Retraction

Retraction: Study on Uncontrolled Intersection Under Mixed Traffic Condition-A Review (IOP Conf. Ser.: Mater. Sci. Eng. 1145 012113)

Published 23 February 2022

This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

Retraction published: 23 February 2022
Study on Uncontrolled Intersection Under Mixed Traffic Condition-A Review

V Naveenraj¹, P Kulanthaivel¹, K Dhanasekar², V Aravindh Ram², G Anand²
¹Assistant professor, Department of Civil Engineering, Kongu Engineering College, Perundurai, Erode, Tamil Nadu, India.
²Final Year Students, Department of Civil Engineering, Kongu Engineering College, Perundurai, Erode, Tamil Nadu, India.
ramaravindh000@gmail.com

Abstract. Every people in the world can access the road for the transportation purpose. Several traffic signs and signals are placed in order to maintain safety for the people. Some places which don’t have the proper signals at the intersection might lead to cause more accidents and that kind of intersection are called as uncontrolled intersection. When several type of vehicles sharing and moves in a same carriage width without any gap between vehicles without any proper lane discipline is known as mixed traffic condition. Due to these accidents many people lose their life and many properties are also damaged. Several studies are being done by many literates about the uncontrolled intersection and it is available in the literature under mixed traffic condition for finding out the causes and some remedial measure were provided in those studies. Some of the study indicates about the Gap acceptance, Conflicts, pedestrian crossing behaviour, occupation time of the vehicle and so on. In this study we are going to discuss about those literatures and to give some remedial measures for the conflicts that occur in the uncontrolled intersection under mixed traffic condition.

Keywords: Uncontrolled intersection, Mixed traffic condition, Gap acceptance, Conflicts, Pedestrians crossing behaviour, Remedies.

1. Introduction
The intersection plays an important role as network in connecting roads of different areas. Important areas are provided with traffic signals whereas in less accident-prone zone or less traffic areas the signals are not provided in India. In most of the intersection there is no yield and stop signals. even though the sign exits no one follow that voluntarily and enter into the intersection even the vehicles about to collide. efficiency of a road network can be determined in the term safety of driver average speed of the vehicle and also the capacity of road section. in developing countries like India both the motorized and nonmotorized vehicles will simultaneously use the road network it will create mixed traffic condition. hence some special attention needed to have for such type of traffic behavior. some place which doesn’t have the proper signals at the intersection might load to the cause of more accidents and that kind of intersection are so called as uncontrolled intersection [1]. When serval vehicles share and moves in some carriage way without any gap
between the vehicles without any lane discipline is called as mixed traffic conditions. Every type of the turning movements of the overall capacity of the intersection on is affected due to the capacity of the intersection [2]. Major urban roads in India are widely used by various types of vehicles like speed cars, cycles, two wheelers and heavy vehicles which carry loads. (addictive-conflict-flow). (ACF) -2 (regression method (or) gap acceptance method)-2

There are certain various type of traffic survey studies which is carried out to determine the traffic character are Traffic volume study, Speed study, Spot delay, Origin and destination, Traffic flow, Traffic capacity, Parking study, accidents.

These were used to determined certain characteristic like gap acceptance and flow of time potential capacity of the intersection movement capacity and impedance effects determine control delay pedestrian crossing behavior and driver’s behavior at uncontrolled intersection [3].

At the intersection at is the gap acceptance for a vehicle to make the turn as soon as it arrives to the junction without stopping if there is no gap then the vehicle must stop and starts to move from the test position pedestrian crossing behavior increase in both the economic and population growth of a county there is a rapid increase in the traffic growth and urbanization [4].

There are many reasons for a pedestrian to cross the roads some will be in a hurry and will not follow the rules due to the increase of road accidents at the intersection due to the pedestrian behavior a certain study been conducted and its methodology is the suitable site will be selected for the field survey the collection of fields data and extraction. Analyzing the pedestrian for the roads crossing behavior of a pedestrian.

2. Gap acceptance
Gap acceptance is an important study to which we can determine the capacity and delay at uncontrolled intersection and critical gap is a parameter required for this study. There are nine different methodology for determine the critical gap [5]. They are green shield method, the lag method, harder’s methods, logit method, wu’s method, Acworth’s method, clearing behavior approach, acceptance curve method, raff method. It is very different for determine the critical gap in uncontrolled intersection under mixed traffic condition. The results from the present method shows variation in the critical gap. Among these method the clearing behavior approach shows the reckonable results. Methods other than clearing behavior approach falls to provide the realistic value of the critical gap under mixed traffic condition [6].

In rural loads and urban streets, the unsignalized intersection will act as an important key element. Lot of approaches are developed for analyzing the uncontrolled intersection. Conflict technique could be a recently development that relies on pragmatically simplified idea considering both the intersection and impact in flows at intersection [7].

The drivers will behave in an aggressive manner when they had to wait in the stop line for longer duration. In binary logit model the nature of drivers, cleaning time, gap duration will influence the gap acceptance. Gap acceptance are normally considered in the intersection where the minor and major streets are connected [8].

Decision trees (DT), support vector machines (SVM), Random forest (RF) are some of the non-parametric techniques used for data mining. POND, POD, bias and accuracy were some of the skill scores used for the performance evaluation. In advanced traffic management system (ATMS), Advanced warning and safety system (AWSS) it is necessary to predict the gap acceptance [9].

The sight range, several maneuvers, main street traffic volume, vehicle features, driver feature and velocity will change the gap size require by the drivers to pass through. Gap acceptance behavior of male and female drivers are not same. Male drivers will show aggressive as compared to female drivers. [10]
3. Conflicts
Conflict is nothing but the collision or accident that occurs at the intersection. The place where the conflicts may occur is called as conflict point [11]. Conflict point is the point in which there is possibility for the vehicles to crash each other. The conflict will occur due to crossing, Weaving, Diverging and Merging. Each type of intersection has different numbers of conflict points [12].

4. Pedestrian Crossing Behavior
There are many reasons for a pedestrian to cross the roads some will be in a hurry and will not follow the rules [13]. Due to the behavior of pedestrians, there may be a chances of increase in road accidents and certain study were carried out and its methodology are as follows
1. The suitable site will be selected for the field of survey
2. The collection of field data and extraction is done
3. Analyzing the pedestrian behavior and their characteristics
4. A model is developed for the road crossing behaviors of a pedestrian.

The pedestrian behavior under mixed traffic condition in India will be different from other countries [14]. The and the pedestrian movements in some developed countries were controlled based on some certain priorities, in particular at uncontrolled intersection, but in India the rules were not fully followed, even the proper signals were provided, but the pedestrians do not follow the rules properly. The main objective for finding out the pedestrian characteristic’s behavior is
1. To identify different type crossing pattern of the pedestrian at the interactions before the installation of the traffic signals and also after installation of the traffic signals.
2. To determine the waiting time and the crossing speed of the pedestrians with respect to the age, crossing pattern and the gender to compare it effectively.
3. The multi linear regression model was developed for pedestrian’s gap acceptance with consideration of traffic and pedestrians’ characteristics.

A multiple linear regression model was developed in order to predict the pedestrian gap acceptance characteristics and behaviors [15]. The analysis of the crossing patterns is done and two major patterns were observed

1. One step (Pedestrians crosses the roads without waiting at the median)
2. Two step (Pedestrians crosses the median in single try and will go for the farther side for crossing the road)

Studies were carried out to make a list of pedestrian accidents through videos. It also includes the safety of crossing of pedestrian at mid blocks and at unsignalized intersections [16]. The main risk factors are that when the crossings are uncontrolled. This paper examines the safety of speed, crossing stages, time of crossing total number of interruptions during the time of crossing [17]. The rolling gap behavior was examined and studied for different age groups of pedestrians. It is also concluded that male pedestrians are subjecting themselves to make more risks than that of female pedestrians. When speaking about age, middle aged pedestrians (25-40 years) have a risk of 60.1% when compared to other age groups [18].

Various literatures had defined the term critical gap in different manners us literatures had defined the term critical gap in different manners [19]. The critical gap for the pedestrian estimated by the raff methods and the results shows that the value of the critical gap for the pedestrian estimated as low of 3.20sec, which...
is comparatively lower when compared to other studies [20]. The ANFIS (Adaptive Neuro Fuzzy Influence System) was established to estimate the possibilities of accepting a given gap and the brief explanation is given below [21].

5. Estimation of Critical Gap

The following were the nine methods which have been used for determining and estimating the critical gap.

5.1 Green shield Method:
In this method for every range of gap a bar chart is used for determining the total number of the acceptance and the rejection of critical gap [22]. The gap size is represented in the horizontal axis, positive or negative values of the rejected and the accepted gaps are represented in vertical axis.

5.2 The Lag Method:
It is very difficult method to find the critical gap in under saturated condition so we use the lag method which makes easy for finding it [23]. This method requires more time for observation. After that the decision of large number observer is analyses and for estimation few samples are used.

5.3 Harder’s method:
It is a popular method in Germany. It was invented in the year 1968. It is similar to that of lag method. In harder’s method lag time is used. We need large sample size to prevent the drawback [24].

5.4 Raff Method:
It is one of the oldest method based on the microscopic model used for determining the critical gap. It was discovered in the year 1950. Due to its simplicity was followed in many countries.

5.5 Acceptance Curve Method:
From the empirical and the theoretical considerations made in this method the response function shape will be in curvilinear if the variable is binary variable.

5.6 Logit Method:
Some approaches are made to summarize it as legit models. Mathematical forms of the legit model are shown below

\[ P(a) = \frac{1}{1 + e^{-\beta_0 + \beta_1 a}} \]

\( \beta_0, \beta_1 = \text{Regression Coefficients} \)

\( P(a) = \text{Probability of accepting a gap of size.} \)

5.7 Ashworth’s Method:
Ashworth discovered this method by determining the critical gap from accepted gap \( E(t_c) \). Where \( E(t_a) \) and \( \text{Var}(t_a) \) are the mean and variance shown in Equation 1

\[ E(t_c) = E(t_a) - q_p \text{Var}(t_a) \]  \( (1) \)

5.8 Wu’s Model:
Wu’s model is based on theoretical background of probability equilibrium from subjected and accepted gaps. This method provides critical gaps by empirical distribution, which is used for microscopic simulation. This method has a disadvantage that rejected gap should be greater than the accepted gap which is minimum.

5.9 Clearing Behavior Approach:
It is the only method suitable for the Indian condition. The drivers clearing behavior is integrated by taking clearing time. However, this method has large theoretical background, it is having some limitation.
6. Potential Capacity:
The maximal number of vehicles which entertain under given conditions with acceptance a is known as potential capacity. This methods like HCM are suitable for interchanges like roundabout, ramps and grade separator where the capacity is identified and solution is proposed.

The v/c ratio is directly proportional to the performance of intersection. Design parameter they normally considered are critical gap and gap acceptance based on time in each leg.

For determining the capacity of a unsignalized intersection a new method has been developed based on the Additive Conflict Streams (ACS) method. This method has been developed for intersection where there is priority. This method has drawback of determining critical gap and its calculations [25].

Normally the traffic parameters were obtained by using videography and the capacity and control delay are calculated by following the procedure of HCM manual.

Level of Service (LOS) and control delay comparisons are made. The results of this conflict methods are compared with HCM-2000 by using field data.

7. Conclusion

- Studying about various methods of estimation of critical gap, it is revealed that clearing behavior goes good with real time values when compared with all other eight type of approaches.
- In India proper traffic rules are not followed by pedestrians which is the major reasons for the conflicts, particularly male pedestrian conflicts are dominating more than female pedestrian conflicts.
- Four legged intersection will usually have 32 conflict points whereas roundabout intersection has only 8 conflict pointed hence conflicts can be handled effectively even in the uncontrolled intersection.
- As the capacity of the road increases the possibility of the occurrence conflicts are maximal, hence it is calculated by using HCM-2000 by field survey. It helps us to regulate the traffic at the intersection.

References

[1] Amin, H. J., & Maurya, A. K., A review of critical gap estimation approaches at uncontrolled intersection in case of heterogeneous traffic conditions. *Journal of Transport Literature*, 9(3), pp 5–9,2015.
[2] S. S. G. P., a Study on Gap-Acceptance of Unsignalized Intersection Under Mixed Traffic Conditions. *International Journal Of Research in Engineering and Technology*, 03(08), pp 289–294,2014.
[3] Dutta, M., & Ahmed, M. A., Gap acceptance behavior of drivers at uncontrolled T-intersections under mixed traffic conditions. *Journal of Modern Transportation*, 26(2), pp 119–132,2018.
[4] Nagalla, R., Pothuganti, P., & Pawar, D. S. (2017). Analyzing Gap Acceptance Behavior at Unsignalized Intersections Using Support Vector Machines, Decision Tree and Random Forests. *Procedia Computer Science*, 109, pp 474–481,2016.
[5] Maurya, A. K., Amin, H. J., & Kumar, A. Estimation of Critical Gap for through Movement at Four Leg Uncontrolled Intersection. *Transportation Research Procedia*, 17, pp 203–212,2016.
[6] Kadali, B. R., & Vedagiri, P., Modelling pedestrian road crossing behaviour under mixed traffic condition. *European Transport - Trasporti Europei*, 55,2013.
[7] Asaithambi, G., Kuttan, M. O., & Chandra, S., Pedestrian Road Crossing Behavior Under Mixed Traffic Conditions: A Comparative Study of an Intersection Before and After Implementing Control Measures. *Transportation in Developing Economies*, 2(2), pp 1–12,2006.
[8] Ravishankar, K. V. R., & Nair, P. M., Pedestrian risk analysis at uncontrolled midblock and unsignalised intersections. *Journal of Traffic and Transportation Engineering (English Edition)*, 5(2), pp 137–147, 2018.

[9] Amin, H. J., Desai, R. N., & Patel, P. S., Modelling the Crossing Behavior of Pedestrian at Uncontrolled Intersection in Case of Mixed Traffic Using Adaptive Neuro Fuzzy Inference System. *Journal of Traffic and Logistics Engineering*, 2(4), pp 263–270, 2015.

[10] Amaranatha, G. A., Manjunatha, N., & Reddy, K. S. B., Capacity Analysis Of Un-signalized Intersection : A Case Study of City Junction. 7(06), pp 154–157, 2018.

[11] Mukhtyarali, S. S., Zala, L. B., & Amin, P. A. A., Kalpa Publications in Civil Engineering Capacities LOS of Intersections. 1, pp 209–218, 2017.

[12] Brilon, W., & Wu, N., Capacity at unsignalized intersections derived by conflict technique. *Transportation Research Record*, 1776, pp 82–90, 2001.

[13] Someswara Rao, B., Rambabu, T., & Venkata Rao, G., Analysis of capacity and level of service at uncontrolled intersections under heterogeneous traffic conditions. *International Journal of Civil Engineering and Technology*, 8(8), pp 181–190, 2017.

[14] Conference, N., Advances, R., & Engineering, C., Critical Gap And Critical Lag Estimation Of Uncontrolled T-Intersections Using Clearing Behaviour Approach Manish Dutta 1, Mokaddes Ali Ahmed 2. March, pp 1–8, 2016.

[15] Haldorai, A. Ramu, and S. Murugan, Social Aware Cognitive Radio Networks, Social Network Analytics for Contemporary Business Organizations, pp. 188–202. doi:10.4018/978-1-5225-5097-6.ch010

[16] R. Arulmurugan and H. Anandakumar, Region-based seed point cell segmentation and detection for biomedical image analysis, *International Journal of Biomedical Engineering and Technology*, vol. 27, no. 4, p. 273, 2018.

[17] Anuroop., Analysis of Occupation Time of Vehicles at Uncontrolled Intersections under Mixed Traffic Conditions. November, 2015.

[18] Surisetty, R., & Prasad, S. S. G., Estimation of capacity at un-signalized intersections under mixed traffic flow conditions. *American Journal of Engineering Research*, 11, pp 213–221, 2014.

[19] Paul, M., & Ghosh, I., Post encroachment time threshold identification for right-turn related crashes at unsignalized intersections on intercity highways under mixed traffic. *International Journal of Injury Control and Safety Promotion*, 27(2), pp 121–135, 2020.

[20] Preet Amin, P.N.Patel, A. A. A, Analysis of Critical Gap Approaches At Four Legged Median Separated Uncontrolled Intersection in Case of Heterogeneous Traffic Condition. *International Research Journal of Engineering and Technology (IRJET)*, 05, pp 2615–619, 2018.

[21] Faheem, M. I., Performance Evaluation Of Unsignalized Uncontrolled International Journal of Technical Innovation in Modern Engineering Performance Evaluation Of Unsignalized Uncontrolled. August, 2018.

[22] Brilon, W., & Wu, N., Capacity at unsignalized intersections derived by conflict technique. *Transportation Research Record*, 1776, pp 82–90, 2001.

[23] Killi, D. V., & Vedagiri, P., Proactive Evaluation of Traffic Safety at An Unsignalized Intersection Using Micro-Simulation. *Journal of Traffic and Logistics Engineering*, 2(2), pp 140–145, 2014.

[24] Ashalatha, R., & Chandra, S., Critical gap through clearing behavior of drivers at unsignalised intersections. *KSCE Journal of Civil Engineering*, 15(8), pp 1427–1434, 2011.

[25] Maurya, A. K., Amin, H. J., & Kumar, A., Estimation of Critical Gap for through Movement at Four Leg Uncontrolled Intersection. *Transportation Research Procedia*, 17, pp 203–212, 2016.