Web-Based Integration of Near Real-time Geophysical Data for Rapid Levee Assessment & Mapping

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Introduction

Geophysical data collected using ground-based field measurements and airborne acquisition systems are common when determining levee stability and identifying potential problem areas during flood events. This work focuses on integrating near real-time measurements from ground-based EM31, EM34, GEM-2 and HERO airborne resistivity data with an Oracle relational database for web-based data ingestion, mapping, management, and dissemination. Resistivity surveys involve not only time-consuming data acquisition methods but significant post processing to develop usable products for analysis. Using Oracle PL/SQL alongside HTML, JavaScript, and Oracle's MapBuilder, we have been able to create a web interface that allows individuals involved in field data collection to interact with their information in real-time through a secure web-based interface. Data collected can be uploaded directly to a common database where it can then be analyzed on graphs, and since the above mentioned data acquire simultaneous Global Positioning System (GPS) information, these data can then be displayed with street level mapping data via a map interface. Furthermore, users can manage their data collections efficiently through metadata and download original and modified data files for later analysis. This system is designed to be highly expandable so that with minimal effort other datasets may be easily incorporated.

Discussion

Oracle MapBuilder was used to create interactive maps to display the data in a clean, easy-to-use interface. Users can view their data alongside street level mapping data or high resolution 1m USGS Digital Orthophoto Quadrangle (DOQ) aerial photography from any part of the country.

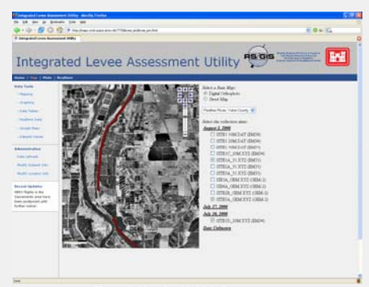

Figure 1: Mapping Multiple Datasets

JavaScript and the HTML Document Object Model were used to create dynamic, interactive forms and menus that change based on user input, disabling options as they become irrelevant, and displaying help text where necessary.

To produce clean, interactive charts, we used KavaChart, a Java-based, server-side application. This system allows the application to generate interactive Flash graphs and .png graphs that can be easily saved and edited. Graphs can show multiple datasets at once, allowing easy survey data comparison.

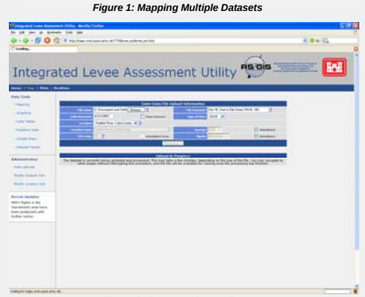

Figure 2: Dynamic Upload Form

Discussion, cont.

The Integrated Levee Assessment Utility is designed to display data in formats that are easy to use and meaningful, and to allow users to upload new data and view or change the metadata.

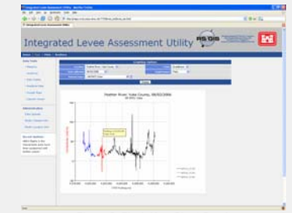

Figure 3: Flash KavaChart Graph

Data can be viewed in one of four ways. The interactive maps provide a simple interface so that users can easily see the geographic location of the data over other maps. The graphing tool gives a more detailed analysis of the data and allows the users to get a representation of non-spatial data. Users can also view the data in a sortable table, or download the original data file for use in other applications.

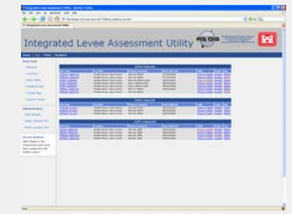

Figure 4: Options for Viewing Data

The system also keeps track of various metadata related to the collection, location, and format of the data. Users can enter this data from the upload page or allow the system to extract the metadata from the file header. The metadata can be easily viewed and modified even after it has been uploaded to the database.

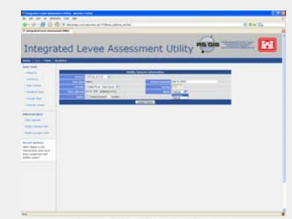

Figure 5: Modifying the Metadata

Future Work

Future work involves adding the ability to upload and view output from numerous other data sensors such as airborne resistivity data (HERO) and possibly ground-penetrating radar. Furthermore, as real-time resistivity data becomes available, we plan to integrate an automated upload and viewing procedure so that users will be able to see the status of various levees at any time.

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