UNIVERSITI TEKNOLOGI MARA

MODELING 85TH PERCENTILE SPEED ALONG TWO-LANE TWO-WAY RURAL HIGHWAY UNDER PHOTOPIC AND MESOPIC VISIONS

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ABSTRACT

Several aspects of requirement for the driving safety must include human visibility such as luminance that has to be pinpoint acutely. Indefinitely, the study outcomes are to predict model of drivers' speed behaviour using Automobile Driving Simulator (ADS) with regard to human visibility aspects and to evaluate differences in intensity of lighting for photopic and mesopic visions. The objectives of the study are to assess and to compare the mean speed of the drivers (age group and gender) with photopic and mesopic visions at two lanes rural road curvatures, to investigate the significant relationship between the drivers' mean speed based on their age group and gender under photopic and mesopic visions at two lanes rural road curvatures, to develop several models of operating speed at the rural road curvatures with regard to the geometrical elements, age group, gender, photopic and mesopic visions. This study also aims to validate the proposed developed operating speed model of ADS to check the effectiveness and the reliability of the models. A total of 80 subjects with a valid driving license were recruited and divided into two groups: (1) young drivers (40 subjects, aged between 17 and 25 years old, with less than 10 years of driving experience) and (2) mature drivers (40 subjects, aged from 30 to 45 years old, with 10 years of driving experience or above). Each subject was required to drive in the driving simulator under photopic (260 cd/m2) and mesopic (0.25 cd/m2) visions where the level of both visions were yielded from average intensity of lighting which was measured by Luminance Meter at the actual site location. The mean speed of the drivers was compared to find the significant relationship. Multiple linear regression analysis was used to develop a statistical relationship between the related parameters. In the validation stage, the empirical data was compared with the predicted data using the paired T-test statistic and discrepancy measure such as Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), and Mean Absolute Percentage Error (MAPE). From the results, the mean speed of young drivers (male and female) recorded is higher than the mean speed of mature drivers (male and female) for all curvatures under both photopic and mesopic visions. However, at certain point in the curvatures (point V_1), young female drivers were reported to drive faster than mature male drivers under mesopic vision. As can be confirmed, the young drivers (male and female) were more aggressive compared to the mature drivers (male and female) when driving in both photopic and mesopic visions. Moreover, the study successfully produced three models of the 85th percentile speed. The models predicted the 85th percentile speed at the middle of the horizontal curve (V_{85HMC}), at the middle of crest vertical curve (V_{85CMC}), and at the start of the sag vertical curve V_{85SSC}) with regard to several related parameters. Those models have been successfully validated and sensivity analysis was also well executed according to the established statistical procedures in the study. Therefore, this study is an endeavour towards the development of national standard for the operating speed model with regard to age group, gender, photopic and mesopic visions at the horizontal and vertical alignments of two lanes rural roads in Malaysia.

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