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Implementation and Applications of Pavement Network Rehabilitation Management System and Geographic Information System

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Abstract

This study is a continuous research effort to integrate a prototype database structure and network rehabilitation optimization algorithms into a commercial geographic information system (GIS) for "network level" pavement management in Taiwan. The concepts of "sampling" and "uniform section" have been proposed for domestic pavement network data collection procedures and database structure. The relational database structure of Microsoft Access software program and the "dynamic segmentation" procedure provided by ArcGIS 9.0 software program have been adopted to automatically generate summarized uniform section databases. Nevertheless, it was still a very challenging task in resolving several system integration problems of the existing TKUNET 2.0 program.

The idea of automatically collecting location data using Global Positioning System (GPS) sensors was first reviewed. According to the literature, however, so far there is no evidence to support the argument that it is a wiser investment. Thus, traditional method using linear location referencing system was still adopted. The ArcGIS geocoordinate data was exported using the most popular geospatial vector data format (or "shapefile"), which has been implemented in a stand alone GIS presentation module accordingly. Many user-friendly interfaces for graphical representation of the network pavement databases were also developed.

In addition, the existing problems of integrating various optimization algorithms of alternative strategies in pavement network rehabilitation management into the GIS presentation module have now been resolved. As such, the newly revised program is renamed as TAINET 1.0, in which many user-friendly interfaces could be used to assist high-level pavement management officials in answering various "what … if …" questions such as the determination of future rehabilitation needs, cost-effectiveness studies, tabular and graphical query, network summary and graphical presentations of optimized budget allocation problems. It is suggested that practical trial applications should be conducted using this prototype system so as to assure the best use of our limited resources for network pavement rehabilitation through minimum time, effort and cost.

Keywords：Pavement Management System, Network Level, Uniform Section, Global Positioning System (GPS), Geographic Information System (GIS), Optimization, TAINET.