

AN INTEGRATED GPS/GIS MAPPING SOLUTION FOR VEHICLE
TRACKING IN JAMAICA

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Abstract

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In the last few years GPS technology has been getting increasingly popular in industries, in-vehicle tracking and navigation and in military operations. There is however an intrinsic problem attached to the technology and this has posed a question in the minds of everyone that comes in contact with it. What can be done about the accuracy of the system? One method that proposes to answer this question is a technique known as Map Matching. In this technique a digital map database is used to correct the inaccuracies of the GPS.

This research project develops a general map matching algorithm, based on Quddus, Ochieng, et al 2003, to overcome the inaccuracies of both the positioning system and the road network system to provide accurate determination of the vehicle's location. This is done by evaluating a list of candidate road segments on a set of criteria and assigning them a weighting score. The criteria are examined and the best relation between them is found, to optimize the performance of the algorithm. This project also explores the effects of using a map database that is represented in a local coordinate system, JAD69. The project concludes with the development of mapping software complete with a graphic user and route advisory functionality.

In order to carry out this study the accuracy of the digital map had to be determined using an international standard of accuracy analyzing. Also vital to the success of the project was the development of a few system interface modules.

It was found that with the use of the local coordinate system the initial inaccuracy was increased however the algorithm was still able to resolve vehicle positions. By employing Map Matching with a stand-alone low cost receiver it is possible to achieve accurate position determination. It was however found that the most reliable criterion to based road comparison on is the calculated path of travel of the vehicle. These results and others presented in this report are obtained from the evaluation of data gathered from a field test carried out in the major metropolitan area of Kingston, Jamaica.

Keywords: Global Positioning System, Geographic Information System, Coordinate System, Spatial Data Accuracy, Spatial Data Model, Map Matching, ArcView, Dynamic Data Exchange, Vehicle Tracking and Navigation.