An Investigation on Safety Performance Assessment of Close-Following Behavior of Heavy Vehicle Using Empirical-Simulation Technique

Mohamed Rehan Karim1*, Ahmad Suisuz1, Hideo Yamaoka1, Aizul Sharizal1, Rahzar Kamli1

1Faculty of Civil Engineering, Universiti Teknologi Malaysia, Johor Bahru, Malaysia

2Department of Civil and Environmental Engineering, The University of Tokushima, Tokushima, Japan

Received October 19, 2013; revised November 22, 2013; accepted December 11, 2013

ABSTRACT

One of the main causes of rear-end crashes is attributed to close-following and hazardous driving behavior. A study was conducted to investigate the close-following behavior of heavy vehicle under various heavy vehicle categories, travel speeds and gross vehicle weights (GVW). Investigation is based on data obtained from simulation and empirical observations. A safety performance assessment of close-following behavior of heavy vehicles is by using empirical-simulation technique is proposed. The simulation, which incorporates vehicle dynamics, is to generate the minimum safe time gap (MSTG) for truck-following-car situations. MSTG is defined as the minimum time required by the following vehicle to decelerate and stop without hitting the leading vehicle when both leading and following vehicles apply the emergency brakes. Based on comparison between the actual time gap data and the MSTG, a safety performance assessment technique that considers vehicle type, vehicle braking characteristics, truck GVW and speed is proposed for truck-following-car situation.

KEYWORDS

Road Safety; Vehicle Overloading; Safety Indicator; Close-Following; Traffic Accident; Weigh-in-Motion

1. Introduction

Close-following has been identified as one of the main causes of road crashes and associated with large number of rear-end crashes and hazardous driving risks. Knapling et al. [1] stated that the main causal factors of rear-end collision were inattention and following too closely. Study by Michael et al. [2] also stated that 38.3% of rear-end collisions in Tennessee in 1997 were because of close following. There are many other studies that provide empirical evidence to support the connection between short headway and rear-end collisions [3-5].

Time gap is defined as the time that elapses between the rear of the lead vehicle and the front of the following vehicle. It is important to distinguish time gap from headway, which refers to time separation between the front of two successive vehicles passing a point. Time headway consists of the time gap and passage time, which is the time taken for lead vehicle to pass a point. Because passage time inversely varies with speed [6] and greatly depends on the length of vehicles, the characteristics of headways and time gaps are dissimilar. It is very crucial for drivers to keep a safe following time gap in order to prevent a rear-end collision with the vehicle in front. The time gap should be sufficient for the reaction time and stopping time.

With the increase of in-vehicle electronic gadget for information and entertainment, the risk of rear-end collision may increase in the near future. Young and Salmon

OPEN ACCESS

JTT