Impacts Of Gender And Gender Mix On Pedestrian Fundamental Diagram

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Abstract

Pedestrian movement study can be possible done by different approaches like Investigation of walker movement (field data collection), experimental observation, and conduction of controlled tests and also by creating pedestrian models. All these diverse sorts of studies are subject to develop fundamental diagrams. Movement of pedestrian along a line of the corridor under the closed boundary conditions is the simplest method to know how the different condition influences the fundamental diagram. We have to study diverse angle and distinctive effects which impact person on foot movement, to give better pedestrian facilities and also help in design spaces for human circulation.So, here in this thesis it is aimed to study the impact of gender mix condition on pedestrian at different densities at fundamental level. In this contribution it is studied through fundamental diagram, whether the impact of gender and gender mix condition influence the pedestrian behaviour or not. To conduct the experiment, the simplest system, which is known as the movement of pedestrians along a line under closed boundary conditions (single file movement) is chosen with five different gender mix condition. It is found that the Mean free flow speed is $1.27ms^{-1}$ for male pedestrian and it is$1.24ms^{-1}$for female pedestrians. While walking females are more conscious about their private space than the males. This may be because of contrasts in their self-organizing behaviour. Without any statistical proof one can't tell whether there are contrasts or not. By statistical hypothesis test it is discovered quantitatively that these distinctions exist, recommending the gender and gender mix impact in fundamental diagram.

Introduction

Walking is perhaps the most useful, necessary and basic transportation system which is available to mankind and used by almost every person in the world. Walking is additionally included in many outings made by different modes. Whatever the fundamental method for travel, walking is normally the first and last mode utilized, giving an essential connection between area utilize and mechanized travel. It is additionally sound, economical and environmental friendly. As per DEMOGRAPHIC OF INDIA, WIKIPEDIA (2014), India is the second most crowded nation on the planet more than 1.27 billion people, more than a 6th of the world's populace. As of now contains 17.5% of the world's populace and India is anticipated to be the world's most crowded nation by 2015,

surpassing china so India should need a adequate pedestrian facilities to provide better design spaces for human circulation, to empower and energize walking for distinctive purpose, the physical facility must be available to backing the physiological, psychological and social need of walkers and guarantee them against overexertion, interference by other person on foot and mischance. For this reason, exploration of walker movement streams has just been given constrained consideration amid the most recent decades. Since walking is a part of the transportation chain without which barely any development is conceivable.

Samples are get to and departure to open transport administration, person on foot streams in inward city ranges, focal business areas and malls, and group amid discharging of theatres and games stadiums and amid celebrations. In this thesis an attempt is made to study the behavior of the Indian pedestrian empirically on the basis of their gender analysis. Empirically, the motion of the pedestrian can be studied by conducting different type of experiments such as single file movement, flow through open corridor, bottleneck experiment, and evacuation from a hall etc.

Problem Statement

The problem of this thesis can be extensively expressed as "to show the impacts of gender and gender mix conditions on pedestrian fundamental diagram". Here the motion of the Indian pedestrian are empirically studied to show the existence of the gender effect on

fundamental diagram by conducting single file experiment on pedestrian movement.

Experimental Observation

Pedestrian activity has been discovered to be affected by mental, physiological, social and ecological variables. The elements which affect studies for characterizing the qualities of pedestrian stream are age, sex, physical wellness, pedestrian interaction and the geometry of the facility. In this study five similar types of experiments are done. All the five sets of experiments are done in N.I.T. Tiruchirappalli to study the impact of space between pedestrians in the direction of motion which can be observed on pedestrian speed. The fundamental diagram between speed and linear density of pedestrian motion is obtained from this study.
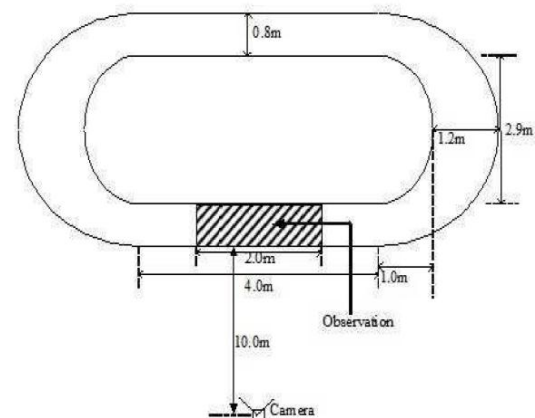
Experimental setup for single file

Data Decoding

The information was decoded by playing the feature utilizing software Avidemux. For data decoding, results and discussions, Seyfried et

al. (2005) was referred. As the entry time and exit time was noted from the video to obtained the speed and density data. The individual velocity is determined from the formula:

$$\text{Individual velocities} = V_i^{man} = \frac{l_m}{t^{out} - t^{in}}$$

$$\text{Density} = \rho(t)^{man} = \sum_{t=1}^{N} \Theta i(t)/l_m$$

$$\Theta i(t) = \begin{cases} \dfrac{t - t_i^{in}}{t_{i+1}^{in} - t_i^{in}} & t \in |t_i^{in},\ t_{i+1}^{in}| \\ 1 & t \in |t_{i+1}^{in},\ t_i^{out}| \\ \dfrac{t_{i+1}^{out} - t}{t_{i+1}^{out} - t_i^{out}} & t \in |t_i^{out},\ t_{i+1}^{out}| \\ 0 & \text{otherwise} \end{cases}$$

Study on intercept

S. No	Data sets	Intercept (a)	Slope (b)	R^2	Data points
1	All boys	0.143	0.315	0.801	339
2	Two boys and one girl	0.154	0.231	0.884	298
3	One boy and one girl	0.16	0.328	0.787	316
4	One boy and Two	0.16	0.240	0.81	309

ANOVA for Multiple Factors

ANOVA sums up to the investigation of the impacts of various elements. At the point when the analysis incorporates perceptions at all mixes of levels of every component, it is termed factorial. Factorial trials are more effective than a progression of single component analyses and the effectiveness develops as the quantity of components increments. Thus, factorial experiments are vigorously utilized. The utilization of ANOVA to study the impacts of various elements has a complexity. In a 3-way ANOVA with elements x, y and z, the ANOVA model incorporates terms for the fundamental impacts (x, y, z) and terms for collaborations (xy, xz, yz, xyz). All terms requre hypothesis tests. The multiplication of cooperation terms expands the danger that a few theory test will deliver a false positive by shot. Luckily, experience says that high order interaction are rare.[verification needed] The capacity to recognize associations is a noteworthy point of preference of numerous element ANOVA. Testing one element at a time hides interactions, but produces apparently inconsistent experimental results.

Summary

In this study, five experiments on single file pedestrian movement was directed in N.I.T., Tiruchirappalli of India to demonstrate the effects of gender impact. A test set-up was constructed to carry out the experiment as said in Chattaraj et al. (2009). Different groups of walkers was utilized for this test as a subject. At that point the direction was given to entry group of subjects to goes around the geometric corridor three times. After moving these subjects three rounds along the geometric corridor, an opening was formed in the shut passageway to keep the walkers out. In the test set-up, two running bars are set independently to find the rectangular measured area, from which video data was taken for data decoding process. Then the fundamental relation was established using the video data and by statistical and hypothesis testing the impact of gender effect was determined.

Conclusions

In this work, the experiments on pedestrian motion under closed boundary condition using the single file pedestrian motion are conducted to observe the impacts of gender and gender mix condition on fundamental diagram.The objective of this study to show the impacts of gender effect on pedestrian fundamental diagram using different hypothesis test. The results were compared statistically using z-test and ANOVA test. The following observation is found from this study: The Mean free flow speed is $1.27ms^{-1}$ for male pedestrian and it is$1.24ms^{-1}$ for female pedestrians. While walking females are more conscious about their private space than the males. Security distance is introduced to explain the private space concept. From this experiment it appears that the male group of test persons are less concerned about their personal space and thus the security distance is smaller compared to the female group. It is clearly notice that the impacts of gender is existed in pedestrian crowd flow and mostly gender condition affects the space between the pedestrians present in mix pedestrian traffic.

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