Muhammad Imran

Thesis

Development of GPS-Based Procedure for Tracking Vehicle Path

Abstract

The thesis presents a GPS-GIS-based procedure to obtain the horizontal and vertical alignments of a road based on a path of a control vehicle. Using differential GPS surveying, field data were collected at a 0.1-second observation interval, under different speed conditions on two different sections of two-lane rural highways in eastern Ontario. The raw GPS data were post-processed to filter out possible errors and then imported into a GIS environment for analysis and interpretation. An extension for ArcView was written to determine the geometric features of the highway horizontal alignment, including the tangents, spirals, and circular curves. Values were obtained for the radius and length of seventeen circular curves, length of spirals, and the lateral position of vehicle path along the straight and curved segment. These were compared with the same features of the actual highway alignment. Results based on 0.1-second observation interval were better than those corresponding to higher observation intervals of 0.5-second and 1-second. The observed elevation data were converted to highway profiles using available software. During comparison with actual profiles, considerable difference was observed in absolute position of the fitted profiles whereas their relative position was very close to the actual ones. Highway segments with open surroundings gave better results than hilly or congested sections.

The results show that the developed procedure can produce both the horizontal and vertical alignment of a road quickly, accurately, and at a relatively low cost. In addition to the extraction of the alignment of a road, the procedure can be used to track the actual vehicle path under normal driving conditions and compare it with the horizontal alignment of a road in an investigation concerning driver behaviour.

Degree

M.A.Sc.

Completion

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Supervisors

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