Original Research Article

Integration of Open Source GIS Software for Improving Decision Making in Small and Medium Companies

Abstract

In this paper the author proposes a prototype of integrating various features and functionalities of different open source GIS software to improve decision-making in small and medium companies. The paper shows possibilities of integrating various open source GIS software to support decision making. Open source software features is combined with the functionalities of GIS such as processing using Quantum GIS, storing and analyzing of spatial data to produce results using PostgreSQL, Provide and share Geo-data over network locally or over the globe using Geoserver, the prototype is based on the three basics features low /free cost of using GIS open source software, simplicity and usability, multiplatform supporting. The integration of open source software is appropriate and successful for the use of companies in the field of GIS, this initiative represents a suitable business solutions that do not consume a lot of money and training to develop the skills of the technicians in this field, this will opens the door to other companies to follow this trend. This prototype contributes open source software components opportunity to process and store data in databases or share the results over different networks.

Keywords: GIS, Open Source software, Small and Medium Companies, Open Source, Information Tech Solutions.

I. INTRODUCTION

A definition of term GIS by NCGIA National Centre for Geographical Information and Analysis is a Geographical Information System GIS a computerized database management system for capture, storage, retrieval, analysis, and display of spatial (locational defined) data. GIS has many components, Figure 1 Represents GIS basics components. [1].Collecting and processing of spatial information is a basic process of decision making. By applying of GIS information technology in decision-making processes, decision-makers were given powerful tools that enable the collecting and processing of large amounts of spatial data and creating a good quality information in a very short time. This paper describes the proposed prototype of an integration several open source GIS software for various purposes in the process of decision-making in local small and medium companies that relate for who IT work [2], [3].

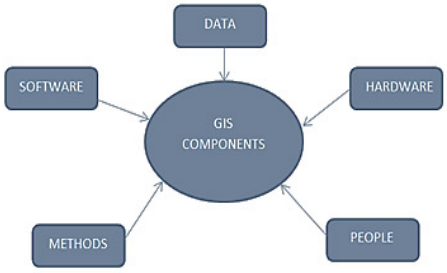


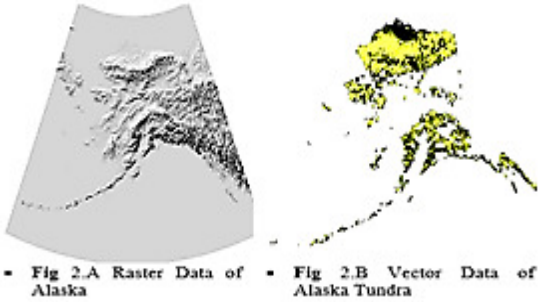
Fig 1 GIS Basics Components.

II. GIS DATA TYPES

The basic data type in GIS reflects traditional data found on a map. Accordingly, GIS technology utilizes two basic types of data. Traditionally spatial data has been restored and represented in the form of a map. Three basic types of spatial data models have evolved for storing geographic data digitally. These are referred to as:

1. Vector data
2. Raster data

The following diagram presents the primary spatial encoding techniques. These are vector and raster. Image data utilizes techniques very similar to raster data, however typically lacks the internal formats required for analysis and modeling of the data. Images reflect pictures or photographs of the landscape. Figure 2 above represents raster and vector data of ALSKA region [4].



- Fig 2.A Raster Data of Alaska
- Fig 2.B Vector Data of Alaska Tundra

III. OPEN SOURCE GIS PROTOTYPE

Author use three GIS open source software for processing data like georeferenced the location of data that feeds from remote sensing sources, vectoring raster data to make vector data as a shape file these series of functionalities can be done by using Quantum GIS or QGIS, then exports data from the first processing to specialist database management system that is called PostgreSQL. Finally using Geoserver locally or through the web network for multi agents. Figure 3 represents the proposed open source GIS prototype.

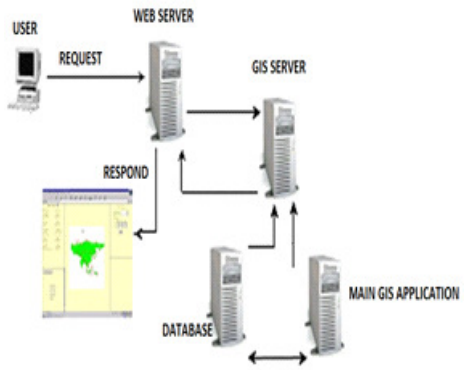
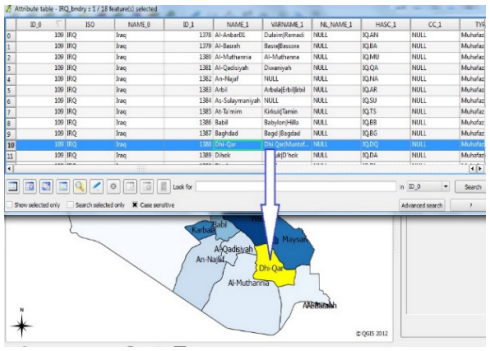


Fig 3 The ProposedOpen Source GIS Prototype

IV. OPEN SOURCE GIS PROTOTYPE SOLUTIONS

Many solutions for different problem require much more ways to store attribute data as sequential data files with fixed formats for the location of attribute values in a predefined record structure. This type of data model is outdated in the GIS arena.
It lacks any method of checking data integrity, as well as being inefficient with respect to data storage, as example limited indexing capability for attribute or records. Figure 4 represents vector data with tabular information. [5]



Open source GIS prototype integrates hardware, software and data for capturing, managing, analyzing and displaying all forms of geographically referenced information.
This prototype allows us to view, understand, question, and interpret and visuals data in many ways that reveal relationships, patterns and trends in the form of maps, globes, reports and charts. A prototype help to answer questions and solve problems by looking at the data in a way that is quickly understood and easily shared. This technology can be integrated into any enterprise information system framework. In general GIS prototype integrates five key components Hardware, Software, data, people and methods. Hardware is computer on which a GIS operates. Today, GIS runs on a wide range of hardware types, from centralized servers to desktop computers and mobile used in stand-alone or networked configurations. Software provides the functions and tools needed to store, analyze and display geographic information [6].
Key software components are:

1. A database Management system (DBMS)
2. Tools for the input and manipulated of geographic information.
3. Tools that support geographic query, analysis and visualization.
4. A geographic user interface (GUI) for easy access to tools.

Data may be the most important component of GIS. Geographic data and related tabular data can be collected in-house or bought from a commercial data provider. Most GIS employ a RDBMS to create and maintain a database to help organize and manage data. GIS technology is of limited value without the people who manage the system and to develop plans for applying it. GIS users range from technical specialists who design and maintain the system to those who use it to help them do their everyday work. A successful GIS operates according to a well-designed plan and business rules, which are the models and operating practices unique to each organization. Figure 5 represents proposed GIS prototype in simplest schematic [1], [6].

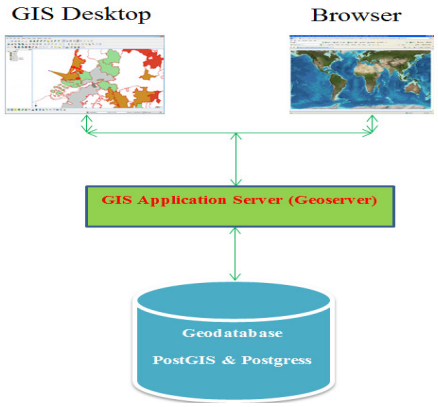


Fig 5 The Proposed GIS Prototype

V. PROTOTYPE TOOLS

Open source desktop GIS equivalent of ArcGIS, which is a user friendly open source geographic information system, QGIS is licensed under the GNU public license, has been developed using C++ and GUI uses Qt library which is used in Linux KDE, QGIS allows integration of plugins developed using either C++ or Python. QGIS lets to brows, edit and create a variety of vector and raster formats, including ESRI shapefiles, spatial data in PostgreSQL/PostGIS, GRASS vectors and raster, or Geotiff. There are many features of QGIS:
Raster and vector support.

1. Integration of with GRASS GIS.
2. Extensible plugin architecture.
3. Digitizing tools
4. Print composer
5. Python language bindings
6. Overview Panel
7. Spatial bookmarks, Identify/Select features.
8. Edit/View attributes
9. Vector spatial analysis.
10. Feature labeling.

Also a PostGIS is an open source spatial extension for PostgreSQL, developed by refractions research, an implementation of the OGC simple features for SQL specification within PostgreSQL for the storage of geospatial data (points, lines and polygons) within SQL based relational database management system (RDBMS) is developed as a set of functions and data types that spatially enable the PostgreSQL object-relational database system. [7], [8]
Geoserver is an open source web server to publish and edit geospatial data over the internet or intranet, strong support for open geospatial consortium (OGC) standards, including WMS, WFS, Filters and SLD [2], [4].

VI. CONCOLUSION

Although of spotting light on current open source GIS prototype, it is important to remember that none of them offers a complete solution for use in solving complex spatial problems but only if we integrate their functionality and with increasing their compatibility it will be possible to create one that system. Today the current trends of integration of existing open source geoprocessing tools with desktop or web applications offers advantages of services that enhance work with simple tools together locally or remotely. For future, with improvement of the existing capabilities of the open source GIS software will be able to increase accessibility. These technologies for GIS users, Prototype can be successfully applied to a wide range of small/medium companies also government organizations encounter every day. Finally it will be surprise using these integrated systems by local authorities, state institutions, and other organizations, so this proposed prototype plays an alternate solution to deploy and develop it. So The integration of open source software is appropriate and successful for the use of companies in the field of GIS, this initiative represents a suitable business solutions that do not consume a lot of money and training to develop the skills of the technicians in this field, this will opens the door to other companies to follow this trend. This prototype contributes open source software components opportunity to process and store data in databases or share the results over different networks.

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