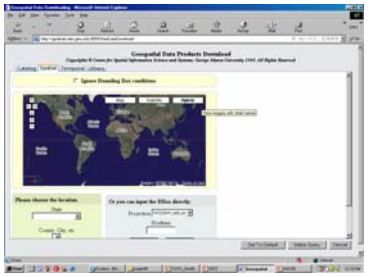
Center for Spatial Information Science and Systems

Mobilization Spatial Data and Information through Web service and Knowledge Management Technologies

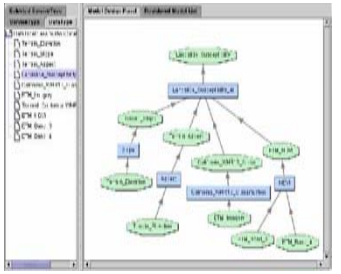
The GeoBrain ESIP at the Center for Spatial Information Science and Systems (CSISS, formerly known as the Laboratory for Advanced Information Technology and Standards), George Mason University is a Type III ESIP. It specializes in making NASA EOS data easily accessible and usable by students and faculty in higher-education institutes through the development and use of geospatial information theory and methodology; geospatial interoperability standards; Web service based spatial information systems; and geospatial knowledge management technologies. CSISS aims to develop new spatial information theory and technologies for automating the process from raw geospatial data to user-specific geospatial knowledge and decision makings. The GeoBrain ESIP started in Year 2004 when NASA REASoN program awarded an education and technology development project, called NASA EOS Higher-Education Alliance (NEHEA/GeoBrain), to CSISS. The project collaborates with more than ten universities to develop an online learning and research environment, to bring innovative ways to classroom teaching, and to improve long distance education. The GeoBrain ESIP intends to provide higher education institutes all over the world the technology solutions for teaching and research using large amounts of NASA EOS data.

CENTER FOR SPATIAL INFORMATION SCIENCE AND SYSTEMS

The MPGC client of GeoBrain for an interoperable way of accessing, integrating, and analyzing distributed, heterogeneous Earth Science Data



The easy-to-use Web interface of GeoBrain for on-demand, personalized data product download



The Abstract Model Designer and Service Chaining Engine of GeoBrain for geoprocessing modeling and knowledge representation and sharing

ESIP Project(s) Description

NEHEA/GeoBrain

The goal of NEHEA/GeoBrain project is to build a data and information system that facilitates the use of EOS data and derived products in higher education and research. The technologies, based on the geo-object and geo-tree concepts, are being implemented in a standards-compliant, open, distributed, Web-service based information system called ***GeoBrain***. The system makes petabytes of NASA EOS data and information, especially those in the ECS data pools as easily accessible as users' local resources. The system allows users to dynamically and collaboratively develop interoperable, Web executable geospatial service modules and geoprocessing models. Users can run those modules or models on-line against any part of the petabytes of archived data and get back customized information products rather than raw data. This project provides a data-enhanced geospatial learning and research environment to students and professors that they have never previously experienced.

Technology

GeoBrain Technology

GeoBrain provides innovative technologies for publishing, accessing, visualizing, analyzing geospatial data, and building/sharing geoscience knowledge online, including:

- OGC WCS, WMS, WFS, CSW servers and clients.
- OGC Geoprocessing services- e.g., WCTS, WICS, Feature cutting service, Reformatting service, etc.
- SOAP-based Geospatial Web services- GRASS GIS Web services.
- BPEL Workflow Engine-BPELPOWER
- Web service chaining and modeling tools

Data Sources

Unlimited Data access

GeoBrain provides users with unlimited and customized access to NASA EOSDIS data holdings through its online data accessing mechanisms and OGC-based machine-to-machine data discovery and retrieval interfaces. For fast and easy use, it also puts about 20 TB NASA EOS data (Landsat global coverage, MODIS, ASTER, etc.) in its repository. It supports multiple data formats and projections, path and row query, subsetting, and resampling, etc. All GeoBrain services can be applied to those data.

Partners

Major Education Partners

Dr. **Mark Abolins,** mabolins@mtsu.edu
Department of Geosciences, Middle Tennessee State University, Murfreesboro, TN 37132

Dr.**Robert E. Ford**, rford@univ.llu.edu
Dept. Earth & Biological Sciences, School of Science and Technology, Loma Linda University (LLU-SST), Loma Linda, CA 92350

Dr. **Guoqing Zhou,** gzhou@odu.edu
Department of Civil Engineering and Technology,
Old Dominion University, Norfolk, VA

Dr. **Hongmian Gong**, gong@hunter.cuny.edu

Department of Geography, Hunter College of
City University New York

Drs. **George S. Young** and **Eugene E. Clothiaux,** cloth@meteo.psu.edu
Department of Meteorology, The Pennsylvania State University.

Three more funded education partners will be added in January 2007.

Key Staff

Dr. **Liping Di, NEHEA/GeoBrain PI.** He is the director of CSISS and a professor at the Department of Earth System and Geoinformation Science (ESGS), George Mason University (GMU). He received his Ph.D. degree in Geography from the University of Nebraska-Lincoln in 1991. His research interests include geospatial theory, standards, and systems; semantic web and knowledge representation; remote sensing; and global climate changes.

Dr. **Wenli Yang, NEHEA/GeoBrain Co-I.** He is the associate director of and a principal research scientist at the CSISS, GMU. He also holds a faculty appointment at ESGS. He received his Ph.D. degree from the University of Nebraska-Lincoln in 1997. His research interests include remote sensing, geospatial information systems, and image processing.

Ms. **Meixia Deng, NEHEA/GeoBrain Project Manager.** She is the assistant director of CSISS, GMU. She has been trained in numerous disciplines, including engineering mechanics, economics, computer science, computational science and informatics. She received her M.Sc. degree in computer science from the University of Missouri-Columbia in 2000.

Dr. **Peisheng Zhao, NEHEA/GeoBrain Technical Lead.** He is a research assistant professor at CSISS, GMU. His research has been focusing on intelligent geospatial Web services for integration and the interoperation of distributed geospatial data.

Dr. **Wei Luo, NEHEA/GeoBrain Co-I**. He obtained his Ph.D. degree in Earth and Planetary Science from Washington University, St. Louis, MO. He is currently Associate Professor of Geography, Northern Illinois University. His current research focuses on interactions between geomorphic and hydrologic processes and GIS applications.

Dr. **Fang Qiu, NEHEA/GeoBrain Co-I**. He is currently Associate Professor of GIS and Remote Sensing at the University of Texas at Dallas. He received his Ph.D. degree from the University of South Carolina in 2000. His research and instructional areas are remote sensing digital image processing, spatial analysis and modeling, GIS application software development, and web-based mapping and information processing.

Dr. **Zong-Guo Xia, NEHEA/GeoBrain Co-I.** He is currently the Acting Vice President for Information Technology/Chief Information Officer of Lehman College of the City University of New York. Prior to his current position, he was Professor and Chair of Lehman's Department of Environmental, Geographic, and Geological Sciences.

CSISS ESIP:
CSISS/GMU
6301 Ivy Lane, Suite 610, Greenbelt, MD 20770
http://csiss.gmu.edu
http://geobrain.laits.gmu.edu