

# SPATIAL DISASTER FACTS ON THE AUTONOMOUS MAP SERVER

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## Abstract

Random spatial data are considered and preprocessed using the weka data mining tool. The spatial data are predicted using data mining algorithms for the analysis of the disaster. Map server is an Open Source platform for representing spatial data and interactive mapping applications. Map server is not a simple map representation, but a huge database investigation. Our contribution is to design a Map Server on Linux based operating system and to have an extensive database of even a small area. Map server is a web mapping service application that powers many map based services. One such map based service is to identify the disaster that is represented on the proposed geographic map. Disaster information is provided on the designed map, based on the disaster affected in that particular area.

**Keywords:** Geographical Information Systems, Map Server, Spatial Data Mining, Spatial Maps.

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## 1. INTRODUCTION

The acronym of GIS is a Geographical Information System. GIS is modeled to seize, report site, operate and examine different types of spatial data. In brief, GIS is a merging of cartography statistical analysis and database technology [1]. A GIS combines geographic data, hardware and software. GIS represents the geographic data in the form of charts, maps and globes. GIS allows us to answer queries easily by observing the data in the form of a geographic map.

### 1.1 Spatial Analysis with GIS

Analysis of geospatial data is an actively transforming field. Geographical Information System packages which include standard built-in facilities, plug-ins is growing actively [2]. In most of the cases, these packages are accommodated by the actual software suppliers and in the remaining cases, these packages are provided by third parties [3].

### 1.2 Mining of Geographical Information System

Application of mining techniques to geographical data is called GIS Data Mining. Data mining is the extraction of hidden previously unknown patterns from a large amount of databases. GIS mining is widely used in environmental monitoring. GIS-based decision is made using GIS data mining. This type of application has the characteristic of spatial correlation of data measurements which needs the use of expertise algorithms for efficient analysis of data [17].

### 1.3 Top Five Benefits of GIS

Industries of different sizes in every field are benefitted by GIS. Vision towards economic values and strategic values of

GIS has been increasing [4]. The advantage of a GIS comes under five basic areas.

1. Money is saved and efficiency of the system is improved.
2. Enrichment in decision making.
3. Communication is improved.
4. Record management is improved.
5. Analyzing Geographically.

### 1.4 The Spatial Approach

Geographical data when paired with GIS helps us to have a clear knowledge on earth. So that we can apply geographic knowledge to the human activities [5]. The spatial procedure is an innovative way of thinking and problem solving that combines geographical data. The spatial approach helps us to create a geographical map by measuring geographical data, classifying the data, determining and forming various methods and their relationships. The spatial approach helps us to apply this information to the approach we sketch, scheme and alert the world. In the rising prototype, GIS has arisen as a potent tool which has prospective to systems complicated spatial environment [5].

## 2. MAP SERVER

A map can be viewed as an area which is a symbolic description highlighting relationships among elements of that geographical area i.e. objects, regions and themes [6]. The majority of the maps are not dynamic, accurate in geometry and 2-dimensional observations of 3-dimensional space, and few of the maps are dynamic, interactive and 3-dimensional.

## 2.1 Types of Maps

1. Climate maps
2. Economic or resource maps
3. Physical maps
4. Political maps
5. Road maps
6. Topographic maps

Map Server is an open source platform for reporting spatial data and associative mapping applications to the web [7]. Using Map server we can build geographically enabled internet applications. It can be executed as a CGI program or via Map script which supports several programming languages.

Map server is a popular project. The purpose of map server is to display dynamic spatial maps on the internet [8]. Map server has many features like capability to run in different environments (windows, Linux etc.), assistance for scripting languages and supports different development environments like PHP, Python, Java, Ruby and .NET. Map server is a Common Gateway Interface that acts inactive on the web server [9]. Map server can be extended and customized through Map script or templating. It can be built to support many different forms of vector input data and raster input data and it can produce a multitude of output formats. Most pre-compiled map server distributions contain most all of its features.

## 2.2 Anatomy of a Map Server Application

Map server has a .map file which is a configuration file and it is in the ASCII format. The .map file is formed by different objects [10]. The parameters of .map file are aligned in a map file. Comments in a map file are specified with a '#' character. Map server analyzes map files from top to bottom. So the map file layers at least will be appearing on the top of all layers. Map server includes relative paths. These paths should be quoted in single or double quotes.

## 2.3 Map Object

EXTENT is the extent of the result. Width and height of the map image are represented by SIZE. Image background color is denoted as IMAGECOLOR.

## 2.4 Layer Object

Starting with Map Server 5.0, there are no limits to the number of layers in a map file. The DATA parameter is relative to the SHAPEPATH parameter of the MAP object. If no DATA extension is provided in the filename, map server imagines it as an ESRI Shape form (.shp).

## 2.5 Vector Layers

Vector layers of TYPE point, line (or) polygon can be observed. The given instance shows how to show only lines from a TYPE polygon layer, using the OUTLINECOLOR parameter.

## 3. Spatial Maps

Position and shapes of environmental characteristics as well as events occurring in the environment are defined by spatial data. Determining this information is critical.

## Advantages of Spatial Maps

We can observe extreme benefits by using maps and Geographical Information Systems.

1. It is a way to store geographical information [11].
2. Using maps we can easily recognize and analyze patterns of spatial data.
3. They are effective in presenting information and communication findings.

The GIS offers many advantages over paper maps. Paper maps are used to manage huge amounts of data very quickly and easily. Paper maps require less number of individuals, less amount of time and more money.

## 4. DENGUE DISASTER PREDICTION

Dengue virus and dengue hemorrhagic fever are amongst the most important challenges in tropical diseases due to their expanding geographical distribution, increasing outbreak frequency, hyperendemicity and evolution of virulence[18]. Artificial Intelligence (AI), with its various subfields, has a long history of knowledge extraction, representation and inference in medicine.

The field of computer-assisted dermatology has benefited greatly from advances in knowledge representation techniques and machine learning algorithms. Clinical Dermatology is mainly a visually dominated discipline. The recognition of signs and symptoms as well as their interpretation of patterns typical for specific diseases remains the core task for diagnosis. During the last decade, computer assisted applications have proven to be of value for the diagnosis of various forms of skin cancers especially cutaneous melanoma, dengue, malaria, polio etc.

Geography is a centralizing discipline. Analysis of geographical data includes data about many disciplines. GIS information which includes health maps is necessary for health related areas. This is motivated by many factors.

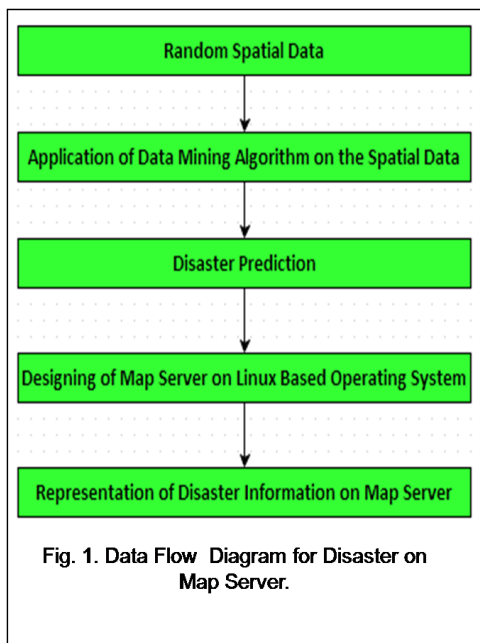
1. Every pattern includes a peculiar variable subset of the original data and the available combinations of attributes are many.

2. For a specific shape, its parameter space is still larger.
3. Patterns differ from location to location.

By applying data mining algorithm i.e. C5.0, the disaster is predicted which was discussed in the research paper i.e dengue prediction system by means of IBM SPSS data mining tool [12].

### C5.0 Algorithm

C5.0 algorithm is used to construct either a decision tree or a rule set. The mechanism of C5.0 model is to split the sample depending on the field that provides the highest information gain[13]. Every subsample described by the first split is then split for a second time and the procedure repeats until the subsamples cannot be divided further [19]. At last, the lowest-level splits are investigated and those that do not contribute significantly to the value of the model are removed or pruned.



## 5. DESIGNING OF THE MAP SERVER

Information Systems enable us to capture up to date effects due to disaster. Spatial data analysis does not reach the needs for determining the huge amounts of data [14]. Epidemic management through geographical maps is determined. This system is used to acquire, process and interpret the data (Health Companion) as a basis for action [15]. Spatial Map for disaster identification is designed.

### 5.1 Rendering OSM Data with Map Server on Ubuntu

1. Build directory: All the map files are installed in a directory called “gsm-map” in the home directory.

```
Mkdir ~/gsm-map cd ~/gsm-map/
```

2. Install Map server & GIS classes : Install new non-GIS packages that are needed later on.
3. Data for OSM is downloaded.
4. Set imposm using virtualenv. cd ~/gsm-map/

```
sudo apt-get install python-virtualenv virtualenv venv
```

5. Install imposm. pip install imposm
6. Build a database.

```
imposm-psqldb > create-sql.sh
```

7. Store data using imposm. cd ~/gsm-map/

```
Imposm --read india.osm.pbf
```

8. Make mapserver-utils map file generator.
9. Setup Map Cache.

As an example the following map server is designed to represent dengue affected areas. Some of the geospatial data characteristics build challenges and some of the characteristics that make geospatial data as a problem has been reported in many other articles.

### 5.2 Advantages of Autonomous Map Server

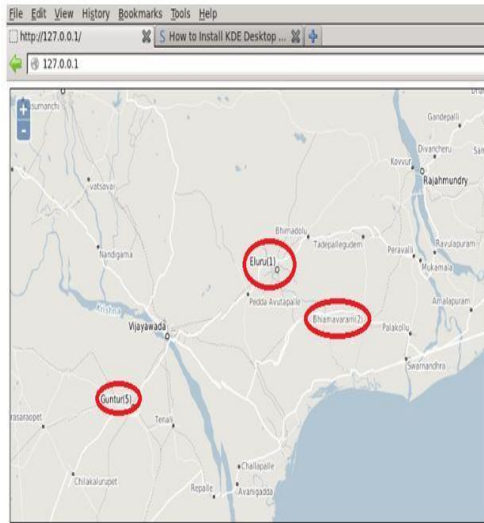
1. Using map server we can dynamically include the areas with disaster on the geographic map distinguishing from other maps like google maps, bing maps and yahoo maps.
2. On this map server, we have our own server which is contrary to google maps, open street maps, bing maps and yahoo maps.
3. Map server is the analogous implementation of Google maps and open street maps. But in the case of map server, we have access to modify the Geographic Information System (GIS) information on the map server.

## 6. DISASTER REPRESENTATION IN THE MAP SERVER

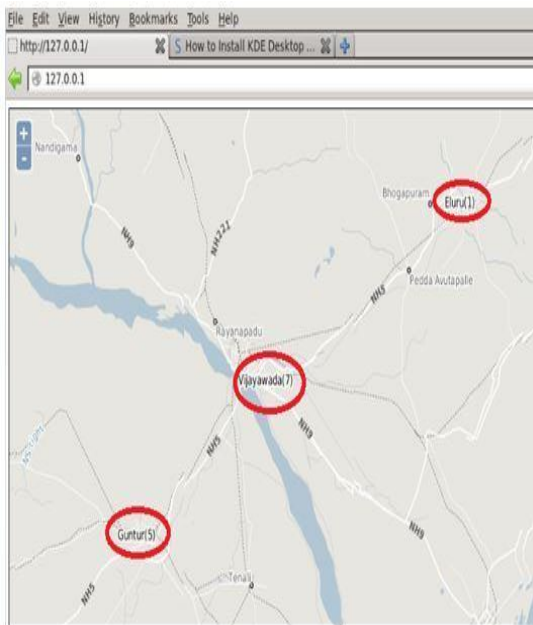
Disaster data are pointed on the map server for the identification of areas that are affected by the disease [16]. By means of this representation, we can easily view the areas that are affected by the disaster at a glance without investigating the health statistics of all the areas. The dynamic modification of a GIS database in the map server is by using the web interface PhpPgAdmin. PhpPgAdmin is a web-based client which includes PHP scripting and the PostgreSQL database to offer a suitable way for users to create a database, alter a database and query their individual data using industry standard SQL [20].

**7. RESULTS**

The figure.2 and figure.3 maps shows Eluru, Bhimavaram, Guntur and Vijayawada are affected by the epidemic disease dengue. The numbers in brackets gives the number of persons effected in that particular area. Map shows in Vijayawada 7 persons are effected by dengue decease, in the same manner Bhimavaram has 2 persons and Guntur has 5 persons.



**Fig 2** The map shows Eluru, Bhimavaram and Guntur as Eluru (1), Bhimavaram (2) and Guntur (5) are affected by epidemic disease Dengue with that numbers of persons.



**Fig 3** The map shows Eluru, Vijayawada and Guntur as Eluru (1), Vijayawada (7) and Guntur (5) are affected by the epidemic disease Dengue.

**8. CONCLUSIONS**

Disaster is identified for the assumed data by using data mining algorithm. A map server is successfully designed for Linux based operating system. Using map server we can analyze, manipulate, store and capture various kinds of spatial data. The analyzed spatial data of disaster are effectively shown on the geographic map. The advantage of map server is we can dynamically include the areas of disaster on the geographic map irrespective of the size of the area.

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