Energy and Environmental Technology Applications Program: Information Systems Technology Project

A Progress Report

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Introduction

This project centers around the development of an Energy and Environmental Information Resources (EE-IR) Center. The goals of the comprehensive EE-IR Center are to create metadata to locate appropriate information sources, and to provide users with transparent searches of the relevant databases. The development of the EE-IR Center builds on the NASA/USL Regional Applications Center (RAC), a data center located at USL. A second aspect of the project is therefore to enhance the RAC's capabilities for data ingest from a wide variety of sources; for calibration, registration, and storage; for real-time fusion of data sets from multiple sources; and for efficient display and effective user interactions. In conjuction with the development work, we will conduct research work in Internet computing with the overall goal that research results can be incorporated into the EE-IR Center and/or the NASA/USL RAC.

Since the project's start date in October, we have made progress in all three directions. We have prioritized the tasks for the development of the center. The EE-IR Center will access data that are local to this region from two sources, viz. the National Wetlands Research Center (NWRC) and the RAC. We have established working relationship with the NWRC and we have begun the acquisition of facilities for the enhancement of the NASA/USL RAC. In research work, we have submitted for publication some of our initial research findings. Three doctoral students who are supported by this project have, or will have by the end of February, defended their respective dissertation proposals.

EE-IR Center Development

In our initial phase of the work, we are working closely with our colleagues from the NWRC. We worked with Gaye Farris, chief of the Technical Support Office, and with Judy Buys, reference librarian, to prioritize the information processing tasks, to identify a core set of data, and to establish an advisory board of users. We also worked with Larry Handley, from the Spatial Analysis Branch, on issues related to geographic information systems. We held regular meetings on Friday mornings to discuss our progress. On 15 December 1997, we had a retreat for all participants of this project. Dennis Traylor, our task monitor from OSTI, attended this meeting. We also invited users from the oil and gas industries, state environmental agencies, and the USL library. We discussed the development plan for the center, users' concerns, research progress, as well as more administrative matters such as equipment acquisition plans(cf. the report of the retreat in the appendix).

Based on our discussion in the retreat, we identified a body who can advise us on technical issues and from a users' perspective. We will have the first advisory board's meeting on 30 January 1998. At the meeting we expect to make some collection development and acquisition decisions based on the predicted needs of users. Specifically:

1) What data should be available at all times.
2) What data sets should be aquired/purchased.
3) What categories of data should be online.

4) What data should be accessed only by metadata.
5) What format is best for searching metadata.
6) What levels of access should be provided.

We have invited these participants to join us at the meeting:

- Bo Blackmon, from Louisiana Dept. of Natural Resources
- Helen Bosto~~k~~, from Data_Direct, ~~a private sector consultant firm~~, in Baton Rouge
- Joe Holmes, the chair of the State GIS Council
- Wendy Couvillion, who has made data available online for the Barataria Terrebonne
- Harvey Fleet, from USGS Biological Resources Division
- Dennis Traylor, our technical monitor from DOE
- Linda Wayne, from the Louisiana node of the NSDI
- Paul Zundel, from the Louisiana Department of Environmental Quality

Statistical Services Firm

Dennis Traylor will visit one day prior to the meeting, and we will exchange ideas and explore opportunities for cooperation between work at OSTI and this project.

Our collaborators at the NWRC have developed a web page on Coastal Online Assessment of Status and Trends in Louisiana (COAST_L) at http://www.nwrc.gov/coastl/coastl.html. COAST_L demonstrates the linking of many databases pertaining to energy and environmental issues that are currently made available by the government, universities, and the private sector. We expect to expand and further develop this and create other similar resources.

Internet Computing Research

The EE-IR Center is to be developed based on Internet computing technology. Research work that is in support of the EE-IR Center was conducted along three directions: multimedia information retrieval, media technology, and parallel and distributed computing. Three doctoral students were supported by this grant. Nancy Breaux worked on methods in an Internet imaging architecture. She investigated the impact of matching display and perception resolutions to the design of compression methods and the allocation of transmission rates. She defended her dissertation proposal in December 1997. Hao Duan developed perceptual organization methods based on wavelet decomposition with applications in indexing images. He defended his dissertation proposal in December 1997. Tom Johnsten is working in data mining, and is specifically addressing its security aspects. He is scheduled to defend his dissertation proposal in February 1998. Balaji Parthasarathy completed his M.S. degree in December 1997.

Publications acknowledging the support of this grant are attached to this report. They are:

S. K. Choubey and V. V. Raghavan, "Generic and Fully Automatic Content-based Image Retrieval Using Color," *Pattern Recognition Letters*. To appear in 1998; in print. Available at
`www.cacs.usl.edu/Departments/CACS/Publications/Raghavan/ChRa97c.ps.Z`.

P. Bollmann-Sdorra and V. V. Raghavan, "On the Necessity of Term Dependence in a Query Space for Weighted Retrieval," *J. Amer. Soc. for Information Sci.*, vol. 49, no. 8, August 1998. In print. Available at
`www.cacs.usl.edu/Departments/CACS/Publications/Raghavan/BoRa98.ps.Z`

S. K. Choubey and J. S. Deogun and V. V. Raghavan and H. Sever, "On Feature Selection and Effective Classifiers," *J. Amer. Soc. for Information Sci.*, vol. 49, no. 4, April 1998. In print. Available at
`www.cacs.usl.edu/Departments/CACS/Publications/Raghavan/CDRS97.ps.Z`

V. V. Raghavan and J. S. Deogun and H. Sever, "Data Mining: Trends and Issues- Guest Editors' Introduction," *J. Amer. Soc. for Information Sci.*, vol. 49, no. 4, April 1998. In print. Available at
`www.cacs.usl.edu/Departments/CACS/Publications/Raghavan/RDS97.ps.Z`

V. V. Raghavan and B. Parthasarathy and V. N. Gudivada, "Qualitative Comparison of Different Client-server Implementations of an Adaptive Image Retrieval Application in Java," *IEEE Internet Computing*. Submitted 1998.

Concluding Remarks

During the remainder of the first year, we expect: to finish most of the equipment acquisition; to complete the hiring process for the professional staff; and to make progress in the development of the EE-IR Center as well as in our research activities.