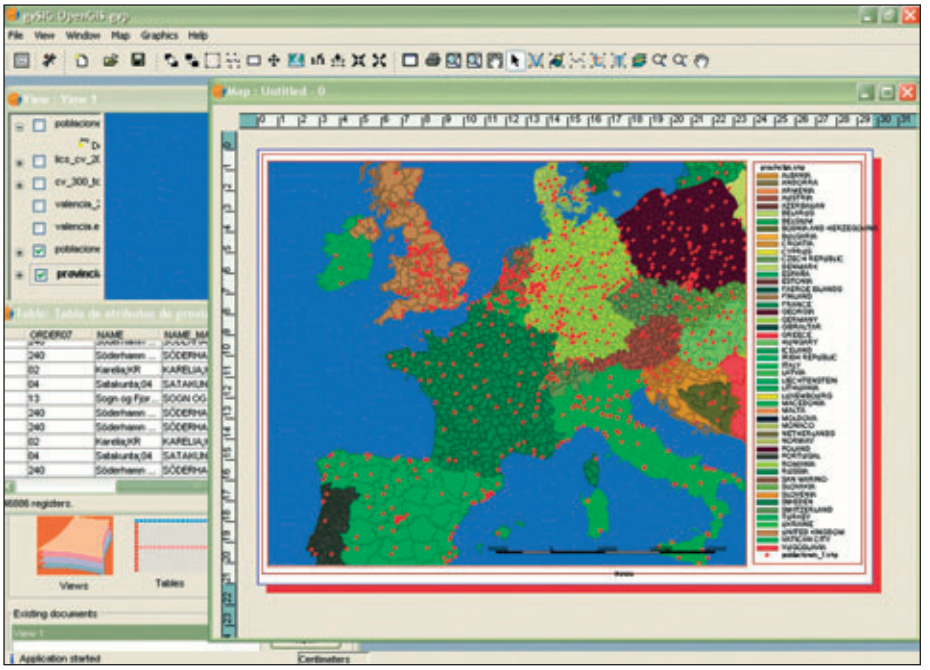
Open Source Software Enters

UMN MapServer and gvSIG Most Potential Ones

Geographic Information Systems (GIS) are getting more and more important in the business world. Besides the proprietary products, now also several Open Source projects are getting a competitive alternative for the versatile use of GIS. gvSIG is an excellent example of a future GIS alternative and will include precise CAD tools. The Java based software is subject to the most important international standards (OGC) and the new paradigms of the Spatial Data Infrastructure (SDI).

By Alvaro Anguix Alfaro and Andreas Wehrle



Map of Europe, created with gvSIG.

Introduction

Today, GIS software can be used for various tasks of spatial data and is essential in many branches. The scope of this software has changed from cartography to many other areas: not only administration and engineer offices but also wholesalers or hospitals can benefit from the combination of analysing tools and geographic information. About 90% of the available geographic data are estimated to be georeferenceable. This means that every selectable point on a map is provided with coordinates. To control this bulk of raw data, potent tools are necessary. These tools have to make data, that are usually stored in spatial databases, available.

Depending on the needs of the user, currently two kinds of GIS software fulfil the main requirements: the light web client or the heavy client, also called Desktop GIS. While the first one only offers basic tools, the heavy client offers many other possibilities and can also be adapted to the various user profiles like urbanism, environmental science, and marketing.

In the last years, Open Source Software has been getting very popular. Numerous software areas already offer an equivalent option to proprietary products. But until now, the market segment of GIS and CAD software didn't provide serious alternatives to the expensive and sometimes oversized market-leading software packages. Due to this lack of selection, the main part of the fast growing community of GIS users has been bound to use certain software. So, the selection of a GIS normally was neither a well-considered decision nor the result of an analysis of the existing possibilities. This unsatisfactory situation is now changing because of the rising of several very promising Open Source projects, such as MapServer or gvSIG.

Actual Situation

Until now, the market of software that is dedicated to modify and treat spatial information and cartography has been monopolized by a few proprietary products. This phenomenon was noticeable in different forms, in desktop GIS as well as in web clients or also map servers.

As a reason of the missing competition, several competitive alternatives have come into being all over the world in the last few years. Some of these alternatives are now developing into serious projects, supported by universities, public administrations and private enterprises. The best examples are the project MapServer of the University of Minnesota and gvSIG, a Desktop GIS, developed by the Valencian Government and the private company IVER.

As aforementioned, the situation in many GIS evaluation processes is that not the most suitable product is selected but the most habitual one. The product is chosen without evaluating the alternatives. Normally, the software user isn't aware of his requirements and functions he needs. Although users often only need certain basic functions, they are constrained to buy expensive software with many complex, but unnecessary tools.

The logical decision shouldn't be buying the most common software, but buying the software that fulfils the user's requirements best.

GIS Market

One can think of language, comfort, price, comprehensibility, and compatibility, to mention a few.

Open Source GIS Projects

Before, Open Source software often was disliked. The preconceived opinion was that a product free of charge can't be worth as much as one with charge. In certain cases, this opinion was correct, since many Open Source projects weren't developed well enough. But with the success of several Open Source projects, public interest is awakened.

The benefits from Open Source software are:

- Independence and control over the final product;
- Investment in variety: all investment can be spent in development instead of royalties;
- Maximizing the client's rights.

In the area of GIS, various projects are worth paying attention to because of their maturity and several fulfilled conditions. The following tools are able to substitute the well-known proprietary software. The conditions are:

- Potency and functionality the software offers;
- Projects with a constant development and support by an administration or company that is able to guarantee the future of the project;
- Multiple platform tools that work under Windows as well as under Linux;
- Tools that incorporate the latest trends in relation to geographic information, Spatial Data Infrastructure (SDI) or INfrastructure for SPatial InfoRmation in Europe (INSPIRE);
- Software that observes standards, like the Open Geospatial Consortium (OGC).

Desktop GIS: gvSIG

Desktop GIS are the most potent tools for the treatment of geographic information. They include numerous functions that allow analysing spatial data, cartographic edition and map design. Actually, there are several products (GRASS, JUMP, QGIS, SAGA GIS) on the market that are to be taken seriously, of which gvSIG is the most progressive one.

Logo gvSIG.

gvSIG counts on the participation of the Valencian Government, the company IVER and the university Jaume I of Castellón. It is a Java development and operates under the GPL licence. Thanks to its Java-platform characteristics, it doesn't depend on the operating system. It works under Windows as well as Linux, the last one spreading rapidly. The multi-language gvSIG is conceived as a heavy GIS client that permits the analysis and consultation of spatial information, cartographic edition and generating maps.

The frequent spatial data standard formats that are used on other GIS systems are supported by gvSIG. Example of formats are shapefile, DXF, DGN, ecw, and MrSID. gvSIG follows the standards of the Open Geospatial Consortium. This means it is able to read local data as well as remote data (as WMS, WFS and WCS).

At the moment, a catalogue is being developed that permits the search and discovery of spatial data, as well as an automatic metadata generator. Metadata is information about data; in the case of cartography, it could be the scale, the year of publication or the source of the map. gvSIG is quite a young project, at the moment of this publication, it is in the version 0.5. It isn't just an alternative to the actual solution, it is also an innovative product that fixes new limits as it is the first desktop GIS that implements the possibility to utilise WMS, WFS and WCS.

Parallel to the GIS development, gvSIG is entering into a second area: the implementation of advanced CAD tools. In this case, CAD tools are needed for the cartographic edition of a map. The use of precise CAD tools is inevitable for the cartographic edition, but their precision must be higher than the one of the habitual integrated tools we know from other GIS software. With the foreseen developments of gvSIG, the use of additional CAD software won't be necessary any longer.

Another advantage of the Open Source characteristic of gvSIG is the huge community in the world of Internet. Thanks to their activity, it is possible to get support and additional features, in English as well as in other languages.

Important Abbreviations

GPL: GNU General Public License. This license grants the recipients several rights for Open Source software, such as the free use, improvement or redistribution of the program.

BSD: Berkeley Software Distribution. It is a similar license like GPL.

RDBMS: Relational Database Management System. Particular kind to store the data, strongly related with SQL.

SQL: Structured Query Language. Computer language that is used to get data from a data base and to modify the data in the data base.

OGC: Open Geospatial Consortium. International Organisation in which participate private companies as well as public organisations, with the aim to create standards in the world of geospatial content.

WMS: Web Map Service. Is able to visualise maps dynamically from geographic data.

WFS: Web Feature Service. Interface that enables the request and online modification of geospatial vector data.

WCS: Web Coverage Service. Interface that enables the request and online modification of geospatial raster data.

Map Server: UMN MapServer

The map server software is the base tool that permits the distribution and diffusion of geographic information via the Internet. At the moment, the leader in the Open Source segment is UMN MapServer. Other leading products that are quite interesting are GeoServer or Degree.

UMN MapServer is commonly accepted by the market. Originally, it was created by the University of Minnesota in cooperation with NASA and the university's department of Natural Resources. The aim was to make maps available on the Internet. It is created with several Open Source and Freeware libraries, such as Shapelib, FreeType, Proj.4, libTIFF, and Perl, and may be installed like a Common Gateway Interface (CGI) or a module on a web server (in the case of Apache).

For the control of map services several visual tools exist, from which MapLab is the most distinguished one. It is also available as Open Source and functions with PHP. It is integrated into the following products:

Map server of the tourist agency of the Valencian Community, developed with UMN MapServer.

- MapEdit: permits the creation and edition of map services, defining layers, symbo logy, and so on;
- MapBrowser: helps to select several GIS data sources from various locations;
- GMFactory: this tool helps to create clients to access map services. It allows selecting the type of client (Java, HTML), available functions and design aspects.

Spatial Database: PostGIS

PostgreSQL is a free database, created under the licence BSD. In the area of database systems, there are many other successful Open Source projects, like MySQL, Firebird, and MaxDB.

PostGIS is an extension to the object-oriented database system PostgreSQL and works under the licence GPL. It allows the use of GIS objects and other objects that appear in the OGC specifications. One can think of things like points, lines, polygons, multilines, multipoints and geometric collections. It works with Geometry Engine Open Source (GEOS) as drive for the topologic control.

PostGIS, and generally any spatial extension to a RDBMS, allows a high flexibility, as it is possible to realize spatial operations at the source of the data. PostGIS is an extension for PostgreSQL and defines new types of data, creates two tables with relevant information to the system (data projection and a column that contains the geographic information). Furthermore, it possesses interfaces for the data exchange with MapServer.

SDI and INSPIRE

The world of geographic information has changed quickly, partly because of the introduction of certain concepts and methodologies about Spatial Data Infrastructures (SDIs). This movement is gaining more and more influence and is adopted by various public administrations. An SDI is a mechanism that unites and standardises spatial information in and between organisations. It is like a distributed GIS which shares information within a working group.

The history of the Spatial Data Infrastructure started in the year 1994, when the then North American president, William J. Clinton, published a presidential order to develop the National Infrastructure of Spatial Data for the U.S.A (NSDI). The main idea behind this: 'sharing knowledge is a source of economical growing'.

In the year 2004, the European Commission also decided to create a Spatial Data Infrastructure inside the European Community, called INSPIRE. The European SDI was composed like a puzzle, created by several parts of national and local SDIs. For already two years now, the influence of INSPIRE and the necessity to fulfil the Commissions' decision have brought to light several SDIs at various levels. The aim is to maximize access to spatial data and minimize the redundancy of investments.

To construct an SDI, some duties must be carried out. It is inevitable to possess the metadata of geographic information. As software elements, the following parts are necessary:

- Web Map Server: distributes geographic information. As an Open Source solution, UMN MapServer could be used;
- Catalogue: helps to search and localize the geographic data;
- SDI client: desktop GIS client. The only one that is capable is gvSIG, in Open Source as well as in proprietary software.

gvSIG: www.gvsig.gva.es
UMN MapServer:
http://mapserver.gis.umn.edu
PostGIS: http://postgis.refractions.net
INSPIRE: www.ec-gis.org/inspire
Open Geospatial Consortium:
www.opengeospatial.org

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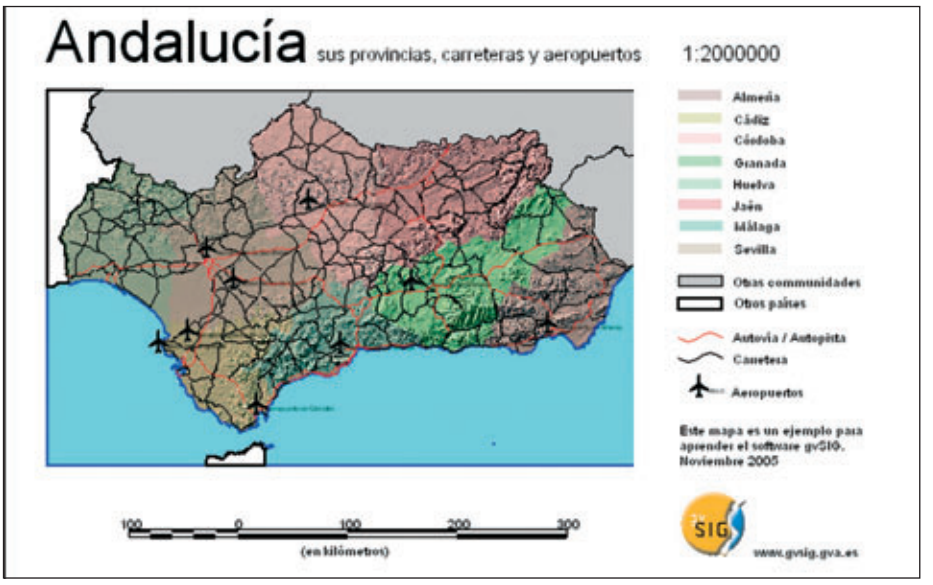

Map of Andalusia, Spain, created with gvSIG.