International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 05 Issue 12
April 2018

Pedestrian Flow Behaviour Along Sidewalks

Munivel. K (P6815PTN05)

PG Student, Prist University, Thanjavur

Abstract

Pedestrian walking is a major mode of transportation in Indian cities and also effective mode of transportation for short trips. In this study pedestrian sidewalk data was collected from three locations in Rourkela city in India. The obtaining three locations data was bi-directional flow unsteady data and also collect uni-directional flow data from L.A.Hall with in the NIT Rourkela campus. These data was analyzed for finding pedestrian characteristics like speed, flow and density as well as to draw the fundamental diagrams. Pedestrian fundamental diagrams and pedestrian characteristics are depends on gender of the pedestrian, age of pedestrian and type of facilities (sidewalks, wide sidewalks and prescient's). " pedestrian characteristics, fundamental diagrams for uni-directional flow as well as bi-directional flow, comparison of pedestrian fundamental diagrams between uni-directional and bi-directional flow, capacity and level of service (LOS) for above three sections" was done in this study. Hypothesis testing was conducted for compare the pedestrian speed between different sections and different combinations was done in this study.

Introduction

Pedestrian movements are classified into two types they are pedestrian sidewalk and pedestrian crosswalk. In this report pedestrian sidewalk has been considered by me. The sidewalk facilities provided and improved was more important in urban areas. They have different types of sidewalks in urban areas they are sidewalks, wide-sidewalks and precincts. In this report pedestrians capacity and level of service (LOS) will be considered. If we can consider capacity, "it means the maximum no of pedestrians passing through a point per unit of time". Level of service (LOS) is a quality measure for sidewalks in terms of speed, flow, comfort and convenience. Capacity and level of service of pedestrian sidewalk are depends on pedestrian speed, density and flow.

Pedestrian walking speed was depends on age of pedestrian, gender and type of facilities. Pedestrian walking speed is more on wide-sidewalk less on precincts. Male pedestrians walking speed is more compare to female pedestrians walking speed. Elder pedestrians speed is less compare to younger pedestrians speed.

Objectives

- Understanding pedestrian speed, flow, density and their relationships (speed-flow, flow-density, speed-density relationships)

- Comparison of pedestrian characteristics with hypothesis test.
- To find the Pedestrian capacity and level of service study for providing better facilities for sidewalks.
- Comparison of fundamental diagrams between unidirectional and bidirectional pedestrian flows.

Methodology

In this section trust that the principal factors that affected by pedestrian flow along sidewalks are the gender of pedestrian and direction of pedestrian flow. In this study two types of experiments are conducted. The first type of experiment has conducted the impact of gender on pedestrian characteristics like speed, flow, density and their relations along sidewalks. This study gives the fundamental diagrams between speed, flow, density and distance headway.

Results

The results of this thesis have been dividing into four parts. In this first part results on free flow speed will be presented. In this second part the results on the fundamental relations of pedestrians will be presented. In the third part pedestrian capacity and level of service (LOS) will be presented. In the fourth part influence of pedestrian flow (uni-directional flow and bi-directional flow) on fundamental relations of pedestrian flow will be presented.

Study Comparision

Hypothesis test was conducted to show the pedestrian speed comparisons between different combinations in above three locations in Tiruchirappalli. In this study first hypothesis test was done to illustrate the pedestrian speed difference between male and female in above all three sections. The combinations was male and female pedestrians at section1 (m1&f1), same as section2 and section3 (m2&f2; m3&f3), male pedestrian speeds between different sections (m1&m2; m2&m3; m3&m1), female pedestrian speeds between different sections (f1&f2; f2&f3; f3&f1), total male speeds in all three locations and total female speeds in all three locations (M&F), all pedestrian speeds between these three locations (section1&section2; section2&section3; section3&section1). In this study speed will be compared in above all combinations in the three sections. The results will be found after hypothesis testing is present in bellow tabular form. In the results m2&m3 combination was got Zobserved value is less than Zcritical value because cannot reject the null hypothesis H0.

Conclusions

In this study experiments conducted on pedestrian flow behaviour along the sidewalks in different places in

Tiruchirappalli city and also experiment conducted on pedestrian characteristics variations in pedestrian uni-directional flow and pedestrian bi-directional flow. From this study results male pedestrian speeds are more, comparatively female pedestrian speeds in above all three sections. In this study pedestrian average speed are more in Bank road (section 3) less in daily market (section1). Bank road has more pedestrian sidewalk width comparatively remaining sections and also sidewalk surface will be even because pedestrian sidewalk will be more in Bank road.

Hypothesis test will be conducted in different combination of pedestrians in different sections, male pedestrian speeds at section2 and section3 will be similar because Z-observed value is in between Z-critical value, this combination will be significant. In this study pedestrian uni-directional flow will be get maximum flow (capacity) comparatively pedestrian bi-directional flow. Pedestrian flow versus density graph initially these two (uni and bi-directional flow) lines will be coincides after that uni-directional flow line has above the bi-directional flow line.

References

- *Hankin, B.D. and Wright, R.A. (1958). Passenger Flow in Subways. Operational Research Quarterly, 9(2), pp. 81–88.*
- *Oeding, D. (1963). Verkehrsbelastung und Dimensionierung von Gehwegen und Anderen Anlagen des Fußgängerverkehrs. Tech. Rep. Forschungsbericht 22, Technische Hochschule Braunschweig.*
- *Older, S.J. (1968). Movement of Pedestrians on Footways in Shopping Streets. Traffic Engineering and Control, 10(4), pp. 160–163.*
- *Navin, F.P.D. and Wheeler, R.J. (1969). Pedestrian Flow Characteristics. Traffic Engineering, 39(9), pp. 30–36.*
- *Mori, M. and Tsukaguchi, H. (1987). A New Method for Evaluation of Level of Service in Pedestrian Facilities. Transportation Research Part A, 21A (3), pp. 223–234.*
- *Weidmann, U. (1993). Transporttechnik der Fußgängers. Tech. Rep. 90, Institut für Verkehrsplanung, Transporttechnik, Strassen und Eisenbahnbau, Zürich.*
- *Seyfried, A., Steffen, B., Klingsch, W. and Boltes, M. (2005). The Fundamental Diagram of Pedestrian Movement Revisited. Journal of*

Statistical Mechanics: Theory and Experiment, P10002.

- *Helbing, D., Johansson, A. and Al-Abideen, H.Z. (2007). Dynamics of Crowd Disasters: An Empirical Study. Physical Review E, 75(4), pp. 046109 (1–7).*
- *Polus, A., Joseph, J.L. and Ushpiz, A. (1983). Pedestrian Flow and Level of Service. Journal of Transportation Engineering, ASCE, 109(1), pp. 46–56.*
- *Hoogendoorn, S.P. and Daamen, W. (2005). Pedestrian Behavior at Bottlenecks. Transportation Science, 39(2), pp. 147–159.*
- *Seyfried, A., Passon, O., Steffen, B., Boltes, M., Rupprecht, T. and Klingsch, W. (2009). New Insights into Pedestrian Flow through Bottlenecks. Transportation Science, 43(3), pp. 395–406.*
- *Henderson, L.F. and Lyons, D.J. (1972). Sexual Differences in Human Crowd Motion. Nature, 240(5380), pp. 353–355.*
- *Young, S.B. (1999). Evaluation of Pedestrian Walking Speeds in Airport Terminals. Transportation Research Record, 1674, Transportation Research Board, National Research Council, Washington, DC, USA, pp. 20–26.*
- *Morrall, J.F., Ratnayake, L.L. and Seneviratne, P.N. (1991). Comparison of CBD Pedestrian Characteristics in Canada and Sri Lanka. Transportation Research Record, 1294, Transportation Research Board, National Research Council, Washington, DC, USA, pp. 57–61.*
- *Isobe, M., Adachi, T. and Nagatani, T. (2004). Experiment and Simulation of Pedestrian Counter Flow. Physica A, 336(3–4), pp. 638–650.*
- *Kretz, T., Gruenebohm, A., Kaufman, M., Mazur, F. and Schreckenberg, M. (2006). Experimental Study of Pedestrian Counterflow in a Corridor. Journal of Statistical Mechanics: Theory and Experiment, P10001.*
- *Hoogendoorn, S.P. and Daamen, W. (2004). Self–Organization in Walker Experiments. In Proceedings of the 5th Symposium on Traffic and Granular Flow, (Eds.: Hoogendoorn, S.P., Luding, S., Bovy, P.H.L., Schreckenberg, M. and Wolf, D.E.), Springer, Delft, the Netherlands, pp. 121–132.*

- *Helbing, D., Bunza, L., Johansson, A. and Werner, T. (2005). Self Organized Pedestrian Crowd Dynamics: Experiments, Simulations and Design Solutions. Transportation Science, 39(1), pp. 1–24.*
- *Rastogi, R., Ilango, T. and Chandra, S. (2011a). Design Implications of Walking Speed for Pedestrian Facilities, Journal of Transportation Engineering, ASCE, 137(10), pp. 687-696.*
- *Rastogi, R., Chandra, S., Vamsheedhar, J. and Das, V. (2011b) Parametric study of pedestrian speeds at midblock crossings. Journal of Urban Planning and Development, ASCE, 137(4), pp. 381-389.*
- *Sahani R., Bhuyan P. (2013). Level of Service Criteria of off-street Pedestrian Facilities in Indian Context using Affinity Propagation Clustering. Procedia Social and Behavioral Sciences (104), Elsevier, Agra, India, pp. 718–727.*
- *Chattaraj, U., Seyfried, A. and Chakroborty, P. (2009). Comparison of Pedestrian Fundamental Diagram Across Cultures. Advances in Complex systems, 12(3), pp. 393–405.*
- *Chattaraj, U. (2011). Understanding Pedestrian Motion: Experiments and Modelling. Ph.D. thesis. IIT Kanpur, India.*
- *Chattaraj U., Seyfried A., Chakroborty P.,Biswal M. (2013a). Modelling single file pedestrian motion across cultures. Procedia Social and Behavioral Sciences (104), Elsevier, Agra, India, pp. 698–707.*
- *Chattaraj U., Chakroborty P., Arumuga S. N. (2013b). Empirical Studies on Impacts of Obstacle inside Corridor on Pedestrian Flow. Procedia Social and Behavioral Sciences (104), Elsevier, Agra, India, pp. 668–677.*
- *Chattaraj, U., Chakroborty, P. and Seyfried, A. (2013c). Some Empirical Studies on Evacuation from Halls. In Proceedings of the 9th Conference on Traffic and Granular Flow, Springer, Moscow, Russia, pp. 207-216.*