CENTER FOR TRANSPORTATION RESEARCH
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Project Summary Report 0-4381-S
Project 0-4381: Develop an Automated System for Updating Pavement Layer Data
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PROJECT SUMMARY REPORT

Summary of the Automated System for Updating Pavement Layer Database

Up-to-date pavement layer data is one of the most critical issues in Pavement Management Systems (PMS). With the availability of accurate and up-to-date pavement layer data, more effective management and engineering of highway pavements can be achieved in Texas. Pavement performance models and pavement structural indexes require pavement layer data as input. In addition, the layer thickness and material types represent an important element of a PMS database and are needed for pavement load rating, overlay design, and maintenance and rehabilitation prioritization. Various efforts have been made at the Texas Department of Transportation (TxDOT) to develop the layer data and layer database in the past; however, none of the efforts were sustainable because of the manpower and resources required to keep the data updated.

Examination of past efforts at TxDOT to develop the pavement layer data revealed that the effectiveness of a database depends not only on the development, but also on a procedure or system that can automatically and continuously update the database. Therefore, a process that can update the database to instantly reflect any change made to a pavement structure is critical for keeping the pavement layer data valid and up-to-date.

The objective of this project was to develop a system with the appropriate mechanism and corresponding algorithms that can be used to build the automated relationships between the pavement layer database and other potential sources of pavement layer information at TxDOT. The system would automatically capture the layer information from one or more potential data sources and update the database whenever needed. With these relationships, the data in the pavement layer database is updated automatically when any change is made to a pavement structure in the network. As a result, the automated system can help ensure that the pavement layer data reflects the current structural condition of the pavements and that the resources needed to maintain the database are significantly reduced.

What We Did...

A thorough literature review was performed of the potential data sources for the automated updating system. Each data source was carefully analyzed with regard to its potential as the candidate data source for the automated system. From the literature, it was clear that high priority should be given to the input files, created in the GEOPAK processes, as the sources of layer data for the automated system.

Careful consideration has been given to what data should be included in the pavement layer database. Because each data item has a direct impact on the automation procedure,

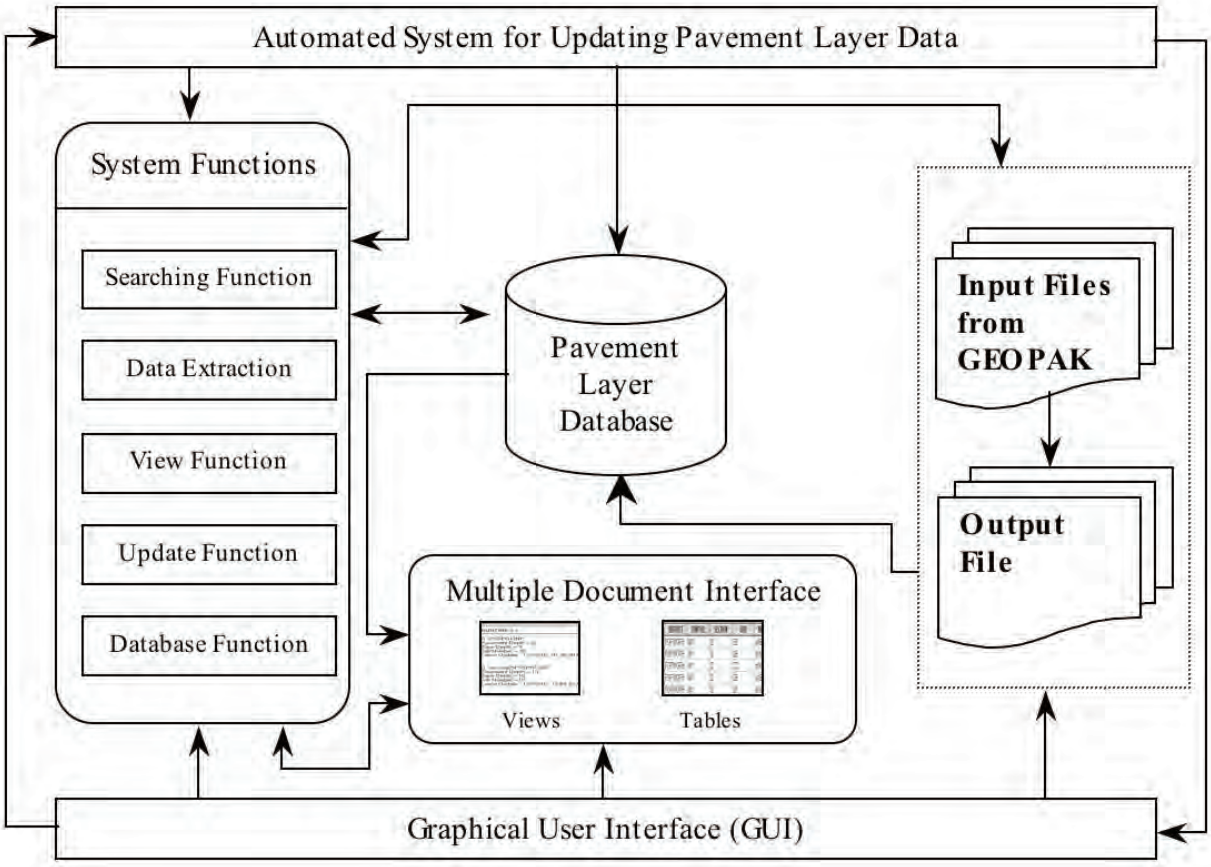

Figure 1 Framework of the Automated Updating System

it is critical that the items be kept at a minimal level while not losing the information intended for the pavement layer database.

The GEOPAK design process was carefully studied to identify the essential data items that are not currently available within the design process. The recommendations for making each of the missing data items available have been developed.

The system design of the automated updating system has been conceptualized. System design of the automated updating system concentrates on two important tasks: (1) electronically capturing the pavement layer information from the input files created by GEOPAK at the end of the Proposed Cross Sections design process and (2) automatically updating the pavement layer database with the captured information. With the automated updating system, resources required from the District and Division offices of TxDOT to maintain the layer database can be minimized.

A prototype of the Automated Updating System (AUS) software has been developed so that it can be used as a tool to achieve a live and accurate pavement layer database. In addition, recommendations for statewide implementation of the AUS have been developed to assist TxDOT in putting the developed system into practice, along with recommendations for future development of the AUS.

What We Found...

A prototype of the automated system for updating pavement layer data is developed based on the framework illustrated in Figure 1.

The AUS is the central component for updating pavement layer data. The AUS performs the data extraction functions as well as the data storage functions. The major data of the AUS is acquired from the input files produced by GEOPAK at the end of the Proposed Cross Sections design process. The output of the

automated updating system can be displayed in two formats: the ASCII text format and the tabular format.

The AUS has the capability to search through each active hard drive for the input files generated by GEOPAK, and can electronically capture all required pavement layer information from those input files in a timely manner. Such information is then used to update the pavement layer database automatically. The AUS is capable of displaying the information within the pavement layer database to the user, within the same Graphical User Interface (GUI). Because all these tasks can be done within the same user environment, the manpower required to maintain the developed pavement layer database will be minimized.

The Researchers Recommend...

Since the current practice at TxDOT does not provide full support to the automated updating procedure, some modifications to current GEOPAK design processes are needed in order to make them compatible with the developed AUS. Two of the most important modifications to be considered are: 1) standardizing the structure of the project directory where electronic GEOPAK files are stored; and 2) developing a mechanism (such as a GEOPAK dummy criteria file) to streamline the input of data related to pavement layers. Such modifications can be best accomplished through collaborated efforts of the Construction Division, the Design Division, and the Information Systems Division of TxDOT.

It is important to note that for construction plans developed with MicroStation, the required pavement layer information available in the design files (.DGN) is stored in binary format, where tracking and capturing the required pavement layer data is much more complicated. Therefore, it is recommended that a simple table for layer data input be developed and included as part of the process of developing construction plans with MicroStation; or, as an alternative approach, it is recommended that an algorithm, based on optical character recognition (OCR) technology, be developed to extract layer data from the .DGN files.

For More Details...

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The research is documented in the following reports:

0-4381-P2 Business Analysis and Solutions Report, June 2005

0-4381-1 An Automated System for Updating Pavement Layer Data, December 2005

To obtain copies of a report: CTR Library, Center for Transportation Research,
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