

An Open Geospatial Knowledge Environment--The GeoBrain Portals

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GeoBrain is a geospatial service, modeling, and knowledge building system based on Service Oriented Architecture (SOA). It has adopted open standards from the Open Geospatial Consortium (OGC), the World Wide Web Consortium (W3C), the Organization for the Advancement of Structured Information Standards (OASIS), and the International Organization for Standardization (ISO). GeoBrain allows world-wide users to discover, access, and analyze peta-bytes of Earth observation data in the distributed repositories. It also provides an open geospatial knowledge environment through its portal system for capturing, discovering, preserving, sharing, and disseminating geospatial knowledge. GeoBrain has been operational since 2005 although the development has been continued.

The GeoBrain portal system is composed of the following individual portals: 1) GeoDataDownload (<http://geobrain.laits.gmu.edu/GeoDataDownload/>), allowing users to search the required Earth observation data and retrieve it in a user-requested form; 2) DEM Explorer (<http://ws.csiss.gmu.edu/DEMExplorer/>), providing data access and processing services to obtain DEM and its derived products for any area of interest around the world; 3) WindSat (<http://geobrain.laits.gmu.edu/windsat/index.jsp>), offering specialized access and services to Navy WindSat data; 4) GeoBrain Online Analysis System (<http://geobrain.laits.gmu.edu/OnAS/>), providing users not only dynamic and on-demand data access and downloading services but also advanced geospatial processing; 5) Abstract Model Designer (<http://laits.gmu.edu/vdp/>), helping users design, register, execute, and share geospatial processing models; and 6) BPELPower (<http://geobrain.laits.gmu.edu:8099/bpelasync/>), supporting the execution of service chains to fulfill complex geospatial computing tasks.

GeoBrain provides two major types of geospatial knowledge: 1) domain knowledge, which can directly support the application decision makings; and 2) geospatial processing modules and models, which represent the knowledge of geospatial experts on how to derive application-specific domain knowledge from a set of raw Earth observation data. Users can access and obtain the first type of geospatial knowledge, which was pre-derived from Earth observation data, through the GeoBrain portals. The second type of geospatial knowledge can also be created, managed, and shared through the GeoBrain portals. The geospatial processing modules are individual processing steps that advance the raw data towards the domain knowledge. GeoBrain provides toolkit to allow users to create interoperable service modules that can work with Earth observation data in GeoBrain as services. A user can upload a processing module into GeoBrain through the GeoBrain portal system. After proper review and evaluation, the module becomes an operational GeoBrain service

offering that every GeoBrain user can use. The processing models tell how a specific type of geospatial domain knowledge is derived through execution of a set of processes in a certain sequence. The GeoBrain portal system allows geospatial experts to create a processing model with the help of both data and service ontologies. The constructed processing models, after peer review and validation, are kept in the GeoBrain knowledge base, and categorized as the virtual products offered by GeoBrain that every user can request. Once a user requests such a product, GeoBrain will instantiate the corresponding model to become a concrete workflow and execute the workflow to generate the product for the user. Therefore, through this knowledge building mechanism, not only geospatial knowledge is shared among world-wide users but also the GeoBrain capability is increased with more user contributions. This mechanism also realizes the GeoBrain vision to be an open community-driven knowledge building system built “by a community for the community.”

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