

## An Approach to Evaluate Horizontal Alignment of Highways Using Curvature Index and Operating Vehicle Speed

R.P.G.K.S Rajapaksha<sup>1</sup> and J.M.S.J Bandara<sup>2</sup>

In recent years, Sri Lanka has experienced an urban traffic congestion that caused a waste of time and energy. It is known that road geometries partly contribute towards decrease in operating vehicle speed. According to conventional Highway Geometric design procedure there is no accurate method to predict operating vehicle speed with different combinations of horizontal alignment (variation of bends with respect to different curvatures). This study explores a methodology to evaluate the actual horizontal alignment of roads to increase the efficiency of highway management with respect to reducing travel time.

In this paper after classification of all the design elements, the new concept of “curvature Index” (the degree of angle variation per unit length) is introduced to represent actual horizontal alignment of a road segment including number of bends and nature of bends. The curvature index measures analyzed were : bend density (number of bends per km); cumulative angle (degrees per km); mean angle (degrees); and standard deviation of angles. The research confirmed that driver's speed choices are more strongly related to curvature Index than curve design speed, and to the approach speed environment.

The curvature index and operating vehicle speed is estimated using the database of GPS (Global Positioning System) receivers. GPS data is collected at selected road segments in Sri Lanka closely representing free flow condition. A methodology is developed to increase the reliability of GPS data obtained in order to investigate the relationship between curvature indexes and operating vehicle speed. Simple linear regression analysis is used to develop operating vehicle speed models, which related driver speed to the curvature Index of the highway. ArcGIS (Geographical Information System) provides a good platform to model relationship between curvature index and operating vehicle speed because the analysis tools in GIS can be directly used to analyze the GPS data.

**Key words:** *Horizontal Alignment, Curvature index, Global Positioning System (GPS), Geographical Information System (GIS), Highway Geometry*

Authors Details;

1. Research Student, Department of Civil Engineering, University of Moratuwa, Katubedda, Sri Lanka. gksrajapaksha@gmail.com, 071-9834406
2. Professor, Department of Civil Engineering, University of Moratuwa, Katubedda, Sri Lanka. bandara@civil.mrt.ac.lk, 0112 650 567 (ext. 2129)