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EDITORIAL PREFACE

Geoinformatica − An International Journal (GIIJ) is an effective medium for interchange of high quality theoretical and applied research in Geoinformatica domain from theoretical research to application development. This is the first issue of volume two of GIIJ. The Journal is published bi-monthly, with papers being peer reviewed to high international standards. GIIJ emphasizes on efficient and effective geomatic sciences, and provides a central for a deeper understanding in the discipline by encouraging the quantitative comparison and performance evaluation of the emerging components of Geoinformatica. Some of the important topics are spatial ontologies, computational geometry and visualization for geographic information systems, geostatistics and spatial statistics, spatial analysis, interoperability, and innovative applications of geotechnologies etc.

The initial efforts helped to shape the editorial policy and to sharpen the focus of the journal. Starting with volume 1, 2011, GIIJ appears in more focused issues. Besides normal publications, GIIJ intend to organized special issues on more focused topics. Each special issue will have a designated editor (editors) – either member of the editorial board or another recognized specialist in the respective field.

GIIJ give an opportunity to scientists, researchers, and vendors from different disciplines of Geoinformatica to share the ideas, identify problems, investigate relevant issues, share common interests, explore new approaches, and initiate possible collaborative research and system development. This journal is helpful for the researchers and R&D engineers, scientists all those persons who are involve in Geoinformatics in any shape.

Highly professional scholars give their efforts, valuable time, expertise and motivation to GIIJ as Editorial board members. All submissions are evaluated by the International Editorial Board. The International Editorial Board ensures that significant developments in geotechnologies from around the world are reflected in the GIIJ publications.

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To build its international reputation, we are disseminating the publication information through Google Books, Google Scholar, Directory of Open Access Journals (DOAJ), Open J Gate, ScientificCommons, Docstoc and many more. Our International Editors are working on establishing ISI listing and a good impact factor for GIIJ. We would like to remind you that the success of our journal depends directly on the number of quality articles submitted for review. Accordingly, we would like to request your participation by submitting quality manuscripts for review and encouraging your colleagues to submit quality manuscripts for review. One of the great benefits we can provide to our prospective authors is the mentoring nature of our review process. GIIJ provides authors with high quality, helpful reviews that are shaped to assist authors in improving their manuscripts.

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Eman El Amir, MSc eman.elamir@gmail.com
Faculty of Computers and Information / Information Systems Department Cairo University
Giza, 12613, Egypt

Prof. Osman Hegazy Osman.hegazy@gmail.com
Faculty of Computers and Information / Information Systems Department Cairo University
Giza, 12613, Egypt

Assoc. Prof. Mohamed NourEldien m_nour@fci-cu.edu.eg
Faculty of Computers and Information / Information Systems Department Cairo University
Giza, 12613, Egypt

Assoc. Prof. Amr Ali amrhali@yahoo.com
Faculty of Engineering / Surveying Engineering Department Benha University
Benha, Egypt

Abstract

Data Mining (DM) and Geographical Information Systems (GIS) are complementary techniques for describing, transforming, analyzing and modeling data about real world system . GIS and DM are naturally synergistic technologies that can be joined to produce powerful market insight from a sea of disparate data.

Web Services would greatly simplify the development of many kinds of data integration and knowledge management applications. This research aims to develop a Spatial DM web service. It integrates state of the art GIS and DM functionality in an open, highly extensible, web-based architecture. The Interoperability of geospatial data previously focus just on data formats and standards. The recent popularity and adoption of Web Services has provided new means of interoperability for geospatial information not just for exchanging data but for analyzing these data during exchange as well. An integrated, user friendly Spatial DM System available on the internet via a web service offers exciting new possibilities for geo-spatial analysis to be ready for decision making and geographical research to a wide range of potential users.

Keywords: GIS, Data Mining, Web Services, Interoperability, Spatial Data Infrastructure.

1. INTRODUCTION

"The whole is more than the sum of its parts." Aristotle

Combining/integrating different technologies provides opportunities to achieve more than each of them alone can provide. Geographical Information Systems (GIS) provide spatial data in ways that help us make more informed decisions by adding the geographical dimension to information. The data used by a GIS, geospatial data, are characterized by holding both the informational aspect and the location aspect of the real-world features[1]. In daily life problems though, data from different providers like -governmental agencies, public sector, and international authorities- may be needed to describe different dimensions of the problem at hand. Spatial data from different providers typically have different formats and scales, and are presented in multiple ways based on the focus of the data providers.

This raises a need for interoperability between the data obtained from and systems used by those different providers. Interoperability of geospatial data has been an ongoing activity and goal of the geospatial information user community for decades. While popular and appealing, the infrastructure approach also created complexities for the geospatial community[2]. There has been an ongoing effort to produce commonly accepted, standards-based specifications and approaches for discovery, evaluation, access, visualization and exploitation of geospatial information[3].

In this paper we propose a model for solving this disparate data and systems problem, and then we showcase this model through a geospatial data mining system exposed through web services, applied to crisis management of road accidents.

The rest of the paper is structured as follows. In section 2 we explain the problem definition of the research. Section 3 describes the proposed model of web services, spatial data mining techniques used to build the model of crises management concerned with road accidents. In section 4 we explain the research areas and technologies and in section 5 we describe the case study, present and discuss the results. Section 6 gives the conclusions and future work.

2. PROBLEM DEFINITION

Web services technology has emerged as a corner-stone for interoperability solutions by providing the standard for communication between hybrid systems, and thus combining web service technology with Spatial Data Infrastructure and GIS technologies can help us solve this challenge[4].

Moreover, GIS tends to produce and accumulate a lot of data over time, providing an opportunity to “make sense” of this data and get more high level information, conclusions, and trends. Data mining technology has been used in Business Intelligence systems for this purpose also.

Data Mining is the science of extracting useful and non-trivial information from the huge amounts of data that could be collected in many and diverse fields of science, business and engineering. Due to its relatively recent development, Data Mining still poses many challenges to the research community[5]. New methodologies are needed in order to mine more interesting and specific information from the data, new frameworks are developed to harmonize more effectively all the steps of the mining process, new solutions will have to manage the complex and heterogeneous source of information that is today available for the analysts [6].

Geospatial data mining combines capabilities in data acquisition, data integration, and subject matter expertise to identify important sources of information and integrate geospatial and tabular data accurately and in a way that is easily retrievable[7].

There have been some efforts to apply data mining on spatial data through desktop environment designed specifically for this purpose. The limitation of this approach is that it operates in a closed-box setting, only providing the results inside this desktop environment. Exposing this on the web can provide an opportunity for the outcomes of such systems to feed into other systems, allowing it to be used on a wider scale. Efforts for data mining over the web have provided interesting results, such techniques have been applied textual data, user communities’ data, web user behavioral data, and however, still we have not seen such techniques applied on geospatial data using rule association techniques[8].

3. PROPOSED MODEL

The intersection between the different technologies occurs where the spatial (map, geographic, or location) dimension adds value to integration and analytics of data mining; the non-spatial integration and analytics adds value to GIS; and Where spatial and non-spatial analytical visualization adds value to both technologies. Along with geographic interoperability is data standards for information exchange the argued web service can analyze this data during

exchange with the data mining techniques. Not just a data exchange yet an inelegant analysis could be done for the better enhancement to decision making.
The model includes a web-based interoperable spatial data infrastructure. It combines spatial data from different sources relating to healthcare, traffic, and civil defense to provide real-time spatial information for the rescue operation and uses rule association data mining technique to further analyze the accumulated data over time.

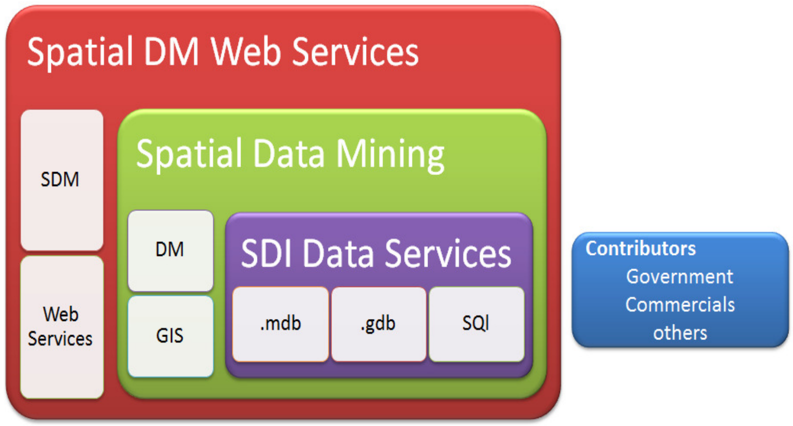

FIGURE 1: Spatial Data mining and Web Services.

The above figure illustrate the idea of having one spatial data infrastructure having data from diverse data sources , then applying spatial data mining analysis on these data, then availing this analysis ability over the web using web service.

4. SYSTEM ARCHETECTURE

The proposed model relies on combining several technologies to address the challenges presented earlier. The following subsections briefly explain the main technologies that provide the building-blocks for the proposed model.

4.1 Geospatial Data Mining

Since data mining becomes a cornerstone in many data processing and knowledge discovery seekers, and spatial data are getting huge and need to be deeply searched to get any simple information or any valuable knowledge[9]. So, we are in an urgent need to identify spatial patterns, to identify spatial objects those are potential generators of patterns, to identify information relevant for explaining the spatial pattern (and hiding irrelevant information) and to present the information in a way that is intuitive and supports further analysis[10].

Because spatial data is not identically distributed in the space, data properties are location dependent, the local trends can sometimes contradict the global trends and spatial data is heterogeneous, there was an urgent need for spatial data mining.

Spatial data mining, or knowledge discovery in spatial databases, is the extraction of implicit knowledge, spatial relations and discovery of interesting characteristics and patterns that are not explicitly represented in the databases. These techniques can play an important role in understanding spatial data and in capturing intrinsic relationships between spatial and non-spatial data. Moreover, such discovered relationships can be used to present data in a concise manner and to reorganize spatial databases to accommodate data semantics and achieve high performance. In this research we apply rule association techniques from data mining techniques.

4.2 Web Services
The e-businesses wanted to integrate their processes with other e-businesses, so the Service Web was created. The Service Web is powered by Web application servers that speak Simple Object Access Protocol (SOAP), and deliver information marked up in Extensible Markup Language (XML).

Today, the Service Web is in its adolescence. We are currently witnessing the rapid maturation and deployment of a stack of interrelated standards that are defining the infrastructure for the Service Web. The building block of the Service Web is the Web service, a set of related application functions that can be programmatically invoked over the Internet.

The Service Web is being built on Internet standards[11]. One of the key attributes of Internet standards is that they focus on protocols and not on implementations. The Internet is composed of heterogeneous technologies that successfully interoperate through shared protocols, not shared middleware[12].

Geographic web services (GWS) permit users to dynamically access, exchange, deliver, and process geospatial data and products on the World Wide Web, no matter the platform or protocol[13].

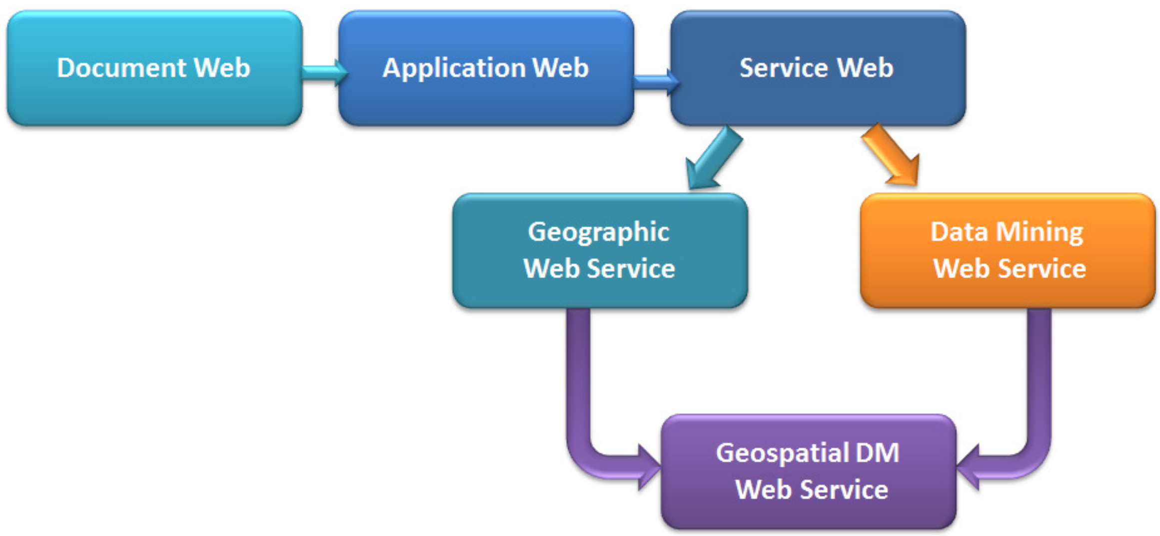

FIGURE 2: Web Services Evolution.

4.3 SDI Spatial Data Infrastructure
Infrastructure can be defined as the basic physical and organizational structures needed for the operation of a society or enterprise, or the services and facilities necessary for an economy to function. The technical structures that support a society, Facilitates production or distribution of goods and services include basic social services[14].

SDI Addresses Global Issues like Climate change, Disaster, National Security and Defense, Natural Resources, Sustainable Development. Data Sharing is a Social Activity Groups of people with a common interest or goal; Relationships help achieve goals, Scale-free networks Invariant to application domain: Enterprise, State, Country, Global, and Community[15].

Every Society Needs Some Rules like Data Sharing Agreements, Education on Policies and Best-practices, Host and Maintain SDI Components and Collaboration. Also there are Data Provider Challenges; Collect Once, Use Many Times – is an agreed upon principle that National Mapping Orgs, United Nations (ex: Statistics Div and Office of Outer Space Affairs) and European

INSPIRE program regularly talk about[16]. GIS enables you to collect, manage, produce and share data through a Geodatabase. SDI is a coordinated framework of policy, technology, data, and people, it like a framework for human resources development, framework geospatial data, technology, network, standards, policies.

5. CASE STUDY: DISASTER MANAGEMENT – ROAD ACCEDENTS

Our proposed model was applied on a case study that uses the proposed model to integrate between agencies involved in the response to road accidents and enable them to exchange the data needed to support each of them in addressing and handling road accidents. This problem can be classified under crisis management[17]. Moreover, the data obtained from this system over time can be analyzed to discover hidden rules between the different aspects of the problem as per the data provided by the different agencies to identify high-risk areas, forecast crises, and therefore allow proactive action to be taken to minimize the risk or the impact of the crisis situations.

The case-study was applied on a real-life case of one of the most crowded cities in Egypt with high population density: the area of Attareen in Manshia district, Alexandria City. The case was applied on different disasters happing at same time, road accidents along with fire at nearby accident location.

5.1 Case Background

Crisis management handling has no standard rule defining its phases, as different agencies are using different phases according to their objectives.

5.1.1 Crisis Management

Phases of the disaster management cycle , which are described as follows in [18]:"

- Mitigation: any activity that reduces either the chance of a hazard taking place or a hazard turning into disaster.
- Risk reduction: anticipatory measures and actions that seek to avoid future risks as a result of a disaster.
- Prevention: avoiding a disaster even at the eleventh hour.
- Preparedness: plans or preparations made to save lives or property, and help the response and rescue service operations. This phase covers implementation/operation, early warning systems and capacity building so the population will react appropriately when an early warning is issued.
- Response: includes actions taken to save lives and prevent property damage, and to preserve the environment during emergencies or disasters. The response phase is the implementation of action plans.
- Recovery: includes actions that assist a community to return to a sense of normalcy after a disaster.
- Disasters "

5.1.2 The Gap Between Emergence Response & Risk Management

The main problem is that there is a large gap between the prediction of the disaster and the emergency response team i.e. police, fire brigade, ambulance, etc. In our example the involved agencies are roads department, civil defense, health care and ambulance, they all need monitoring data to predict or handle future disasters. [19].

If the predictions are as close as possible to the future scenario, the Emergency response team can be guided efficiently to remedy and rescue the humanitarian and economical loss[20].

Disasters don't occur at sudden in fact it has different phases, within these phases a huge number of data is collected. The need of this data is not equally distributed with respect to time. Data mining can play a large effective role into:

- Selecting the useful data
- Data mining needs an infrastructure (SDI, can we really apply data mining on our existing infrastructure? What are the minimum requirements?
- Processing data within critical time
- Detecting trustable data source
- Data flow (capacity and parties and exchange) with respect to each phase
- Statistical analysis
- Date exchange between different layers and parties

5.1.3 Scope of the Models

Generally Disaster management systems can be classified into scenario based and demand based. The Scenario-based systems focus on a single type of disaster and attempt to cover sufficient number of factors and processes.

Demand-based systems attempt to cover any kind of emergency, the concept of this system is relatively new and should take into account interoperability, standardization, sharing information, share dynamic data, and a large cooperation between different actors and agencies.

5.2 Applying our Proposed Model on the Case Study Problem

The case-study solution enables this real-time information exchange between all those authorities. It was applied on a real-life case the area of Attareen in Manshia district, Alexandria City, Egypt.

Different authorities are involved in the handling of road accidents:

- Health authorities are concerned with sending ambulances to the accident location
- Traffic authorities are concerned with handling the roads congestion resulting from the accident, finding alternative routes, and clearing the accident site

In order for each of these authorities to do their jobs properly, they need information from other authorities and they may also need their cooperation:

- They need real-time information from civil defense about fires that may exist around the accident in order to route the ambulance and police/towing cars away from that, and they may also need a fire truck to be sent to the accident site in case the accident itself resulted in a fire

- They need information about the nearest hospitals that are ready to receive the accident. This requires real-time information about hospital capabilities, availability of beds, blood, operating room, medical care professionals of the relevant specializations etc. They also need to notify the hospital of choice to prepare for receiving the cases.

- The main problem here is have lack of data exchange through well-defined spatial data infrastructure that enable data conversion from different formats while preserving data privacy at each agency of them though a web service that provide intelligent data analysis using data mining techniques.

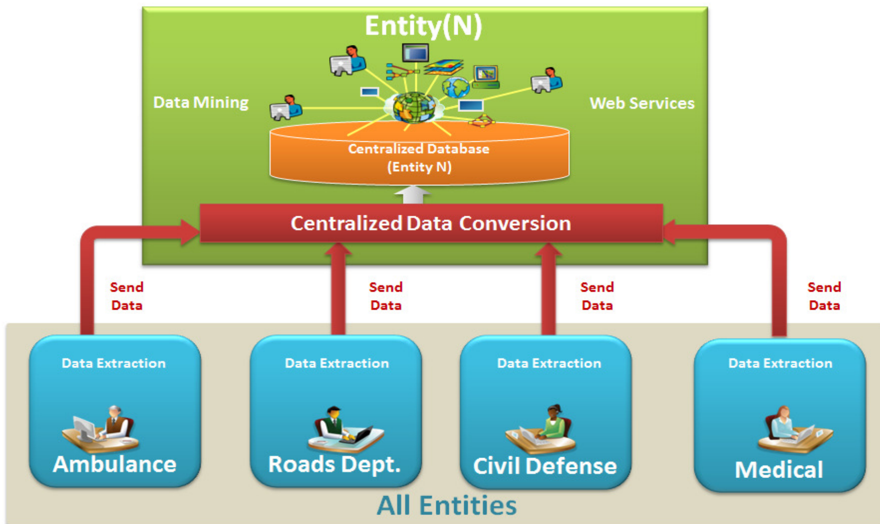

FIGURE 3: Solution Conceptual Model

Oftentimes, when a road accident and a fire occur in the same time at near-by areas, they could both result in they delay of relief reaching each other as one may block the road leading to the other or to resources needed for the relief of one of them. Real-time information exchange between these authorities can greatly reduce the losses resulting from such situations by allowing these agencies to identify blocks, coordinate with each other, and make alternative plans in order to effectively send relief which can save lives.

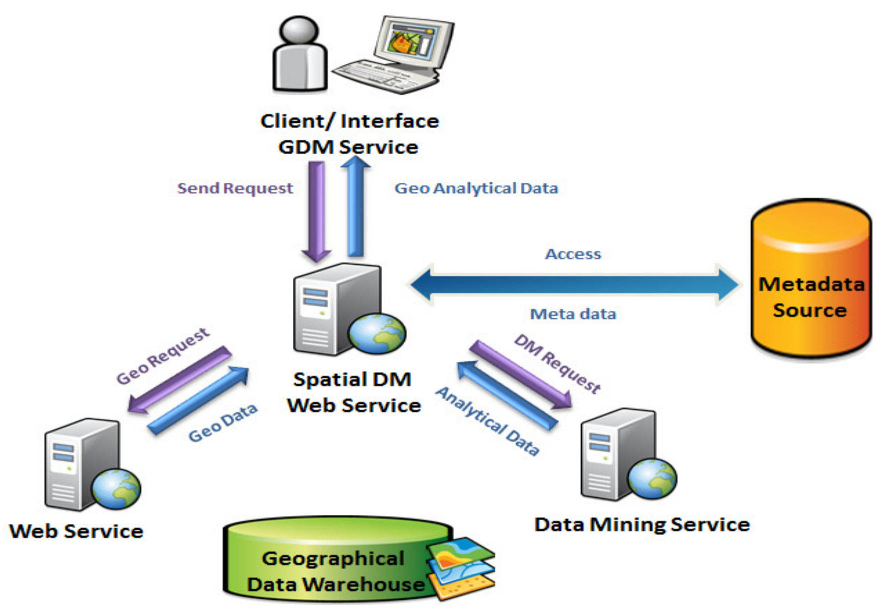

FIGURE 4: Solution Architecture: GML Analysis for Geospatial Web Service

The figure 4 illustrates how data analysis will be performed for the geospatial web service and the ability to access meta data from metadata source.

A comprehensive investigation and analysis of Web Services and their benefits at multiple levels (business, managerial, organizational, technological) will be illustrated. A more specific analysis of Web Services is performed in the context of geospatial data infrastructures, by researching and analyzing abstract and technical documentation from the Open Geospatial Consortium, the Global Spatial Data Infrastructure (GSDI) committee, and other relevant literature.

An analysis will be performed to assess the impact of Web Services on GIS and Data mining as a discipline, and on the changing requirements created by the Web Services approach to geospatial intelligent analysis. An analysis will be done to assess the impact of Web Services in the area of geospatial information policy and intellectual copyright.

Taking into account the previous sub research areas, a comparative analysis is performed between previous data mining analysis for geospatial data and the new interoperable approach using web services.

5.3 Application and Results

Here we illustrate the application to proof the concept of combining GIS and Data mining via and exchange the data web services and the results the below figure illustrates the situation before and after applying our system, there was no information sharing inability share data or to send any query, after applying our system all participates agencies can send query and exchange information.

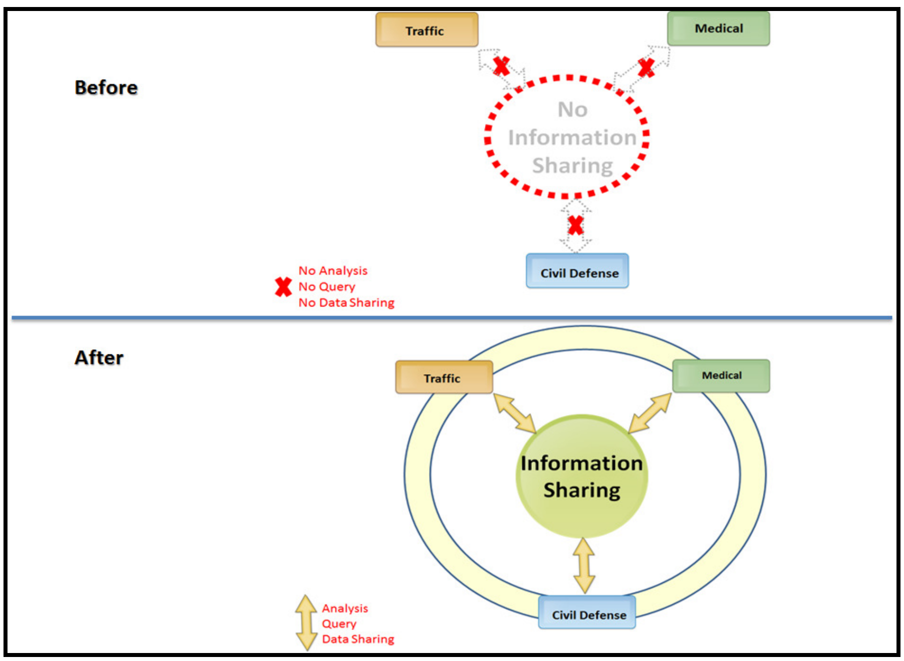

FIGURE 5: before and after applying the System

In the below figures we can see the sample results of the developed application to prove the concept we are applying to the case study of crisis management for road accidents. The concerned authorities are traffic, medical, civil defense and main application could be hosted on high level authority that can integrate between all these authorities. The main Application here is not defined agency in our assumption we agreed that this main agency would be one that all other authorities lie under their umbrella and have a written agreement for exchanging data and analysis between each other to avoid privacy and security problems and preserve each authority rights of their own data.

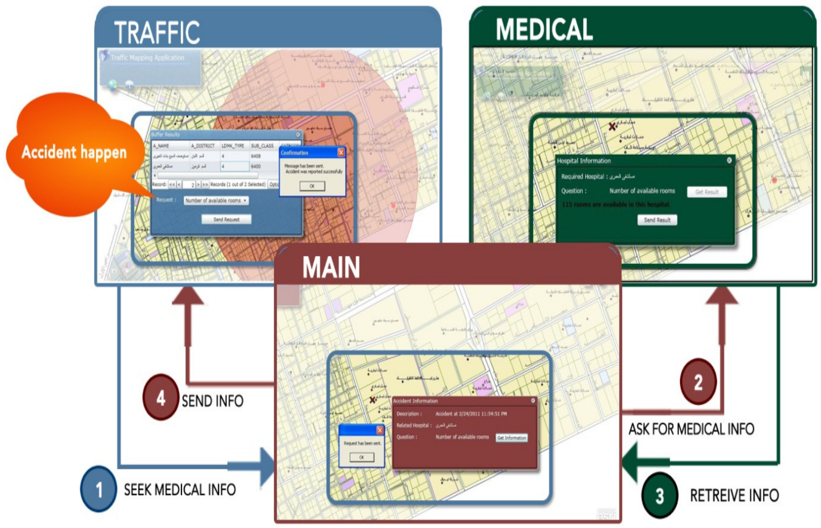

FIGURE 6: Synchronization between traffic, main, and medical applications

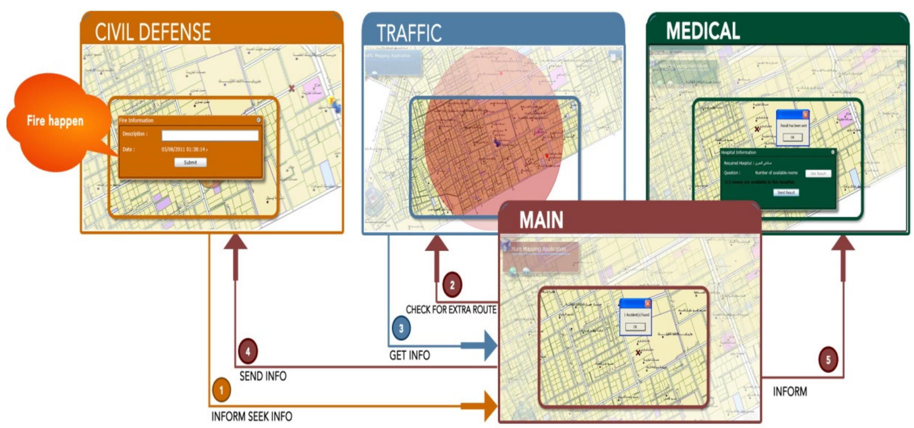

FIGURE 7: Synchronization between traffic, medical, civil defense, and main applications

Also after accumulating huge amount of data, we can make data mining analysis and discover the hidden information and relations between data; we can apply the rule association techniques to help solve problems later and have better scenarios solving road accident problems and have better understanding of real cause of the problem.

6. CONCLUSION

Taking into account literature and technical publications on geospatial information, infrastructures, technology, standards and interoperability, data mining , GIS this research has explored and investigated the potential of applying Web Services as a new approach to a geospatial data infrastructure. The research used specifications endorsed by the Open Geospatial Consortium (OGC) and the access, visualization, evaluation and discovery of geospatial data.

Using application prototypes, this research has reviewed and assessed past trends in geographic information interoperability, and explored Web Services as a new approach to interoperability, in the context of Geographical Data Infrastructure in addition to data mining techniques for intelligent data analysis.

We had developed an interoperable web service that can handle intelligent analysis of geospatial data from different heterogeneous sources to ease of use for decision makers. We applied the case study on disaster management of road accidents; the sample date explored Alexandria, Egypt.

7. FUTURE WORK

To extract the hidden information and gain the knowledge from different sources of data at two cases the first when we have ability to get the data from these sources we collect it in data warehouse and extract the hidden knowledge from those different sources, and distribute the feedback analysis for the interested users to aid decision making. While at second case with inability to get data from these sources we started an analysis survey to highlight that instead of hosting the data at each organization we can move all data into cloud computing. Cloud computing furnishes technological capabilities commonly maintained off premises that are delivered on demand as a service through standard internet protocol[21] . Using cloud computing we can reduce the capacity then handle issues of privacy and who have the ability to get the data and analysis, ability to apply rest of geospatial data mining techniques at the cloud [22]will be investigated to get all benefits of technology updates to our proposed integration as future work.

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Comparison of Interpolation Methods in Prediction the Pattern of Basal Stem Rot Diesease in Palm Oil Plantation

Somayeh Kheirandish *somayehkheirandish@gmail.com*
Faculty of Geoinformation and Real Estate
UniversityTechnology malaysia
Johour Bahru Malaysia,

Mahsa liaghat *Mahsalia@yahoo.com*
Faculty of Geoinformation and Real Estate
UniversityTechnology malaysia
Johour Bahru Malaysia,

Tengku Mohd Azahar *azhar@inomaps.com.my*
Universiti Kuala Lumpur MFI, Malaysia,

Adel Gohari *Adel.Gohari@gmail.com*
Faculty of Geoinformation and Real Estate
UniversityTechnology malaysia
Johour Bahru Malaysia,

Abstract

Basal Stem Rot is a diseases that caused by Ganoderma Boinense that is the most serious disease for oil palm trees in Malaysia. The analysis of plant disease has been carried extensively with the advancement in computer technology. Particularly, in terms of spatial and temporal, it is very complicated to be processed. Furthermore, the application of GIS in plant disease analysis is becoming more popular, precise and advance. In previous studies, Kriging has been used to predict the pattern of BSR disease. In this study, two commonly used interpolation methods for GIS, Kriging and Inverse Distance Weighting (IDW), are used to interpolate and predict the pattern of Basal Stem Rot disease. Since the IDW method is an exact method and is more accurate one, it was expected to see more accurate results. However, the accuracy results of both methods are the same. Based on the characteristic of both methods and according to advantages and disadvantages, the Inverse Distance Weighted is recommended in this study but, for more informative data, Ordinary Kriging is suggested to be the preferable method to be used as an alternative method.

Keywords: Inverse Distance Weighted, Kriging, Palm Oil

1. INTRODUCTION

About half of the world's palm oil is produced in Malaysia. The oil palm is an important socio-economic crop in Malaysia, with the value of oil palm products estimated at 10.8 million tons in 2000. Concerns about the impact of diseases on future competitiveness and sustainability of the industry have surfaced. Fungal pathogens cause many diseases that strike oil palms. One of these deadly diseases of oil palm in Malaysia is the Basal Stem Rot.There is not enough information on the dynamics of the Basal Stem Rot disease in the system of production of palm oil. The analysis of plant disease has been facilitated to a considerable area (Markom *et al.,* 2008). Although the advancement in computer technology has been substantial, the analysis, particularly in spatial and temporal terms is a very complicated process. Furthermore, using GIS in plant disease analysis is becoming more popular, precise and advanced. GIS can be used in plant disease analysis in many ways. Interpolation is the process of creating estimated values of a phenomenon (such as air temperature) from verified values of the same phenomenon. This method is commonly used in GIS to create maps depicting phenomena. Two widely used interpolation methods for GIS are Kriging and Inverse Distance Weighting (IDW) which are used to interpolate and predict the pattern of Basal Stem Rot disease in this study.Experiments were conducted on an area of 10.88 ha (108800 m) at the MPOB (Malaysian Palm Oil Board) Teluk Intan Research Station (3.49o N, 101.06o S) in Perak, Malaysia. (Tengku Mohd Azhar Bin Tuan Dir, 2010).

Kriging provides a means of interpolating values for points not physically sampled using knowledge about the underlying spatial relationships in a data set to do so. . Kriging is based on regionalized variable theory, which provides an optimal interpolation estimate for a given coordinate location, as well as a variance estimate for the interpolation value. Inverse distance weighted interpolation is an exact method, using IDW to enforce the condition to influence estimated value more by nearby points rather than farther away. It means that Inverse Distance Weighting (IDW) points in nearest distance to the sample point give more weight when calculating the mean. . Those measured values closest to the prediction location will have more influence on the predicted value than those farther away. Thus, IDW assumes that each measured point has a local influence that diminishes with distance. (Chang, 2010).

2. STUDY AREA

Experiments were conducted on an area of 10.88 ha (108800 m) at the MPOB (Malaysian Palm Oil Board) Teluk Intan Research Station (3.49o N, 101.06o S) in Perak, Malaysia. The study area is mostly flat and lies mostly between 5 to 8 meters above sea level. The site receives a moderately high and uniformly distributed rainfall and has a high soil water table. Between 1990 and 2001, the annual rainfall at the site varied from 1696 to 2404 mm with the driest month being July and the wettest, November. The soil is characterized with very deep (above 3 meters) peat, comprised of a heterogeneous mixture of decomposed plant (humus) material that has accumulated in a water-saturated environment and in the absence of oxygen (Markom et.al, 2009).

2. METHODOLOGY

Kriging involves an interactive investigation of the spatial behavior of the phenomenon before generating the output surface. It is based on the regionalized variable theory, which assumes that the spatial variation in the phenomenon is statistically homogeneous throughout the surface; that is, the same pattern of variation can be observed at all locations on the surface. This hypothesis of spatial homogeneity is fundamental to the regionalized variable theory. Indeed, Inverse Distance Weighting (IDW) is an interpolation technique in which interpolated estimates are made based on values at nearby locations weighted only by distance from the interpolation location. This technique determines cell values using a linearly weighted combination of a set of sample points. The weight is a function of inverse distance. IDW allows the user to control the significance of known points upon the interpolated values, based upon their distance from the output point (Chang, 2010).

The data is divided to training data which include 70% of all data and testing data which is 30% of all data. (Norman, 1975).The output of training (70%) data of using Inverse Distance weighted and Ordinary Kriging is in continuous raster format, while, the selected testing (30%) data is still in two classes (0 and 1) and vector format.

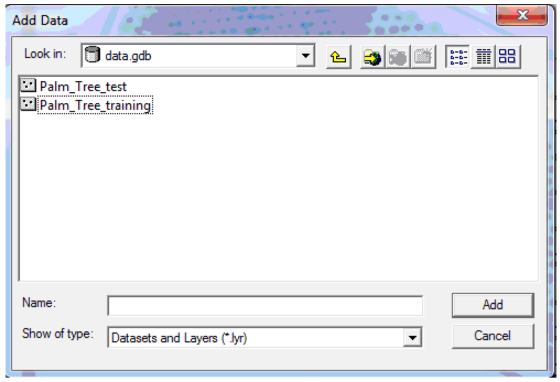

FIGURE 1: Sample testing and training data

In comparing the predicting output and the testing data we need to convert raster output to vector format. Consequently, the raster result is classified into classes: 0-0.5 and 0.5 to 1, and the test value are added into the classified raster output. Then, by comparing the applying selection of attribute in ArcGIS, we can conclude the accuracy of the two applied methods and all other aspects as well.

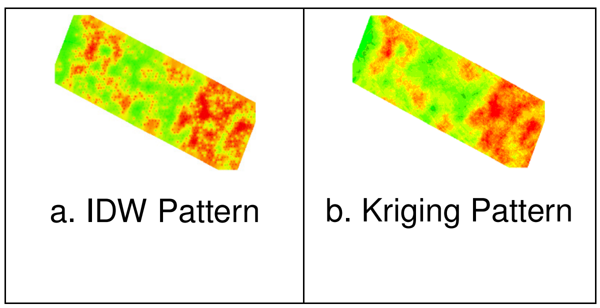

FIGURE 2: The Pattern of BSR Disease in a. IDW and b. Kriging Methods in 2004

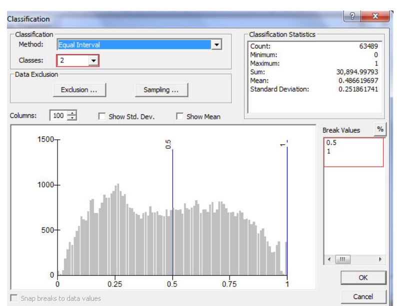

FIGURE 3: The process of classify raster output

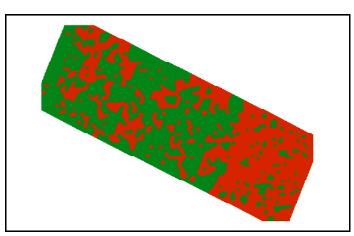

FIGURE 4 : The classified output

Then, the value of the 30% selected testing data is extracted to the classified output. When we extract the value to the result, in fact, we add the value of 30% randomly selected data to the result of 70% ones. This step is exactly the same for the both used methods, and the result is used in the next stages. (Adams *et.al,* 2009).

By extracting the value of selected points to the output, one field (Raster value) is created which contains the infected or non-infected trees in the selected data. This field contains actual data that has not been influenced by prediction patterns and can be used as a reference for testing and measuring the accuracy.

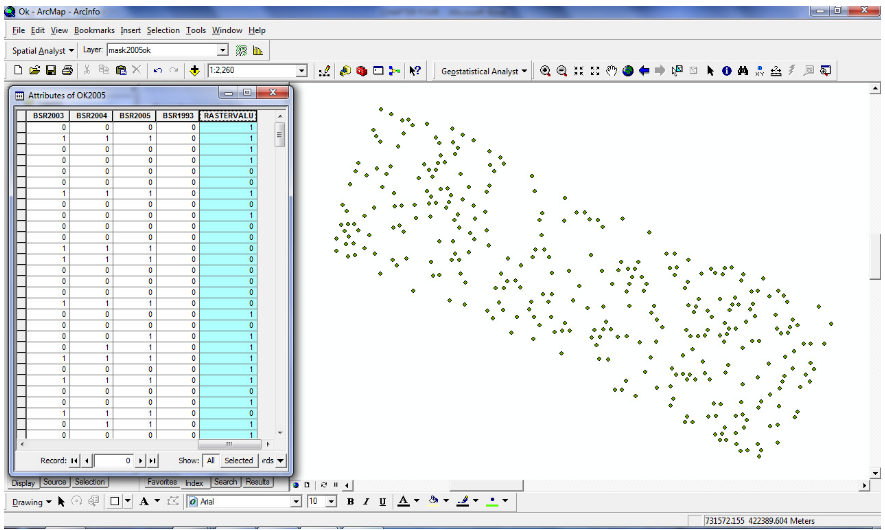

FIGURE 5 : The extracted result of raster map and testing data

Accuracy of the both methods should be compared in ArcGIS by using Selection in the menu and also selection by the attribute. There are four kinds of data in result, the prediction value equal to 1 or 0 and the actual value equal to 1 or 0. Hence, we have agreed values between two predictions filed and actual one and non same values between two predictions field and actual one. Consequently, based on these results we can compare both methods and conclude the more accurate ones.

2.1 Result and Discussion

The accuracy of both Inverse Distance Weighted and Kriging is almost the same. In this study, since nominal data was used to get the result, IDW has more simplicity procedure and fewer steps in comparison Kriging. The advantage of IDW is that it is intuitive and efficient so for this kind of data is recommended. However for more informative data Kriging is more preferable, indeed, Kriging provides a more reliable interpolation because it examines specific sample points to obtain a value for spatial autocorrelation that is only used for estimating around that particular point; rather than assigning a universal distance power value. Furthermore, Kriging allows for interpolated cells to exceed the boundaries of the sample rang. (David w.S Wono, Jay Lee (2005).

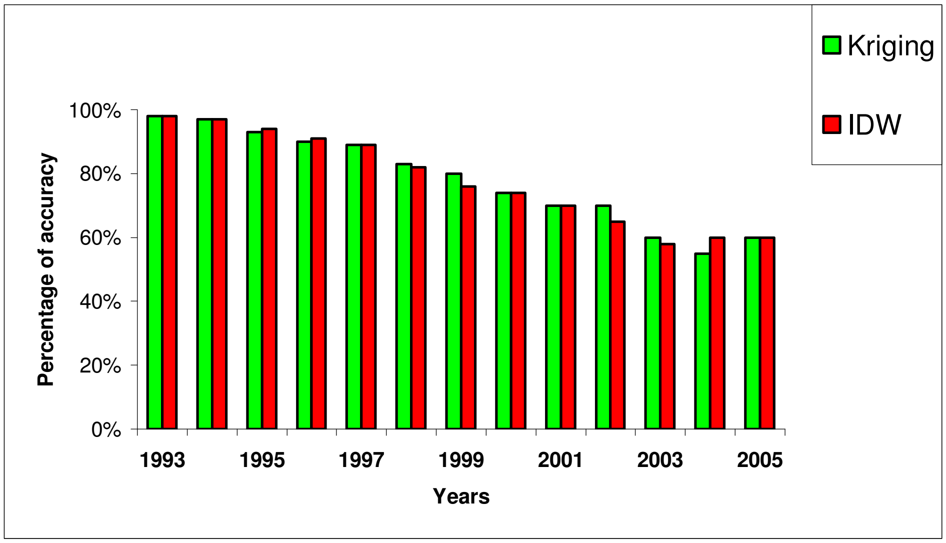

FIGURE 6: Agree values in Kriging and IDW methods (Accuracy of Methods)

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CONTACT INFORMATION

Computer Science Journals Sdn BhD
B-5-8 Plaza Mont Kiara, Mont Kiara
50480, Kuala Lumpur, MALAYSIA

Phone: 006 03 6207 1607
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