HEADWAY DISTRIBUTION IN EXPRESSWAYS IN SRI LANKA

R.M.C.B Rathnayake

(199577D)

Degree of Master of Engineering

Department of Civil Engineering

University of Moratuwa
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Thesis/Dissertation submitted in partial fulfillment of the requirements for the degree Master of Engineering

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…… Date: 15th April 2024

Prof. H. R. Pasindu

DEDICATION

This dissertation is dedicated to my loving parents, my wife, my siblings and my friends for their endless love, support, and encouragement given during this journey.

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R.M.C.B.Rathnayake

Department of Civil Engineering,

University of Moratuwa

ABSTRACT

The relationship between traffic flow parameters such as speed, flow and density should be understood to properly construct, plan and design traffic operation and improve them. Headway distribution can be considered as the basis of the traffic flow modelling but there has not been studied done on understanding headway distribution in expressways in Sri Lanka. It is mostly used to evaluate road capacity, line changing, vehicle conversion and traffic control strategies in intersection as studies of headways are also important for safety assessments. This study is focused on developing a time headway distribution for different flow categories and different vehicle pairs. To find the data, 12-hour video clips were recorded during peak hours from three different locations. Then Passenger Car Units (PCU) were considered for calculation by selecting eight vehicle categories Car, Van, Light good vehicle (LGV), Medium lorry (MG1), Large lorry (MG2), Medium bus (MBU), Large bus (LBU) and Truck (TRK). Since the headway distribution can be changed according to its flow category it should be tested so the headway distribution is tested by choosing 5 flow (PCU/5min/lane) categories 20-40, 40-60, 60-80, 80-100, 100-120, and considered whether they can be combined or not. The results show that flow categories have to be considered separately and 20-40 followed the "Dagum distribution" with 8.87s average time headway, 40-60 followed the "Frechet distribution" with 6.32s time headway distribution, 60-80 followed the "Generalized Extreme Value distribution" with 5.07s average time headway, 80-100 followed the "Burr distribution" with 4.12s time headway and 100-120 followed the "Pert distribution" with 3.43s time headway. The same process was done for vehicle categories, testing whether they can be combined or not as well as the distribution types of each category belongs to concerning the properties such as mean, mode, and median. All the flow and vehicle categories were tested using random and normality tests to check the parametric and non-parametric states of each category. The results show that the flow categories cannot be combined (have to consider them separately), and vehicle pair categories can be combined. In vehicle pairs Car-Bus & Bus-Car is considered as one group and it is followed the "Dagum distribution" with average time headway of 5.22s and rest of the vehicle groups can be combined as a one group and followed the "Burr distribution" with 5.52s average time headway.

Key Words: Headway distribution, road capacity, average time headway, parametric, non-parametric, Passenger car unit, randomness, normality, 5min time interval.

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LIST OF ABBREVIATIONS

Abbreviation	Description
PCU	Passenger Car Unit
PCE	Passenger Car Equivalent
LOS	Level of Service
HCM	Highway Capacity Manual
IAT	Inter Arrival Time