Project Summary

Texas Department of Transportation

0-5513: Development of a Flexible Pavements Database

Background

Flexible pavement databases have been used and served well in Texas since 1972. The first database consisted of 350 pavement sections, which were selected following a stratified random sampling approach. The original intent of developing this database was to come up with the performance equations and pavement condition prediction capabilities which were later incorporated into the Flexible Pavement System (FPS) software for flexible pavement design. With the advent of mechanistically-based pavement design approaches, popularity of the Falling Weight Deflectometer (FWD) and back calculation techniques, the existing database failed to meet the challenges in terms of handling huge data sets that these procedures needed. To address these issues, a project entitled "Preserving the Texas Pavement Database" was initiated. The motive behind this project was to preserve, improve, and update the existing database. Once this effort concluded, a period followed during which the data was not updated. In 2001, another project was initiated with an objective of populating the Flexible Pavement Database experimental cells with missing data. Unfortunately, by 2006, the data that existed was too obsolete to be used for the calibration and validation of data intensive mechanistic-empirical pavement design models. Hence, research project 0-5513 was initiated from ground zero with the goal of developing a web-based database, collecting and populating the database with the objective of validating and calibrating pavement performance models.

What the Researchers Did

The research project had two primary objectives – development of the Texas Flexible Pavement Database (TFPD) and local calibration of commonly used mechanistic-empirical pavement performance models. To this effect, the models contained in the Mechanistic Empirical Pavement Design Guide (MEPDG) developed under the sponsorship of the National Cooperative Highway Research Program (NCHRP) were used. The TFPD developed under this project can be accessed online http://pavements.ce.utexas.edu and is open to all registered users. The database currently houses nearly 160 flexible pavement sections of which only 73 sections are part of the experimental design proposed for this research project. Of these 73 pavement sections, 32 have been adopted from the Long-Term Pavement Performance (LTPP) database. The remaining 41 sections are the Texas sections that were recommended by TxDOT districts and divisions. Another 18 pavement sections from the Specific Pavement Studies (SPS) experiment of the LTPP database have also been included in the TFPD since these sections provided the dataset for the interim local calibration.

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The web interface provides the user the ability to view, as well as download, structural and traffic details, performance and deflection data, and material information for each of these pavement sections. Figure 1 displays the Texas Flexible Pavement Database home webpage, where the user can create an account and sign into the database. The philosophy behind the creation of the TFPD was to provide one-stop shopping for pavement design data. In addition, the database is open to anyone who has internet access.

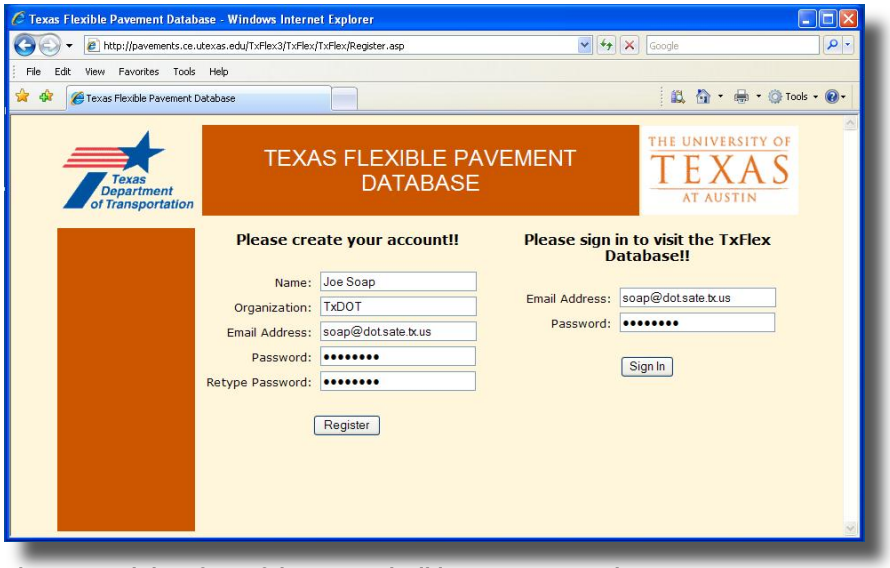

Figure 1. Web-interface of the Texas Flexible Pavement Database.

What They Found

The development of the TFPD proved to be quite challenging in several aspects. The first challenge was to decide on the platform that would be most suitable for this project. After interaction with TxDOT personnel, adequate review of TxDOT standards, and consideration of the volume of data to be handled, it was decided that Microsoft SQL Server 2000 would be the most suitable. In an effort to cater to TxDOT's Microsoft-oriented business architecture, the programming platform chosen was ASP (Active Server Pages) which can be hosted on any Windows NT 4.0 and upwards server with the IIS (Internet Information Services) up and running.

This database provides dynamic information that can be used for various prediction and interpretation exercises. For example, the research team was able to derive a number of important observations while calibrating the permanent deformation performance models in the MEPDG. One observation showed a high rate of initial rut followed by a slow rate of rut over time for every region in the LTPP dataset.

What This Means

The ability to tie together all relevant information needed for pavement design, at a project level, makes the TFPD unique and the first of its kind. In addition, because it is available online the database is totally portable for any internet user around the world. The database provides all of the key information for each pavement section, which can be downloaded or used to run a pavement design on the newly developed MEPDG. Finally, the interim calibration factors estimated as part of this study can be safely used for Texas regions and locations instead of using national coefficients, thus providing a higher level of accuracy and reliability.

For More Information:
0-5513-1 First Year Progress Report on the Development of the Texas Flexible Pavement Database

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