Minimum Safe Time Gap (MSTG) as a new Safety Indicator incorporating Vehicle and Driver Factors

Mohamed Rehan KARIM\textsuperscript{a}, Ahmad SAIFIZUL\textsuperscript{b}, Hideo YAMANAKA\textsuperscript{c}, Airul SHARIZLI\textsuperscript{d}, Rahizar RAMLI\textsuperscript{e}

\textsuperscript{a, b, d, e} Center for Transportation Research, Faculty of Engineering, University of Malaya, 50603 Kuala Lumpur, Malaysia
\textsuperscript{a} Email: rehan@um.edu.my
\textsuperscript{b} Email: saifizul@um.edu.my
\textsuperscript{d} Email: airul7716@yahoo.com
\textsuperscript{e} Email: rahizar@um.edu.my
\textsuperscript{c} Department of Civil and Environmental Engineering, The University of Tokushima, Tokushima, 770-8506 Japan
\textsuperscript{c} Email: yamanaka@ce.tokushima-u.ac.jp

Abstract: Safety of traffic operations on roads is of utmost importance especially in developing countries like Malaysia where the rate of motorization is still increasing. Apart from the common approach of conducting safety analysis based on historical data, simulation-based traffic safety analysis is becoming more common. This paper aims to propose a new safety indicator called the minimum safe time gap (MSTG) which incorporates vehicle dynamics and gross vehicle weight (GVW). This simulation-based safety indicator is able to analyse the capability of a vehicle in a car-following situation to safely stop without hitting the vehicle in front when an emergency brake is applied by considering the braking time of the two consecutive vehicles and the perception-reaction time of the driver of the following vehicle. Results from this simulation study indicate that the MSTG is influenced by the vehicle type and GVW, hence providing a more comprehensive safety indicator for safety analysis.

Keywords: Road Safety, Braking Time, Safety Indicator, Close Following, Traffic Accidents, Perception-Reaction Time

1. INTRODUCTION

In a developing country like Malaysia, high traffic growth and an increasing level of motorization is something to be expected. The challenges that come with this phenomenon may take various forms including traffic congestion, road accidents and environmental degradation. Probably one of the most pertinent issues to be addressed currently is with regards to traffic accidents and fatalities. Malaysia is known to have a significantly high accident fatality rate in comparison to the developed countries. Accident fatality data has indicated that more than 25% of accident fatalities involve heavy vehicles. Although the number of registered heavy vehicles is hardly 5% of all vehicle registration, the composition of heavy vehicles in the traffic stream may reach 20% of all traffic on the road (depending on locations). Since the heavy vehicles vary in types and sizes, the gross vehicle weight (GVW)