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Research Article
Open Source Softwares for Application design and Development

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Open source software, comparison and analysis, WBGIS software, Time and financial resources

Abstract

This study is significant in that it attempts to bridge the knowledge gap between the real pros and cons of proprietary and open source software through concrete comparison and analysis of certain critical factors related to overall performance. Current literature solely dedicated in this direction is difficult to find. The topic presented in this study strives to orient future research in the field towards the awareness of open source products within the overall realm of the WBGIS software market. Distinction between proprietary and open source software. Factors for judging performance of a Web-Based GIS Application the relationship between market share and overall ease of use of a WBGIS software solution.Time and financial resources in WBGIS application development. Security, stability, scalability and maintainability of a WBGIS software solution and/or configuration.

Introduction

The importance of Open Standards as they relate to system interoperability and how geographic data is exchanged. The objectives of this research were to effectively compare two WBGIS systems built with open source and proprietary tools to identify criteria that can be used to evaluate individual software components for constructing a web based GIS application. Based on the results of the analysis, open source tools have proven to be able to provide robust and quality output for mapping and GIS applications over the web. When considering software tools to use in building a WBGIS, open source should definitely be a consideration.

The open source movement is a worldwide attempt to promote an open style of software development more aligned with the accepted intellectual style of science than the proprietary modes of invention that have been characteristics of modern business. The idea – or vision-to keep the scientific advances created by software development openly available for everyone to understand and improve upon. Open source in a generic sense, encompassing free software as referred to by the free software foundation (FSF) and open source software as referred to by the Open Source Initiative (OSI) organization. Open source systems and applications often appear to offer significant benefits vis-a vis proprietary systems. Consider some of the merits they competeon. First of all, open source products are usually free of direct cost. They are often superior in terms of portality. The products may arguably be both more secure and more reliable than systems developed in a proprietary environment. It has traditionally been perceived that "open source software is often geared towared information technology specialists, to whom the availability of source code can be real asset, proprietary software is often aimed at less sophisticated users"(Hahn,2002).

There are two definitions for open source, distinguished by lower case or uppercase letters. A lowercase open source indicates that a program's source code can be viewed and modified by other users and developers, generally without restrictions. An uppercase open source defines a certification owned by the open source initiative (OSI,http://opensource.org).software is considered open source when it uses a license approved by the OSI. The OSI started as a response to concern in the nineties about ownership of intellectual property.(Tim O'Reilly)

Software Requirements

In the present study, the following software's are used. They are

- Google Earth
- Ms4w
- PostgreSQL
- PostGIS
- Shp2kml

Google Earth

Google earth is a basic tool that gives you a nice photo rendered look at anywhere in the world. Google Earth displays satellite images of varying resolution of the Earth's surface, allowing users to visually see things like cities and houses looking perpendicularly down or at an oblique angle. The degree of resolution available is based somewhat on the points of interest and popularity, but most land (except for some islands) is covered in at least 15 meters of resolution. Google Earth allows users to search for addresses for some countries, enter coordinates, or simply use the mouse to browse to a location.

For large parts of the surface of the Earth only 2D images are available, from almost vertical photography. Viewing this from an oblique angle, there is perspective in the sense that objects which are horizontally far away are seen smaller, but of course it is like viewing a large photograph, not quite like a 3D view.

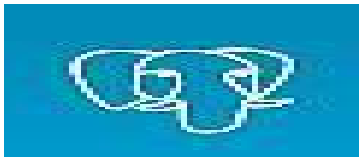
For other parts of the surface of the Earth 3D images of terrain and buildings are available. Google Earth uses digital elevation model (DEM) data collected by NASA's Shuttle Radar Topography Mission (SRTM). This means one can view the Grand Canyon or Mount Everest in three dimensions, instead of 2D like other areas. Since November 2006, the 3D views of many mountains, including Mount Everest, have been improved by the use of supplementary DEM data to fill the gaps in SRTM coverage. Google Earth is able to show all kinds of images overlaid on the surface of the earth and is also a Web Map Service client. Google Earth supports managing three-dimensional Geospatial data through Keyhole Markup Language (KML).

Ms4w version 2.2.4

MS4W v 2.2.4 is the MapServer package for Windows. A novice MapServer user with little knowledge (or time) to compile MapServer from scratch. Interested in one of the MS4W addon packages and looking to avoid configuration issues. Any MapServer user who needs a quick and dirty installation on Windows. This is not a true installer; it will not modify any file or registry setting outside of the MS4W directory. Since it is not a true installer, it will not install to any location. The MS4W addon packages must be extracted at the same root as the base installer, and files must be overwritten.

PostgreSQL Version 8.2.7-1

POSTGRESQL is the most advanced open source database server. Three basic productivity applications exist: word processors, spreadsheets, and databases. *Word processors* produce text documents critical to any business. *Spreadsheets* are used for nancial calculations and analysis. *Databases* are used primarily for data storage and retrieval. Databases allow orderly data storage, rapid data retrieval, and complex data analysis.



- PostgreSQL is an object-relational database management system (ORDBMS).
- It is released under a BSD-style license and is thus free software. As with many other open-source programs, PostgreSQL is not controlled by any single company, but relies on a global community of developers and companies to develop it.

PostGIS 1.3.5.1

- PostGIS is an open source spatial extension to the PostgreSQL open source enterprise relational database.
- Spatial databases such as PostGIS, Oracle Spatial and DB Spatial are used for high-performance multi-user access to large seamless data sets.
- If you are managing large volumes of read/write spatial data, using a spatial database can improve access speed, ease management overhead and guarantee data integrity.
- Built as an object extension to PostgreSQL, PostGIS has been certified as "Simple Features for SQL" compliant by the Open Geospatial Consortium.
- PostGIS was first released in 2001, and is now used around the world as a high-performance server for spatial objects.
- It features a spatially-enabled query planner, highly concurrent R-Tree spatial index, and hundreds of spatial analysis and processing functions that allow for GIS-style data analysis right inside the database.

Database administration front-ends

Psql

The primary front-end for PostgreSQL is the psql command-line program, which can be used to enter SQL queries directly, or execute them from a file.

PgAdmin

Pgadmin is a graphical front-end administration tool for PostgreSQL, which is supported on most popular computer platforms. The program is available in more than a dozen languages, and is free software released under the Artistic License.

PhpPgAdmin

phppgadmin is a web-based administration tool for PostgreSQL written in PHP and based on the popular phpMyAdmin interface originally written for MySQL administration.

Shp2kml

Shp2kml is a standalone tool that transforms GIS layers to Google Earth. It uses as input the most common format file for GIS (ESRI shape file) and generates a KML File. Google Earth requires coordinates to be in Lat/Lon and referenced to the WGS84 datum. Shp2kml is able to transform the coordinate system. The input file can be Lat/Lon (Geographic) or UTM (Projected) coordinate system. Also shp2kml will change datums if required.

Hardware

The following are the minimum hardware required for hosting .

Items	Specifications
Hardware CPU, RAM, Hardisk	Pentium (R) Dual CPU 1.73GHZ Recommended; 1.99GB of Ram
Operating System	Windows for XP (Provided with this document)
Web Browser	Demontration applications were tested using opera browser. We can use any other browsers.

4.1 Hardware Requirements

Installation of Ms4w for Windows

Download the MS4W package from the Map tools website at http://www.maptools.org. Once you have it downloaded you can follow the installation instructions that come with MS4W. One important thing to note is to make sure you extract the .zip file to a root directory so the path is something like C:\MS4W.

It does not have to be installed on the C drive; it can be installed at any root drive. You should not have two MS4W folders.
The MS4W download will install Apache, Map Server and PHP

Run URL in the Internet Explorer : http://localhost/
The ms4w packages running properly mean particular map server window will be display.
The apache 2.2.3 server working properly means, if click apache 2.2.3 mapserver window apache server window will be display.
The php 5.2.0 server working properly means, if click php 5.2.0 mapserver window php server window will be display.

Installation of postgresql-8.2.7-1 and postgis-pg8.2 for Windows

Download the **postgresql-8.2.7-1.zip,** postgis-pg8.2 this program doesn't need to be installed, just unzip it and run it.
After Installed postgresql-8.2 & postgis
Default Database postgresql-
8.2 =>postgres-1.3
postgis=>postgis
template_postgis
Shp2kml
Converting shape file to kml by using the shp2kml application. This program doesn't need to be installed, just unzip it and run it.

Trying the Demo part for creating the thematic mapping engine

The first step involved finding appropriate statistical and spatial data the could be combined and used for thematic mapping. The data had to be gathered from various sources and stored in a database. The engine takes statistical data (attributes), spatial features and thematic mapping parameters as input and returns a KML/KMZ file. This file can be viewed in Google Earth, or other geobrowsers supporting the KML standard.
Download the tme source code for creating the thematic mapping engine
To a root directory so the path is something like C:\ms4w\Apache\htdocs\tme

Correcting the coding on the TME _Engine, TME_Psql_Dataconnecter, TME_Example

Run the http://localhost/tme_sample/TME_Example.php in the internet Ex: kml/kmz layer for India has been created and It is displayed over the Explorer

This file can be viewed in Google Earth, or other geobrowsers supporting the KML standard.

The capabilities of many web mapping products in 1999 are different from that available just last year. A major error in selecting a web mapping solution is the implicit view that web mapping is simply an extension of existing enterprise GIS desktop mapping activities. The primary purpose of this phase of the Web GIS development process was to specify "how" the Web GIS performs the required applications. Data base design involved defining how graphics will be symbolized (i.e., colour, size symbols.etc) how graphic structured, how non graphic attribute files will be structured, what is active layer, in what scale shall the layers, how GIS products will be presented ,and what management and security restrictions will be imposed on file access.

The initial requirement analysis contained some application of a complex nature. However, the majority of initial application was straight forwared, and can be implemented using the basic functionality that is the part of the Web GIS software. The more complex applications were not supported by the basic functions of Web GIS but have been programmed. Ease of use, user-friendliness, and reducing the volume of data been were the critical issues considered in the development.

The final step in web GIS implementation was to put the system to use. With system integration and testing completed and all applications available for use, the system was released to users. User support and service, in which new applications will be determined, and system maintence, in which the Web GIS, has run smoothly.

In the present study, development of dynamic thematic for Cropping Pattern a new approach to cropping pattern application. This approach involves development of tools that will regulate the data applied to afield based on actual need. A key component to this approach is the utilization of GIS technology. GIS provides the visual integration of all the data sources tied to crops and allows users to identify the cropping pattern information. This approach uses GIS to incorporate spatial information such as Cropping Concentration and Crop Combination Regions. The addition of spatial information to process allows the user to consider within- field they navigate different layers.

There were a series of main geospatial accessing tools are included in this system. They are Choropleth map, Bar map, Prism map, Proportional symbols for Image, Regular polygon or 3-D object and Time. Some powerful functions are show as below

Creating database in postgresql

An alternative would be to use the PostgreSQLdatabase with the PostGIS spatial extension, but this would exclude many potential users since PostGIS is
seldom pre-installed by hosting providers.
For using geometry_columns and spatial _ref_system in postgresql database will not support.
PostGIS adds support for geometric objects to the postgresql object relation database.
Installing the php
Installing the pear package also
Giving the path shp2pgsql

Error in pgAdmin

When we creating a new database in postgres, its not accept to give the Template as postgis.
To rectify it, select postgis database and close it and then once again open pgAdmin III.
Now it can create new database.

Creating Database for layer details

There are four layers considered in this project. Select the layer for which you need to create thematic map.
State
District
Taluk
Block

Importing shape files

Database name is tme –inside database will be creating or adding shapefile
Select the postgresql click on the postgresql select command prompt give the pathname: shp2pgsql "
D\project\current\ka\state_project.shp" –s 4326 india> india.sql
psql –d tme –U postgres –f india.sql

Giving the password for postgres
TME Web Interface
Requirements Needed
Download the Ext js-2.1
Php and apache
Google earth
Creating the TME Web Interface
Downloading ext-2.1, giving ext path in index.php
Find out the lat long for selecting layer.
In attribute table removing the(&) symbol Ex:ANDAMAN & NICOBAR

Download the mst_layer and restore the postgresql database
Selecting the mst_layer

On the mst_layer right click select view data again select view top 100 rows it display mst_layer window.
For adding layer type in database adding shape file already name has given for table name (state-india, district-tamilnadu) that name give.

Adding the thematic field

Selecting one shapefile: Ex:India
Right click on the shapefile it will display some options, select the properties, It will display the particular shapefile table.

In that properties window select the columns it display the shapefile attribute field

Adding the Commend Field

In thematic field select one name for Ex:Area
Select area go to change option
Click change it display the column area
Give the name(area) comment field
After giving name give ok
Like that change all name then give ok
we have not give this name means web interface thematic field will not display
Mst_layer giving names for Ex:states(india),district(tamilnadu)

This is achieved through an interactive web form where the user can select between statistical indicators and various thematic mapping techniques
The form returns a KMZ file which can be visualized directly in the web browser using the new Google Earth plug-in, or downloaded to a computer.
TME Web Interface URL: http://localhost/tme/index.php

Elements of TME web interface

This guide explains how to use the web interface to create a thematic map.
Statistics
Indicator
Thematic field
Technique
Choropleth
Prism
Bar
Proportional Symbol
Image
Regular polygon
Collada(3d)
Colour
Colour scale
Single Colour
Classification
Unclassed
Equal intervals
Quantiles
Time
Single Year
Time Series
Time Slider
Display
Show Title& Source
Show Colour Legend
Show Values
Show Names

Statistics

When the web interface is loaded by the web browser, an AJAX request is automatically fired to the web browser. The browser is asking for a list of all available statistical indicators, and this list is returned by the web server. This information is added to the first drop-down box in the web form. When the user selects one of the indicators in the list, a new request is sent, asking for a list of years where data is provided. The years are added to the second drop-down box.

Technique

Select one of the thematic mapping techniques (Choropleth, Prism, Bar, Proportional symbol)

Choropleth

The thematic mapping techniques presented so far are all using the longitude/latitude position (centroid) for each feature. A choropleth map requires the geometry representing the border of the feature (e.g. country). The fill colour is specified for each feature, since the polygons are colourised according to a statistical value.

Prism

As regular polygons can be turned into 3-D bars by adding an altitude value for each Coordinate tuple , irregular polygons can be turned into prisms. When 3-D prism maps are rendered in Google Earth, holes appear in the polygons representing large countries with low values on a statistical indicator (i.e. those with a low altitude value). KML has three Parameters for controlling the behaviour of polygons; *extrude*, *tessellate* and *altitude Mode*. By setting *altitude Mode* to *clampToGround*, the country polygons follow the great circle. The problem arises when the polygons are extruded by adding an altitude representing statistical value. Only the vertices of the polygon are extruded to the given altitude, and not the

Figure 4.1: Ms4w Window

Figure 4.2 Apache server Window

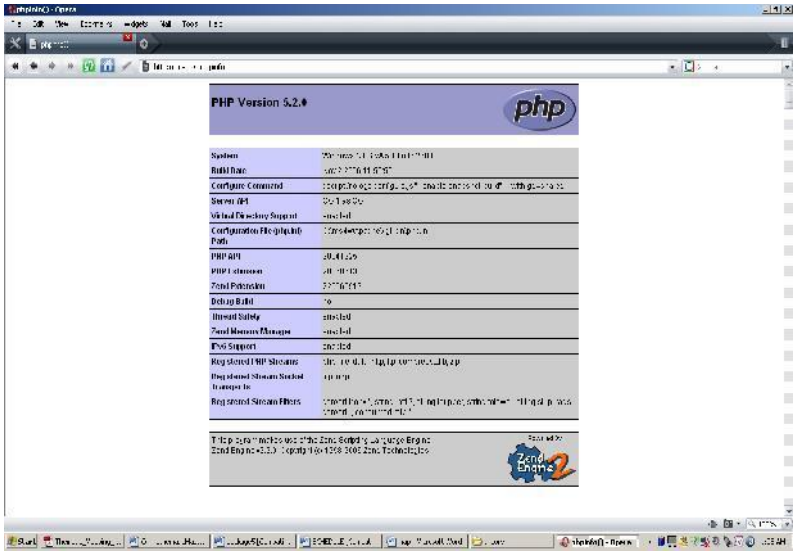


Figure 4.3 Php server Window

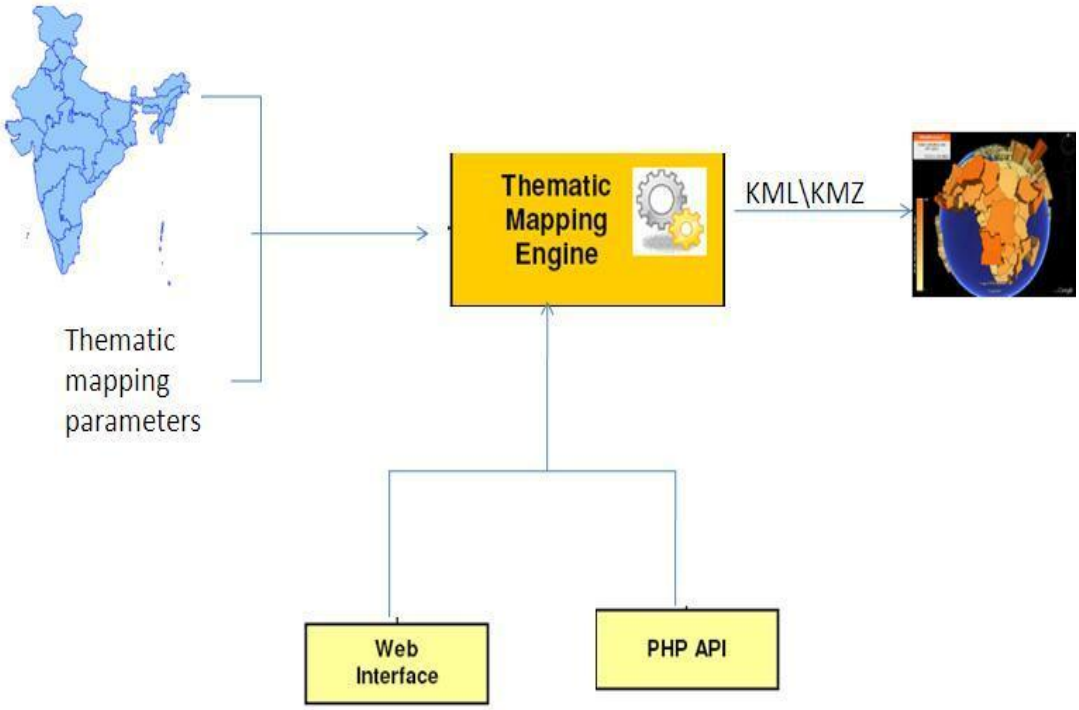


Fig 4.5 The interfaces of the Thematic Mapping Engine.

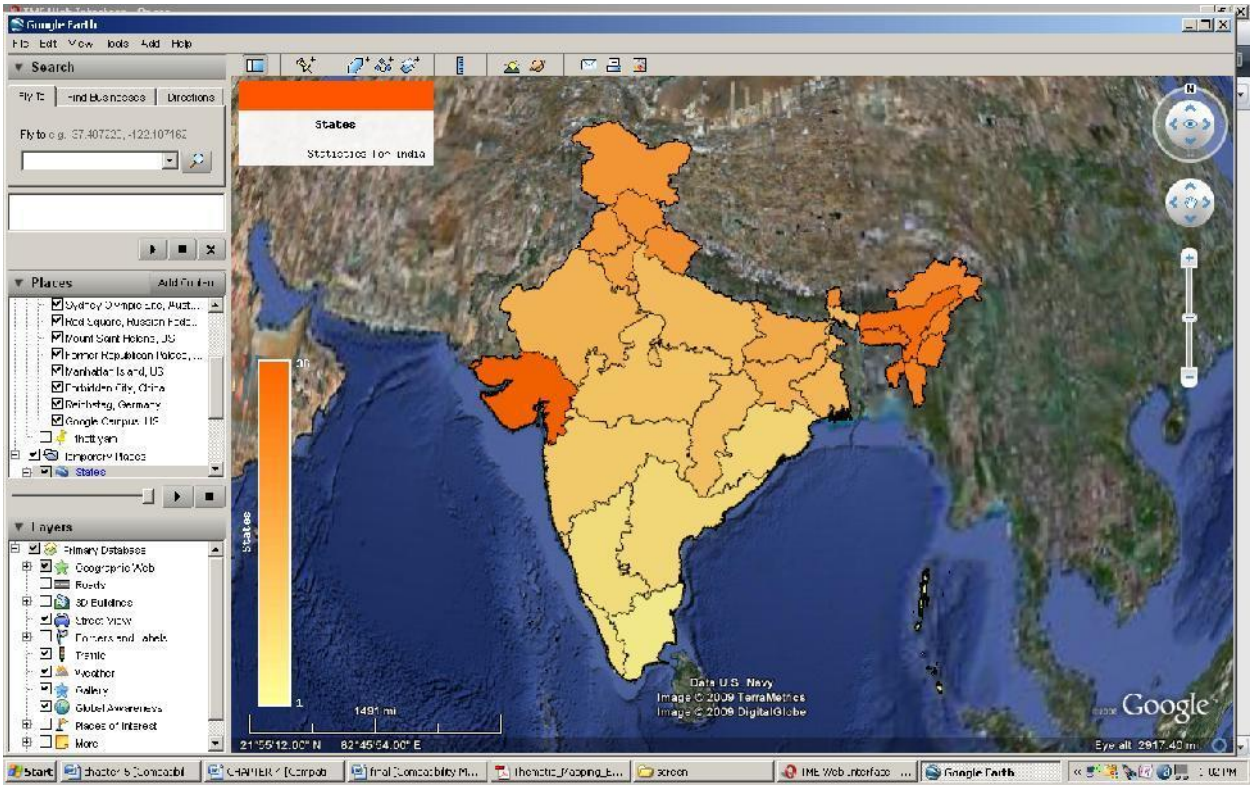


Fig: 4.4kml/kmz layer for India has been created

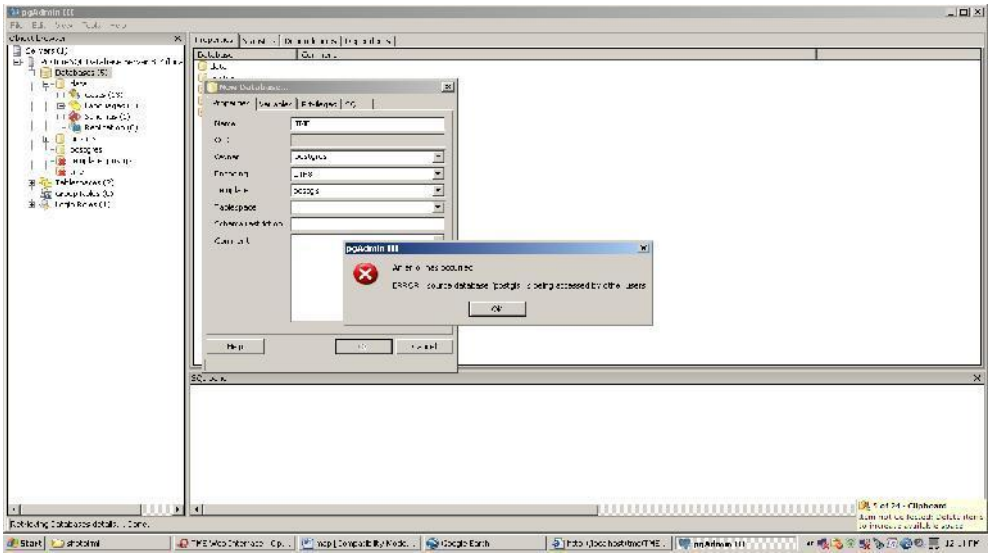


Fig: 5.1 Error in pgAdmin

Name	tme
Owner	postgres
Encoding	UTF
Template	postgis

Table: 5.1 Creating the Database Table

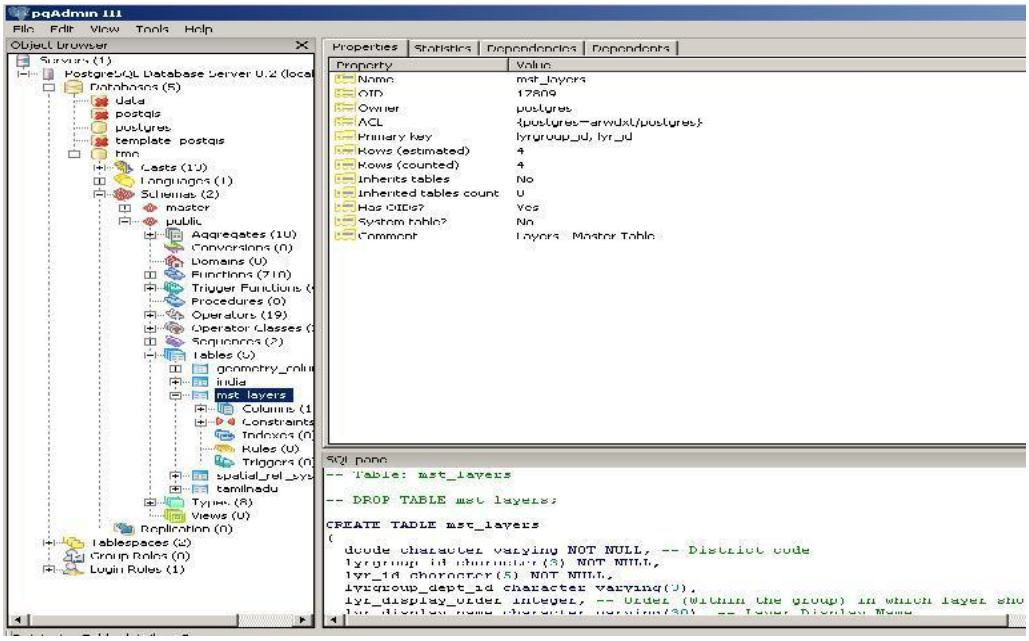


Fig: 5.2 Selecting the mst_layer

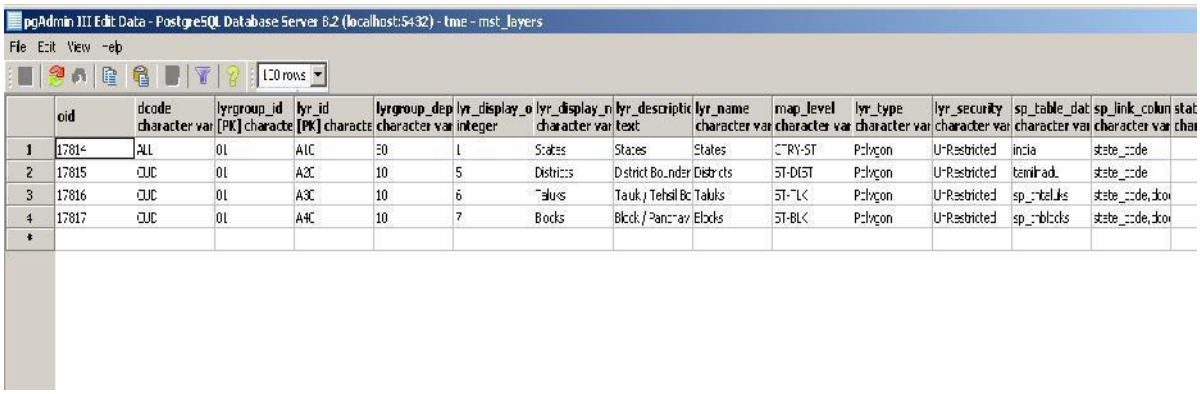


Fig:5.3 Adding layer type name

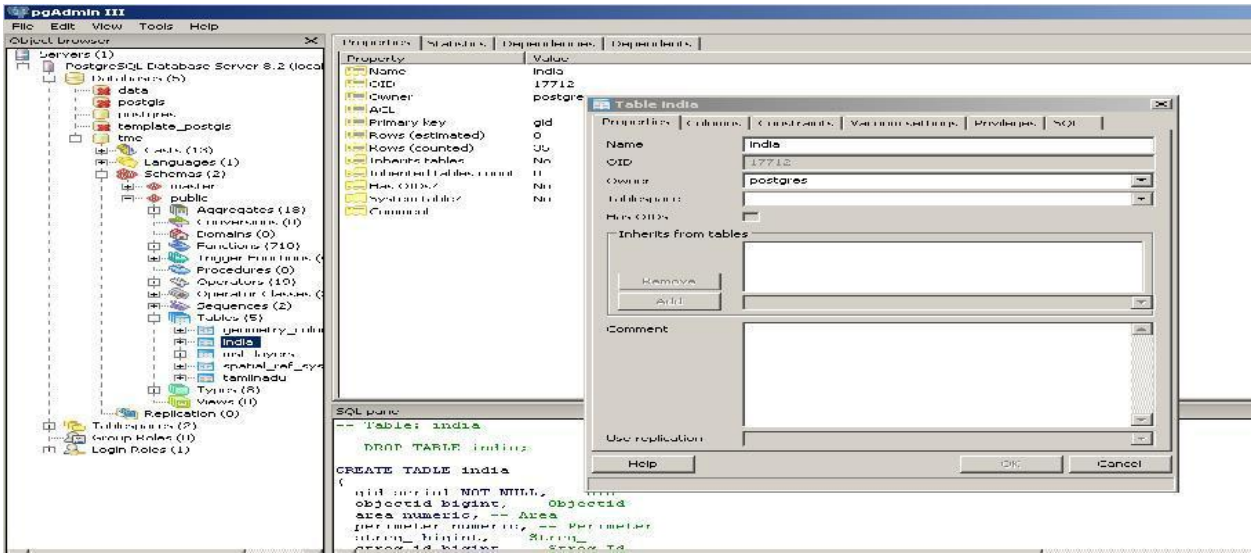


Fig: 5.4 Displaying shapefile table

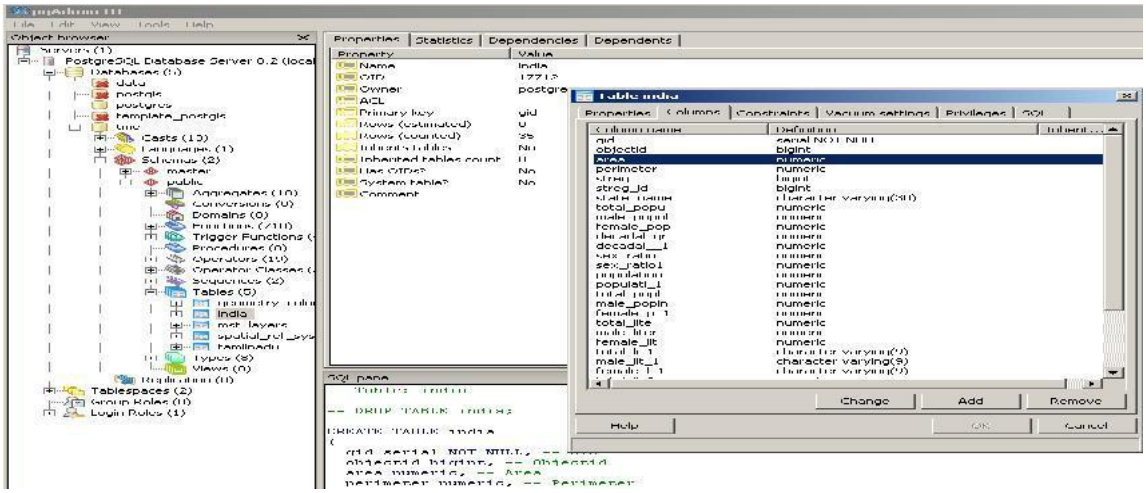


Fig: 5.5 Adding the Commend Field

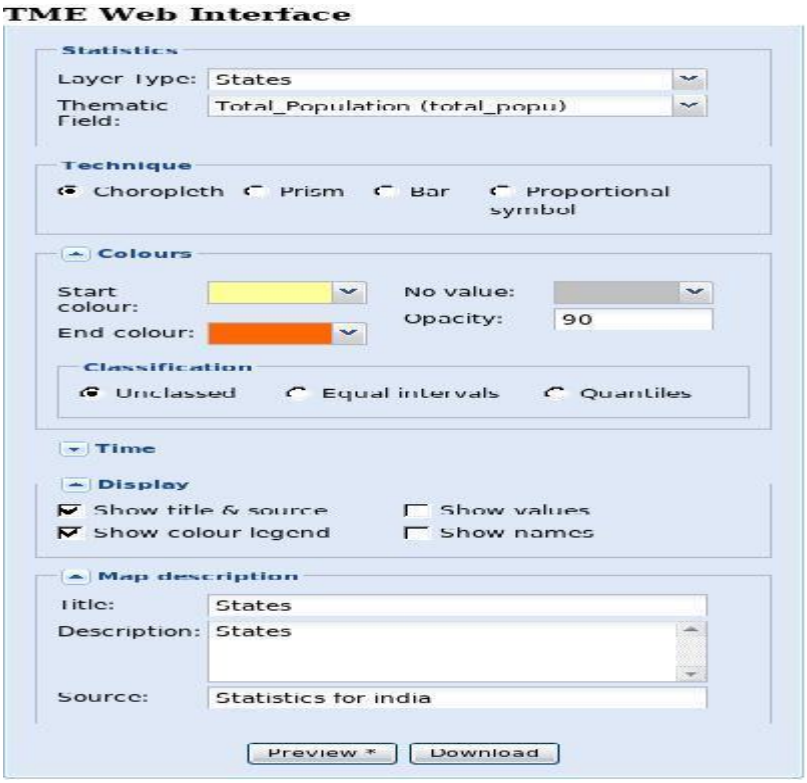


Fig:5.6 Elements of TME web interface

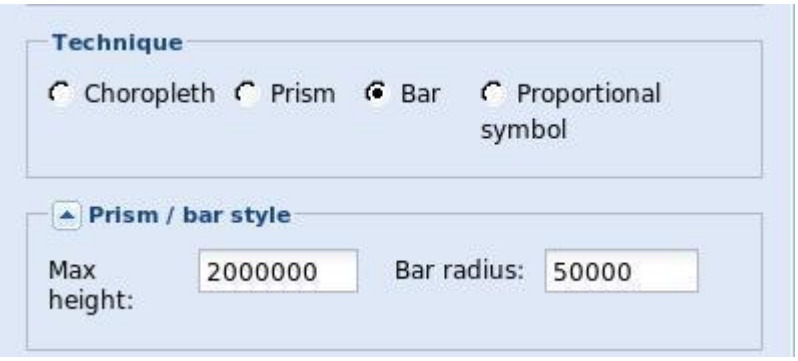


Fig:5.11 Selecting the technique for Bar

Fig:5.14 Selecting the proportional symbol

Fig: 5.13 Selecting the technique for display

centre of the geometry. A new a *clampToAltitude* option in KML could solve this problem.

Bar

The regular polygons described above can be turned into bars by adding an altitude value for each coordinate tuple (vertex). Altitude values are in metres above sea level, and should be directly proportional to the statistical value.

Proportional Symbol

KML icons are used to visualise various point data, and custom icons can be added by referencing an image stored on the local file system or a remote web server. Two symbols, a circle and a square, were created using Adobe Photoshop Elements. A shadow effect was added to give the icons a slightly 3-D appearance. The symbols are white on a transparent background, and saved as PNG files. KML icon images can be scaled and colourised by using the *IconStyle* element. Only one image is thereby needed to create symbols in different colours and sizes. This reduces the total file size and improves the performance.The *Link* element specifies the Collada object to load. The *Location* element specifies the coordinates of the object's origin in latitude, longitude and altitude. The *Scale* element scales the object along the x, y and z axes in the object's coordinate space.
As for bars, the z (height) dimension could represent a different statistical indicator than the x/y dimension. Collada objects can also be placed on top of each other by specifying an increasing altitude value (e.g. to create stacked bars).

Colour

Choose colour scale or single colour map. An alternative method is to duplicate the symbology by supporting a colour legend for all thematic mapping techniques, also for proportional symbol maps. The colour legend informs the user about the range of values (min and max), and where the different symbols are positioned in this range.

Classification

The colour scale can be unclassed or classed (*equal intervals* or *quantiles*). The number of classes can be changed (2-9 classes).

Equal Intervals

Each colour class occupies an equal interval along the value range. This scheme is easily interpreted by map readers, and is particularly useful for comparing a series of maps (Krygier and Wood 2005). The data distribution is not taken into account, and this classification may result in most data values falling into one of two classes, while other classes have no values.

Quantiles

Quantile schemes place the same number of data values in each class. A quantile classification is attractive because it always produces distinct map patterns: it will never have empty classes, or classes with only a few or too many values (Krygier and Wood 2005). The problem with this classification is that it often places similar values in different classes or very different values in the same class.

Time

Select Time series or Time slider to visualize statistics for all available years.

Display

Select information elements that should be displayed on the map.

File compression

A series of files are often needed when a thematic map is created using KML: legend image, icon image, 3-D Collada object and the KML file itself. The KML file can also be very large when it contains a lot of features and complex geometries repeated for several time steps. Fortunately, KML files, linked images and 3D objects can be compressed into a single KMZ file. This makes file transfer easier, as only one file needs to be transferred, and more efficient, due to the reduced file size.

The Thematic Mapping Engine uses PHP ZIP functions43 to create KMZ files. Basically, a KMZ file has the same properties as any other ZIP file, except for the file extension. By using the PHP ZIP functions, a new KMZ file can be created and the various files added.

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