Open source GIS and remote sensing software

These are exciting times in the open source GIS and remote sensing software arena. There are a handful of software projects geared toward the desktop market and use of these products is increasing. Until recently, most of the open source GIS development projects focused on building software libraries with powerful functionality. Unfortunately these packages were, for the most part, inaccessible to the typical user who wanted an application that was easy to install and use.

An excellent survey of the current state of open source GIS and remote sensing software is presented in "The State of Open Source GIS" by Paul Ramsey (Refractions Research Inc.). This document provides a nice overview of some of the more promising projects including comments that put each project into perspective.

What is open source software?

Open source software is defined as software that has the source code freely available and is licensed so that it can be freely distributed and modified as long as appropriate credit is provided to the developers. There are several licensing options for open source software but all of them follow these basic rules. More information about open source software is available at the Open Source Initiative web page (http://www.opensource.org/).

The software products addressed in this document are classified into libraries and applications. The libraries are shared among different projects, thereby significantly reducing the amount of time when a new application is developed. For example, the GDAL library is designed to read and write dozens of different common image and vector formats. Integrating this library in an application quickly provides advanced data reading capabilities.

The applications are designed for an end-user. These include GIS, remote sensing and products that combine this functionality. Most of the open source applications have a graphical user interface so working with the software is similar to common commercial software.

Where does open source software fit in?

Open source software can be a replacement for or a compliment to commercial software. A lot depends on your current situation. If you work for an organization with commercial software you might consider open source software to “fill in the functionality holes” of the commercial software or you may just find that the open source version does some tasks better than what you have already. If you are new to the world of remote sensing or GIS, open source software is a great place to start since it is free. If it meets your needs than you are all set and if you need functionality not available from open source packages you can consider the alternative of purchasing commercial software.

So, how can you help?

If you are a computer programmer your contribution is fairly straightforward but what if you
are an end user who would like to contribute. Simply using the software and providing input to the development team about the interface, additional functionality, and bug reports is appreciated. Writing or commenting on existing documentation is another area where users can help. Most of these software projects have discussion lists and some of these are focused specifically on users. The best advice is to download the software, play around with it and share your thoughts. If you like it, pass on the good news to your friends and colleagues.

What’s out there and where can I get it?

Here are links to many of the open source GIS and remote sensing projects. The list is grouped by the computer languages used to develop the software. The two most common languages are Java and “C”. From the user’s standpoint the language used to develop the software is not very important but developers often have a preference based on their previous experience.

Some applications that the AMNH Center for Biodiversity and Conservation are working with are OpenEV, OSSIM (using the ImageLinker graphical user interface), and JUMP. We are anxiously waiting for the first release of uDig that is expected out in early 2005.

C shared libraries

- GDAL/ORG (http://remotesensing.org/gdal)
  These libraries provide capabilities for reading and writing dozens of raster (GDAL) and vector (OGR) file formats. GDAL and OGR are used in most GIS and remote sensing packages and are also used by some commercial software.

- Proj4 (http://proj.maptools.org/)
  This is a library providing support for over 100 map projections.

- GEOS (http://geos.refractions.net)
  This is a topology library for dealing with vector files. It is the C++ implementation of the JTS topology library listed below.

C applications

- OpenEV (http://openev.sourceforge.net)
  OpenEV is an image and vector viewer with some analysis and editing capabilities. This runs on Linux and Windows platforms.

- UMN Mapserver (http://mapserver.gis.umn.edu)
  This is a very popular web-based map server. It is rapidly gaining in popularity and competes well with commercial offerings.

- GRASS (http://grass.itc.it/index.php)
  GRASS is credited at being the oldest open source GIS product. It was developed as a raster GIS and is now also used for remote sensing applications and vector visualization and analysis. It is quite popular as a modeling tool but has a fairly steep learning curve. It runs on all major operating systems.

- OSSIM (http://www.ossim.org/)
  OSSIM is a remote sensing image processing package implementing some state of the functionality. The OSSIM team recently developed a graphical user interface called ImageLinker that runs on all major operating systems. ImageLinker makes the OSSIM libraries accessible to the average user. Documentation is being developed along with tutorials so this
is expected to be a powerful image processing package.

- **QGIS** ([http://qgis.org](http://qgis.org))
  QGIS is a desktop GIS package built for Mac OSX, Windows, and Linux/Unix operating systems. It supports vector, raster, and database formats. There is also an interface with GRASS being developed.

- **Thuban** ([http://thuban.intevation.org](http://thuban.intevation.org))
  Thuban is a desktop GIS package that runs on Windows and Linux. It supports image and vector data.

- **GMT** ([http://gmt.soest.hawaii.edu](http://gmt.soest.hawaii.edu))
  GMT is an open source collection of tools for working with geographic data. It works primarily with image data. It is set up to run on Unix/Linux operating systems but instructions are available to run the tools in Windows and Macintosh operating systems.

- **PostGIS** ([http://postgis.refractions.net](http://postgis.refractions.net))
  This provides spatial capabilities to the PostgreSQL object-relational database.

- **Java shared libraries**
  - **GML4J** ([http://gml4j.sourceforge.net](http://gml4j.sourceforge.net))
    This is a Java API for facilitation work with the Geography Markup Language (GML).
    WKB4J is a Java library designed to read the Well-Known Binary (WKB) format from a data source and transform this data into corresponding Java objects.
  - **JTS** ([http://www.jump-project.org](http://www.jump-project.org))
    JTS is the primary geometry library for Java GIS development. It provides a standard set of geometries and many complex spatial methods.
  - **GeoTools** ([http://www.geotools.org](http://www.geotools.org))
    This is a Java GIS toolkit for developing OpenGIS compliant solutions.
    GeoServer is a Web Map Service built on top of the GeoTools library. It is a Java implementation of the OpenGIS Consortium’s Web Feature Server specification.
  - **DeeGree** ([http://deegree.sourceforge.net/](http://deegree.sourceforge.net/))
    DeeGree was formally known as JaGo and it offers a broad range of GIS functionality but it is geared for the developer community and has a steep learning curve.
  - **JUMP/JCS** ([http://www.jump-project.org](http://www.jump-project.org))
    This is a simple to use desktop GIS program for viewing and manipulating spatial data sets. This is quite possibly the best user-oriented desktop open source GIS package available at present.
  - **OpenMap** ([http://openmap.bbn.com](http://openmap.bbn.com))
    OpenMap is a library of components for building GIS applications in Java.
• uDig/JUMP2 ([http://udig.refractions.net/](http://udig.refractions.net/))

The uDig project is new and it shows a lot of promise. The first release is due out in the summer of 2004 and the final implementation is due in March 2005. This project will leverage several existing open source resources to create a fully functional desktop GIS package.

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