For that Sai Nagar Square location have been taken for analysis. From the above chart we conclude that maximum responses ie 60% suggest the A traffic Circle for the Sai Nagar Square junction for traffic free moment

V. CONCLUSION

- The growing traffic congestions are becoming a huge challenge for the governments worldwide, to provide pollution free environment. Private vehicle ownership is one of the reasons for traffic jams in the cities, with the ever-increasing population.
- Results in elongated queues, congestion at every lane and high pollution levels. Moreover, the struggle of avoiding traffic and rash drivers is the major cause of frustration and stress.
- Over the years, there have been almost no efforts or innovation to re-design the conventional for traffic crossing junction. As mentioned above, a lot of temporary measures have been adopted till now with no signs of a permanent solution.
- In this research, the Traffic Analysis of Amravati city are studied, the research is to understand the uninterrupted flow and interrupted flow of the Sai Nagar Square and Gandhi Chowk Amravati mid-square area and suggest effective system to control traffic interrupted flow for the particular area/
- According to uninterrupted travel speed analysis for the Gandhi Chowk and Sai Nagar Square should have uninterrupted travel speed are around 19 (km/h) and 18 (km/h) respectively

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- Survey has been taken for the where we experience maximum difficulty in traffic analysis of Amravati city. For that Gandhi Nagar location have been taken for analysis. From the analysis conclude that maximum responses ie 65% suggest the signal crossing for the Gandhi Nagar junction for traffic free moment. And For Sai Nagar Square location conclude that maximum responses ie 60% suggest the A traffic Circle for the Sai Nagar Square junction for traffic free moment.
- After observing the results of the simulation, signal crossing becomes even more essential to consider such initiatives that not only seem to be effective but are also practically tested and proved. This innovative idea of reducing traffic jams caused by signal crossing lane has definitely proven to be a visionary concept for all the other key players. Perhaps it is the most efficient and effective way to reduce traffic congestion, as it involves very low infrastructure investment.

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