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Development of Traffic Sign Assets Management System in Indian Context

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ABSTRACT
Traffic situation at uncontrolled intersections is complex, especially in highly heterogeneous traffic conditions, as in India. Available gap is used by vehicles to clear the intersection as no control measures exist at uncontrolled intersections. Thus a thorough understanding of gap acceptance behaviour of drivers is the key in evaluating performance and safety of unsignalised intersections. Moreover, the traffic volume on each leg of the road also has an effect on the gap acceptance. For the intersection where traffic volume is low, studies have shown that adopting gap acceptance method may not have a direct influence, but where the traffic is expected to grow rapidly, it is very important to assess the effect of traffic volume on gap acceptance. This study studies the influence of traffic volume on gap acceptance behaviour at uncontrolled intersections. These intersections are priority intersections that join a major road and a minor road. Video graphic technique was used to collect the traffic volume data for a period of six hours at both the intersections and geometry of the intersections was also collected. The accepted and rejected gaps by different classes of vehicles in the major and minor traffic streams were retrieved from the video graphs and the volume of the each approaches of the intersections are obtained.
Keywords: Heterogeneous, Traffic volume, Uncontrolled intersections, Unsignalised intersections,

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I. INTRODUCTION

The volume is counted for each 5 minute over the observation period. The flow rates were grouped with respect to their corresponding values. Critical gaps and follow-up times are estimated for these groups. An estimate of the critical gap was made using Raff's method.Siegloch's method was used for follow-up time calculation. It was observed that the estimated value of critical gap for different turning movements under mixed traffic flow condition varies considerably from the basic parameter values proposed by HCM 2000.

The influence of different vehicles types on critical gap was also studied. Two-wheelers are found to accept relatively smaller size of gaps and consequently have lesser critical gap than the other types of vehicles.

Brilon, et al., (1999) discussed about different methods of critical gaps at unsignalised intersection. They have tested the usefulness of the various methods and compared in between them.

The maximum likelihood estimation procedure and Hewitt method gave the best results. Gattis and Low (1999) studied a T- intersection to understand the gap acceptance behaviour at which left-turn traffic on the through leg had the right-of-way.

A number of methods like Greenshield's method, Siegloch's method, Raff's and acceptance curve method were used to model the critical gap size at these intersections. The critical lag and gap values varies with different methods. Different priority movements or conflict combinations exhibit different critical gap values.

Cheng et al., (2008) discussed on the variability of critical gap during peak and non-peak hours. The critical gap in the rush hour is shorter than after the rush hour. Cumulative probability of accepted and rejected gaps was used for this study. Drew used both lag and gap information. Here, mean critical gap is the parameter.

In Dawson's and Miller's method, gaps are used, whereas, McNeil and Morgan's used information regarding lags accepted or rejected only. In maximum likelihood estimation method, gaps or lags can be used. Flow rates are categorised based on the conflicting flow rates and gaps values (Ranganath, 2005).

II. METHODOLOGY AND DATA COLLECTION

The field recording of data consists of observation and recording of data in the field. The various techniques generally used for this can be

classified as Manual methods, Mechanical methods and Photographic methods.

2.1 VIDEO GRAPHIC TECHNIQUE:

The video system can be mounted on a car, at a stationary point by the side of a road or assembled in laboratory. The greatest advantage of the involved system in this technique is its flexibility. An arrangement for frame by frame analysis can also be built in. By another arrangement, the two images from the separate cameras can be brought out simultaneously on the screen, the top half representing the view from one camera and the bottom half from another.

2.2 INTERSECTION DETAILS

For the purpose of the study, two four legged intersections in 7 roads junction, in kadapa city in AP are selected. One intersection is Mini bypass rd Junction and another one is Pallempalli Junction. The schematic diagram of Chennai to Hyderabad bypass road is shown in Figure. At both the intersections the major road is of two lanes and does not have any median.

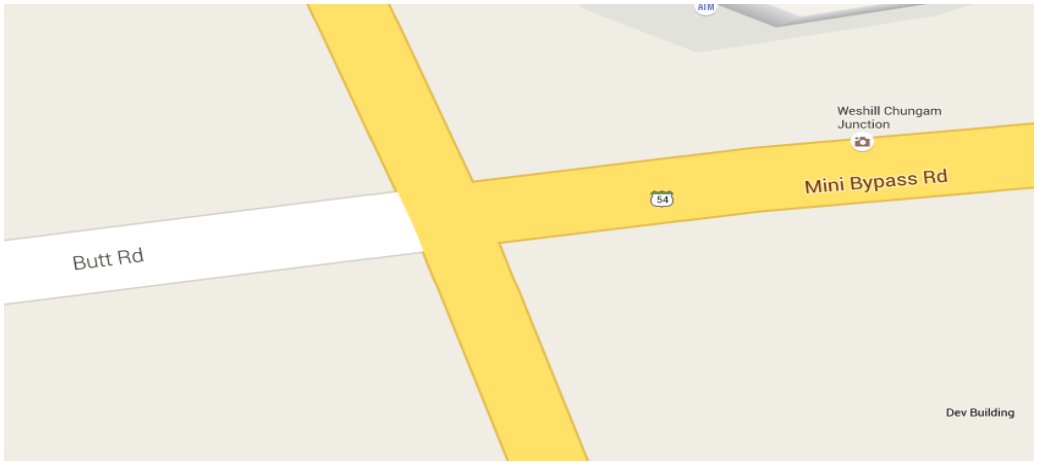

Figure 1: Chennai – bypass road , kadapa.

One of the intersections is at, 7 roads junction, Ganagapeta, kadapa. This intersection is an uncontrolled intersection with numbers of approaches is four. Major road carriageway width is 11.00 m in one side and 9.00 m to the other side, whereas, Mini Bypass road is a 2 lane road with 9.50 m carriageway width and Butt road is a single lane road having 5.00 m carriageway width. The entry width of Major road is same as its carriageway width, entry width of Mini Bypass road is 25.75 m with a channelized median and entry width of Butt Road is 12.00 m. The height and width of the median is 0.2 m and 0.6m respectively. Approaching gradient is negligible in all the major and minor roads.

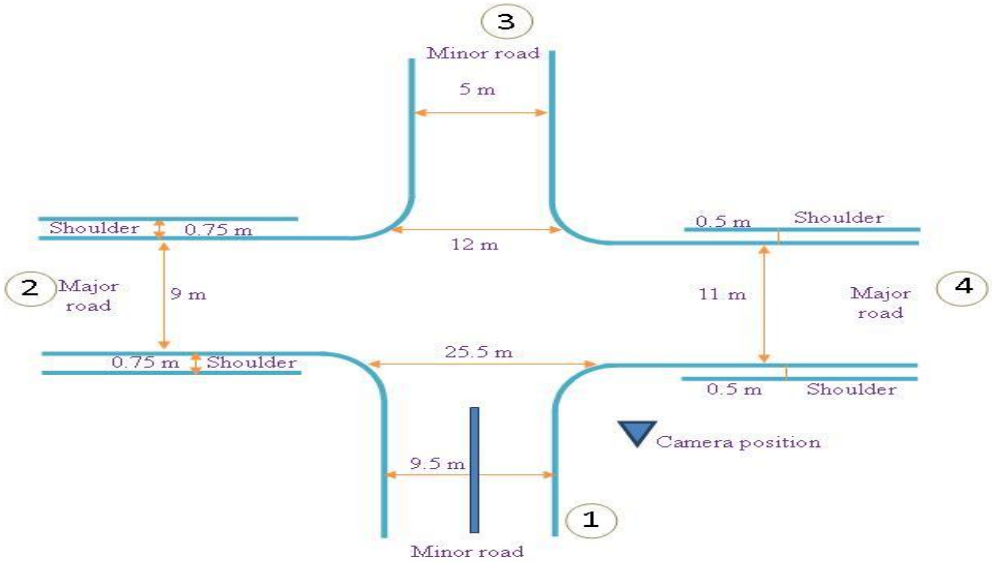

Figure2 : Schematic Diagram of 7 roads junction, Ganagapeta, kadapa.

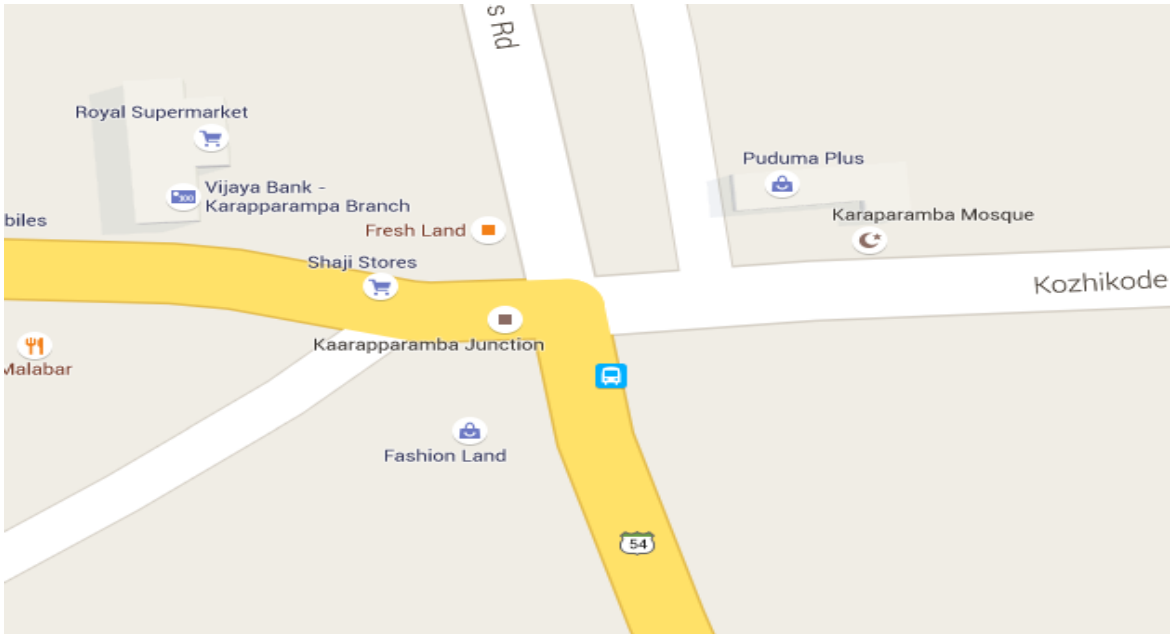

Figure3: Palempalli Intersection.

Palempalli intersection also is an uncontrolled intersection and numbers of approaches are four. Major road carriageway width is 8.5 m in one side and 8:00 m to the other side, whereas, minor road carriageway width is 7.00 m in one side and 8:00 m to the other side. The entry width of major road is same as its carriageway width, entry width of minor roads are 17m and 14.5 m. Gradient is negligible in all the major and minor approaching roads.

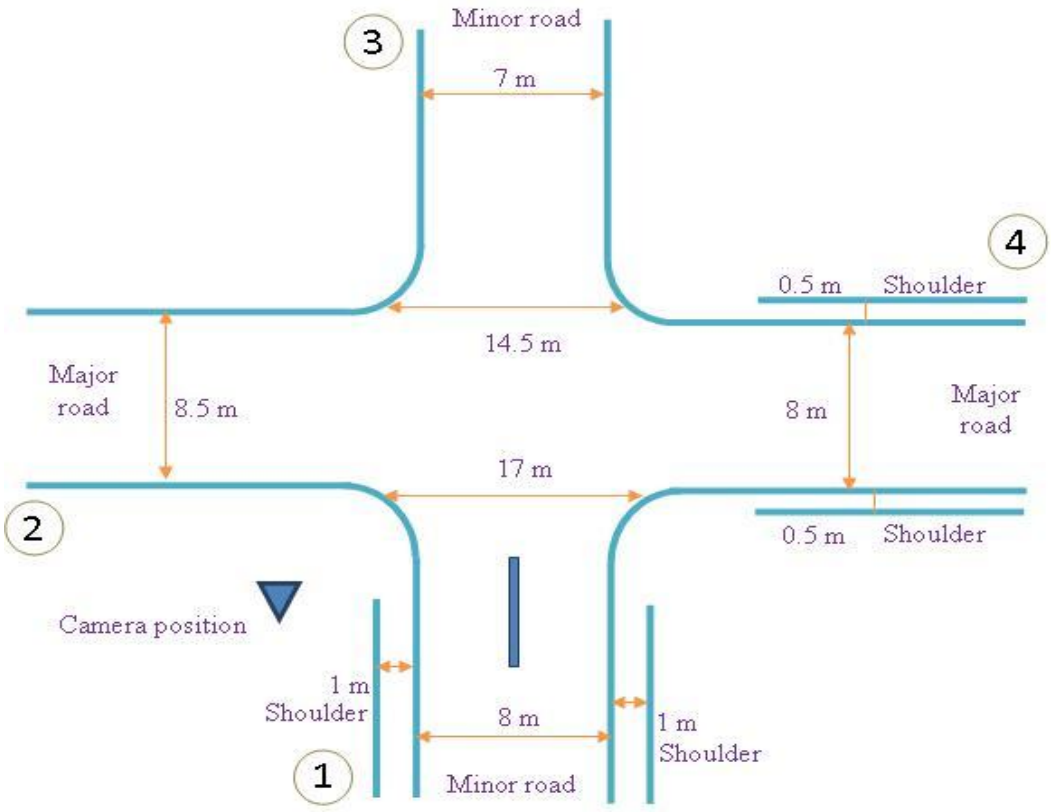

Figure 4: Schematic Diagram of Pallempalli Intersection

2.3 VIDEO RECORDING

Video camera was positioned on the top of a building, adjacent to Junction. The camera was positioned in such a way that it covers each approach of the intersection. The video recording was carried out on clear days and under dry pavement conditions. The traffic flow was recorded continuously 6 hours starting from 8:00 am to 2:00 pm. After the completion of the recording, the recorded videos were brought to the laboratory and data was retrieved.

2.4 RETRIEVAL OF DATA FROM VIDEO TAPES

The following procedure is adopted for retrieving the data from video tapes:

Step 1: Preparation of format for noting downs the volume.

Video tapes are played in video players and volume are noted down in an interval of each five minutes. The different types are vehicles which are noted down are two-wheelers, car, jeep, bus, mini bus, passenger auto (3 wheeler, 4 wheeler), goods auto (3 wheeler, 4 wheeler), LCV, truck (2 axle, 3 axle, multi axle), tanker (2 axle, 3 axle, multi axle), cycle, JCV.

Step 2: Preparation of format for noting downs the accepted gap and all rejected gaps.

Avidemux 2.6 software used for extract the gap values. With this software time can be noted up to 1 in 25 fractions of seconds. The format for calculating accepted and rejected gap for minor street vehicle is given in Table.

Table 1: Format to note down the Calculated Gaps and Lags.

Sl No	Accepted Gap	Rejected Gap 1	Rejected Gap 2	Rejected Gap 3	Rejected Gap 4	Rejected Gap 5	Maximum Rejected Gap	Rank
1	1.32						0.00	8
2	2.36						0.00	8
3	9.24	2.62	3.78				3.78	9
4	3.36						0.00	8
5	4.96	1.26					1.26	9
6	9.26						0.00	12
7	6.24	3.24	4.48				4.48	8
8	9.12	3.26	7.24	2.66			7.24	8
9	8.64	4.36	3.78				4.36	9
10	3.78						0.00	8
11	3.12						0.00	9
12	4.96	1.42					1.42	8
13	7.26	3.32	2.66	4.28			4.28	12
14	5.26	1.24					1.24	7
15	5.00	2.70					2.70	3

Table 2: Format to note down the Gaps and Lags.

Sl No	Accepted Gap	Rejected Gap	Subject Vehicle	Rank
1	1.32	0	Tw	8
2	2.36	0	Tw	8
3	9.24	3.78	Truck	9
4	3.36	0	Tw	8
5	4.96	1.26	Tw	9
6	9.26	0	Truck	12
7	6.24	4.48	Tw	8
8	9.12	7.24	Car	8
9	8.64	4.36	Car	9
10	3.78	0	Car	8
11	3.12	0	Tw	9
12	4.96	1.42	Tw	8
13	7.26	4.28	Auto	12
14	5.26	1.24	Auto	7
15	5	2.7	Tw	3

III. VEHICLE COMPOSITION

Vehicle composition in major and minor streets at, 7 roads junction, Ganagapeta, kadapa and allempalli intersection is shown in Figure. The percentage of vehicles from different approaches of, 7 roads junction, Ganagapeta, kadapa and Pallempalli intersection is shown in Figure.

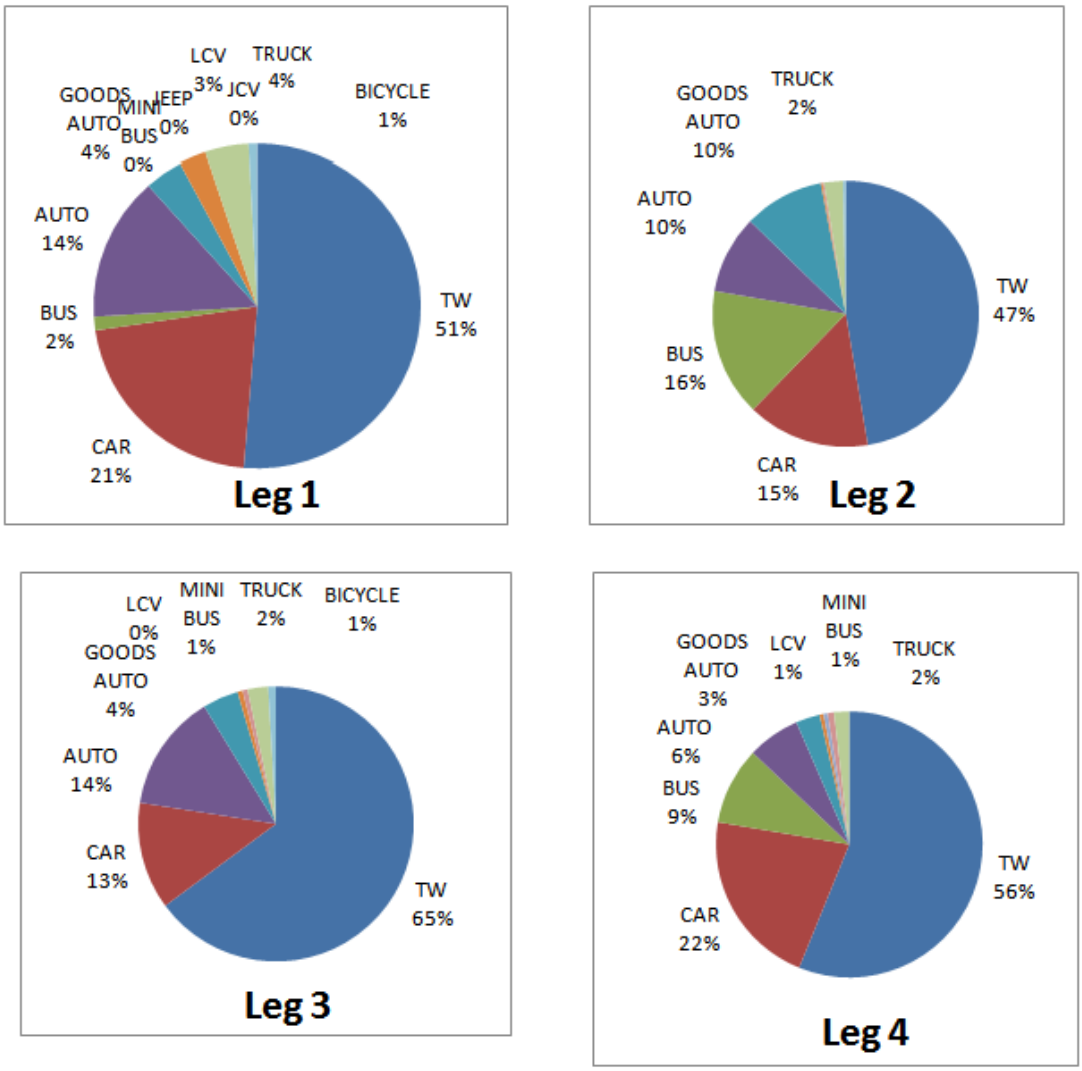

Figure 5: Vehicle Composition at 7 roads junction, Ganagapeta, kadapa from four approaches.

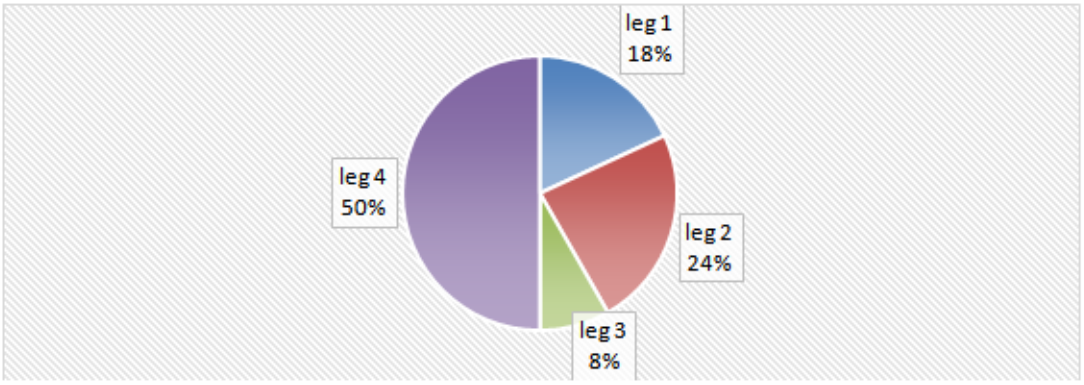

Figure6: Percentage of vehicle distribution from four approaches at 7 roads junction, Ganagapeta, kadapa.

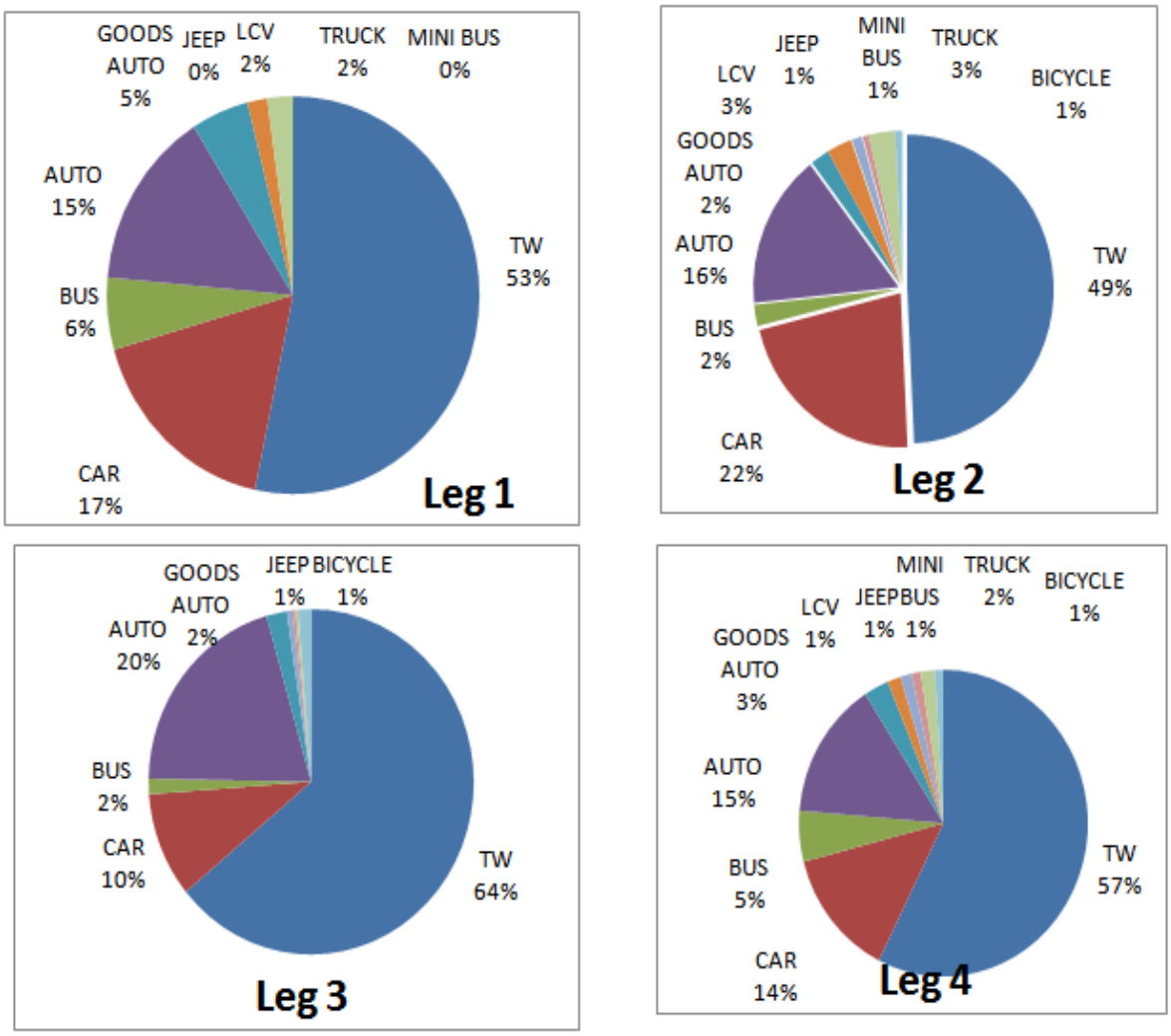

Figure7: Vehicle Composition at Pallempalli intersection from four approaches.

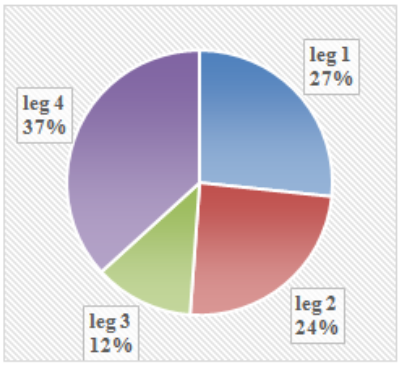

Figure 8: Percentage of vehicle distribution from four approaches at Pallempalli intersection.

In all the major and minor streets approaches, presence of two wheelers is almost 50 percentage of the total entry traffic of that approaching street and car percentage are nearly 15 to 20 percent. The percentage of major road approaches are more compared to the minor road approaches. This traffic composition has an effect on gap acceptance parameter. Estimated critical gap and follow-up time for different types of vehicles are presented in the next chapter.

IV. SUMMARY

In this paper various data collection technique were discussed. The study area, intersection details and retrieval procedure of recorded data were also stated. Vehicle composition, procedure to collect accepted and rejected gaps were also studied. The critical gap of different rank of vehicles and for different type of vehicles are high at low conflicting flow rates and low at high conflicting flow rates.

V. LIMITATIONS OF THE WORK:

- The critical gap and follow-up time depend on the intersection geometrics in addition to conflict flow.
- For rank 2, rank 3, rank 4 vehicles, combination of all vehicles can be considered for the calculation of critical gaps.

VI. SCOPE FOR THE FUTURE WORK:

For different ranks, critical gaps can be calculated for different types of vehicles separately. Models can be developed to study the effect of volume on critical gap and to study the influence of geometric features on capacity. This type of analysis can be carried out for three-legged intersections and generalised models can be developed for different types of intersections.

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