UNIVERSITI TEKNOLOGI MARA

DEVELOPMENT OF OPERATING SPEED PREDICTION MODELS FOR HORIZONTAL CURVE BASED ON URBAN ARTERIAL ROADWAY

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of the requirements for the degree of
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Geometric road design consistency modelling is used to detect any inconsistencies in road alignment, particularly horizontal and vertical alignment. Unusual features of road geometries or inconsistencies can produce unsafe driving experience due to carelessness in the handling of vehicles. To help minimize the risk of accidents at the curve, the 85th percentile speed prediction model is needed for the Malaysia scenario to ensure the road consistency. The current technique of identifying speed design based on REAM (2002) guidelines is prone to produce inconsistencies in road design. This is because the geometric elements determined from the identified speed design are based on minimum values and it is recommended to adopt higher values for the purpose of road construction (REAM, 2002). However, no maximum value has been set up thus leads towards under-design or over-design of road geometry specifications. With this in mind, this research aims to develop models for the purpose of predicting consistencies of urban road specifically for horizontal alignment curves with novel methodology adopted in this study. Several techniques were adopted such as spot speed study, VBOX-GPS and Automatic traffic counter detector and had been successfully performed. Parameters collected are the curve length, radius of curve, width of lane, vehicle speed at the beginning of the curve, at the middle of the curve and at the end of the curve, superelevation and road gradient. By adopting multiple regression analysis, one model for the beginning of the curve, $V85_{CS}$, one model for the middle of the curve,$V85_{CM}$ and one model for the end of the curve, $V85_{CE}$ with R-Sq value of more than 50% were successfully developed. These regression models generally estimates 85th percentile operating speed at specified points along the curve. $V85_{CS}$, $V85_{CM}$ and $V85_{CE}$ were further validated to confirm of its usefulness in predicting the value of operating speed for horizontal alignment. Validation of models were performed by comparing the mean difference of the develop regression models with the empirical data which is isolated from being used in the model development process. Comparisons of $V85_{CM}$ and three models from other researchers were also conducted and it revealed that $V85_{CM}$ is more superior compared to the other models developed from other researchers and established guidelines from overseas. It was also discovered that radius of curve, CR is highly sensitive in predicting the 85th percentile operating speed at the middle of curve compared to superelevation and V85(CS). To conclude, fundamental differences in driving behaviour, traffic composition and road design standard guideline used may contribute to high difference of R-Sq values between the established models and $V85_{CM}$. Furthermore, other models are not reflective of Malaysian road conditions and this was discovered in the comparisons conducted in this study. All these factors might contribute to the overestimation or underestimation of the models. Therefore, the developed models in this study are proposed to be a starting basis of the prediction of the 85th percentile operating speed model to be included in the Malaysian urban geometric road design guidelines.

TABLE OF CONTENTS