IMPROVEMENT OF PAVEMENT MAINTENANCE MANAGEMENT ACTIVITIES USING GEOGRAPHIC INFORMATION SYSTEMS TECHNIQUES

Thesis summary

This thesis consists of six chapters. The following is a brief description of the thesis components:

Chapter 1: Introduction. This chapter describes the basic components of the research. It includes research motivations, objectives, and methodology.

The Thesis explores improving the efficiency of pavement maintenance decision-making process using GIS/GPS integration. A comprehensive study has been conducted on selected roads (total length 51.3 km) in the roads network of Fayoum Governorate, Egypt. Distress data collection (i.e. defected areas) has been carried out using media that facilitates real-time data transfer and/or downloading. In this study, handheld computer and global positioning system (GPS) technology have been used to capture pavement condition and to accurately mark specific distress spots on the roads. The Pavement Condition Index (PCI) values for the study roads were calculated and a database was then created. These data can then be Geo-referenced in a database with appropriate attributes and displayed on maps through the GIS system that has been also developed throughout this research. Using the developed GIS-based Pavement Maintenance Management Systems (PMMS), road network maps showing location of different distresses facilitates distress analysis and pavement condition evaluation. Furthermore, complete details of maintenance program, which is based on a developed simplified decision tree system, have been shown on the GIS-based PMMS maps that need maintenance to come up with the most cost-effective maintenance decision. In addition, maintenance scenarios under different budget levels have been also performed and shown in the GIS-based PMMS maps. As a result, pavement maintenance and rehabilitation activities can be improved using technological concepts of GIS, which is considered a powerful tool in assisting decision makers for effectively identifying, planning and scheduling maintenance works.

Chapter 2: Literature Review. All previous studies that have been done related to the research subject have been presented in this chapter such as:

- Pavement Management System
- Pavement Maintenance Management Systems
• General Components of the PMMS Program
• Principals of Network Identification
• Data Collection Procedures
• Bituminous Pavement Maintenance
• Pavement Maintenance Strategies
• Maintenance Decisions
• Maintenance Decision Trees
• GIS/GPS

Chapter 3: Research Methodology. It includes the steps that have been followed to achieve the objectives of this thesis.

Chapter 4: Data Collection and Compilation. This chapter describes the data collection and preparation. It is considered the first important step to come up with the data that were used in development of the required GIS-Based PMMS.

Chapter 5: Development of GIS-Based PMMS. In this chapter, a GIS-based PMMS has been developed to visualize management all activities of PMMS.

Chapter 6: Conclusion and Recommendations. The recommendations and conclusion of this research have been presented in this chapter.