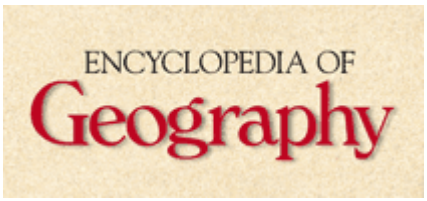

Open Source Gisopen source gis

Open Source GIS (OSGIS) is a family of GIS software packages that are published along with their respective source code, in contrast to the closed-source model of proprietary GIS packages. Usually, open-source software is understood to be also free software, that is, the source code is published under a free software license with the rights to run the program for any purpose, to study how the program works, to adapt it, and to redistribute copies, including modifications. These software licenses, including the license-free public domain, are evaluated and promoted by the Free Software Foundation (FSF, www.fsf.org) and the Open Source Initiative (OSI, www.opensource.org). OSGIS is the general concept of Open Source/Free Software applied to GIS software.

History

Software Projects

GRASS (Geographical Resources Analysis Support System) is the earliest OSGIS, which reached production status and supported both raster and vector data. It was originally developed from 1982 to 1995 by the U.S. Army Corps of Engineers and since then by the international GRASS Development Team. Initially published as public domain software, its license was changed to GNU GPL (General Public License; see www.gnu.org) in 1999, one of the commonly used Free Software licenses. The GPL ensures that modified or new source code must be published again under the GPL. In the 1990s, further desktop and server OSGIS software projects were established in various GIS sectors, including libraries (PROJ4, GDAL/OGR, GEOS, Geotools, Geoserver), Desktop GIS (Quantum GIS, SAGA GIS, uDIG, gvSIG, ILWIS), Web mapping/WebGIS (Mapserver, MapGuide Open Source, degree), spatial SQL (Structured Query Language) databases (PostGIS), geostatistics (gstat, R Project for Statistical Computing), and metadata catalogs (Geonetwork opensource).

Organizations

In 1992, several organizations were merged into the Open GRASS Foundation (OGF) with the scope to expand private sector developments for GRASS, to manage memberships, and to recruit sponsors from government, the private sector, and academia. The spread of GIS raised the need for data sharing and interoperability. With more industrial companies joining, OGF was restructured as the Open Geospatial Consortium (OGC) in 1994 with a focus on interoperability and geospatial standards.

The increasing number of OSGIS projects led in 2006 to the creation of the Open Source Geo-spatial Foundation (www.osgeo.org), whose mission is to support and promote the collaborative development of open geospatial technologies, data, and educational material.

Philosophy, Development Methods, and community

Open Source in general refers to a software development method where the source code is maintained in a public repository with a group of developers, often volunteers, working on it. After peer review of code style, functionality, and quality, software packages are regularly released under a commonly accepted software license that regulates the distribution terms ensuring free redistribution, permission of modifications and derived works, and more (see "The Open Source Definition," www.opensource.org/docs/osd; "What Is Free Software and Why Is It So Important for Society?" www.fsf.org/about/what-is-free-software). For the end user, the promise of Open Source is to receive quality software at lower cost, which is flexible, interoperable, and free of any vendor lock-in. OSGIS software packages are developed following this philosophy. Open source software can be considered commercial like proprietary software as it is also used in commercial projects by for-profit companies offering a variety of related services.

The important OSGIS software packages are interoperable and follow industrial standards for data exchange. The geospatial industry has started to integrate OSGIS libraries into their proprietary products to improve their interoperability capabilities. Additionally, and in contrast to dominant proprietary GIS software packages, OSGIS are portable, that is, they can be operated on various computer operating systems.

OSGIS is strongly linked to the opening of the Internet to the civil society and the subsequent availability of collaborative development tools and means of electronic communication. Through this, virtual developer and user communities were formed, which strongly support the evolution of software and its documentation. In some cases, companies are also involved, even pursuing the development as the main actor.

Functionality

The relevant OSGIS software packages offer functionality comparable with proprietary GIS. As in the traditional industrial market, general-purpose tools and specialized applications are available.

Available OSGIS libraries include reprojection support, optimized spatial data storage (nonto-pological/topological, with integration in spatial SQL databases), and data exchange in all common and also special spatial formats. Open Source Desktop GIS offer a graphical and sometimes also command line access to spatial algorithms, including import/export of common GIS data, from GIS Web services and from global positioning systems with scopes for risk analysis and assessment, map projections, raster and vector network analysis, spatialization, and geovisualization. Processing of digital terrain model data, creation of flow maps, geocoding of raw data, map generalization, terrain analysis, viewshed analysis, as well as map algebra are supported. Vector data can be generated through digitizing from scanned paper maps or through vectorization of raster data; some OSGIS also support the analysis of topological relationships. Geostatistics are either found in dedicated software packages or through dedicated GIS interfaces to spatial classes of statistical software, which directly read from the GIS database. Further functionality includes image processing with data extraction from LiDAR (light detection and ranging) and airborne laser scanning, analysis of microwave/RADAR (radio detection and ranging) data, multispectral imagery, multitemporal imaging, stereoscopy and orthoimagery, and supervised classification of aerial and satellite data. Reduced and optimized software packages are available for mobile GIS.

Open Source Internet GIS is provided as passive Web-mapping applications or as interactive WebGIS with the capabilities of a Web processing service.

For OSGIS metadata management, dedicated catalog systems are available, which operate as online metadata harvester and retrieval systems. They access and list spatial data hosted in-house or in remote but Internet-accessible databases through specialized protocols for metadata exchange.

Markus Neteler

Further Readings

Mitchell, T. (2005). *Web mapping illustrated: Using open source GIS toolkits.* Sebastopol, CA: O'Reilly.

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