

Geographical Information Systems: A Study

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Abstract:

The computing system i.e., Geographic Information System is use to capture, store, manage, analyze data and then represent all types of data geographically. The systems of GIS are used in cases of cartography along with the GIS merging of cartography and database. There is no considerable activity of human that is related to the territory of the geographical region that uses standardized GIS system. This system of GIS allows efficient estimation and the resource management for the environment protection. This technology provides safety to the general public and has the ability to manage and examine the large amounts of the information. This paper explains about the GIS application and mine mapping of the suspected areas and have the ability to facilitate the surface displacement.

Keywords: *Computing system,, Geographical Information System,, Cartography, resource management of GIS*

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Introduction

The Geographic Information System i.e., GIS is a data collection method that is computer based and also helps in storing data. This analyzes the tool that combines the information that is unrelated into maps which are easily understandable. The manager of the public sector and the business leader has provided the power by GIS to understand the relationships which are complex, the power that plans for the future, the power that presents data in a clear and understanding manner, power to form the informed decisions and also the power to save time, money and lives. The usage of GIS technology for the management of land records, infrastructure, addresses the performance and routing as a part of their operations by Local Governments. The agencies of State Government uses this GIS system for the school bus routing, the management and the observing the natural resources, emergency response and sex offenders tracking among various other routine activities (The Great seal of the state of North Carolina, 2008).

The software of GIS helps in producing massive amounts of data that combines separate information layers to manage and retrieving the data in a more appropriate way. It also provides a way for agricultural scientists through which they get better decision making in the process of implementation of planning activities for the agricultural development.

GIS also used in the process of scientific investigation, management of resources and assets, environmental impact assessment, urban planning, cartography, history, sales, marketing, criminology and logistics.

Background of Geographical System

This idea of displaying the separate data layers on a base map series and then relating these things geographically is found to be much older than any computer inventions. The man, thousands years ago used to draw animals picture, those animals have hunted on the caves wall. These drawings of animals are called as the track lines and tallies describe the routes of migration. In 1854, John Snow represented an outbreak of cholera in London through points to depict the individual's location. This study which is based on the cholera distribution led to the disease's source and having a water pump which is contaminated. The map of John Snow was considered as unique by using cartographic methods that only depicts but along with this also analyses,

geographical clusters which is the dependent phenomena.

In 1980s and 1990s, the growth of industries are encouraged with the growth of GIS on Unix workstations and the PCs i.e., Personal Computers. At the end of 20th century, the growth in the several systems had been combined and then optimized. The users of GIS exports the data of viewing GIS over the Internet that requires uniform format of data and the transfer standards.

GIS Components

This component enables the user to input the data, manage, manipulate, analysis and geographically displaying the referenced data using a computerized system and then to perform various kinds of operation with GIS, the GIS components which are software, hardware, people, data and methods are essential components.

GIS Software

This software provides the essential tools and functions which are required for the purpose to store, analyze and display all the geographical information. The key components of the software are:

- Database management System i.e., DBMS
- Tools for the input process and modification in the geographical information
- Tools that answers the geographical query and visualization
- Graphical User Interface (GUI) for easily accessing the tool

Some of the available commercial GIS software includes Intergraph, Gram++, MapInfo etc. in which the Arc/Info is the most used package of software (<http://www.manage.gov.in/studymaterial/GIS.pdf>).

GIS Applications

The Information Systems are used by most of the organizations for one or more core applications which are processing, operations, management of inventory, planning and decision making and the internal control in management. GIS can be used for various applications as they possess functionality which are common to other kinds of Information system. The system of GIS also have some functionalities which are unique that distinguish

them from other systems of information. A framework is proposed that simply defines the relationship present between functionalities of GIS and the areas of application for which GIS can be used by businesses and this framework is used for the identification that includes how GIS can be used and also defines the research opportunities.

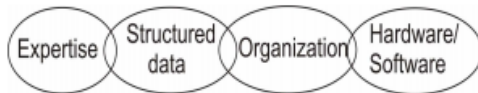


Figure 1- GIS system suitability chain

The four main GIS functions are specified by the framework which are spatial visualization, the management of the database, decision modelling and the design and planning.

- The Spatial Imaging is the GIS capability that represents the information and data present within a spatially defined system.
- The management of database represents the GIS capability to store, manipulate and providing data access.
- The function of decision modelling describes the capability of GIS for the purpose to provide analytical tools that are used to support the process of decision making.
- The function of design and Planning represents the tools of GIS that are used to create, design and plan.

All these applications includes the mapping and surveying, management of facility, analysis of market, transportation, and logistics, strategic planning, design and engineering (Mennecke and Crossland , 1996).

In GIS, one of the unexpected consequence for ocean and air navigation and for the purpose of positioning the scientific observations, is that exposing the inaccuracies to world's published mapping and the inconsistencies exists between the earth and support making mathematical earth figures that provides supports to mapping.

The GIS application is increasing the usage of electronic communication and there are many records of geographical information to the science of global change that are available to anyone who are connected to the Internet. The Earth Observing System i.e., EOS and Information system in

combination is EOSDIS. National and State governments, non-governmental organizations, universities and research libraries sponsor the archives of geographical information (<http://www.geog.ucsb.edu/~good/papers/354.pdf>).

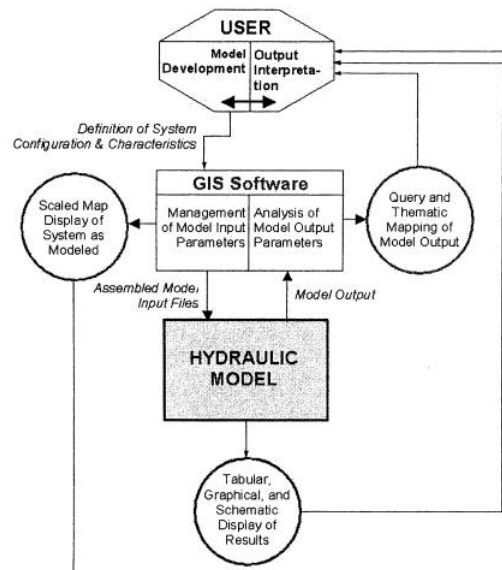


Figure 2 – GIS Software Integration (<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.664.8799&rep=rep1&type=pdf>)

According to the suggestions of DeMers in 2009, some of the following changes may need consideration:

Change in priorities – If the productivity of GIS increases, then the organizational priorities need some kinds of improvements.

Change in the hierarchy of the organization – As the GIS work success changes with the requirement that should be made to the importance of GIS work that comes within the total work of the organization.

And there are other factors too such as change in the flow of work, product types and amount, need of training, financial distribution and the working in spatial design and allocation.

The current studies shows that out of total data 80% of data is managed by the decision makers present in any kind of organization whether it is public or private which has a geographical component or location.

The GIS technology is accepted broadly in world but India is slowly catching up the concept of globalization and glocalization. Some organizations such as Reliance is expanding business using GIS and satisfaction of customer is also required. Some of the suggested future scope of research in this particular field is the expertise in geographical arena along with the understanding of software that is required for expansions in business and satisfaction of customer.

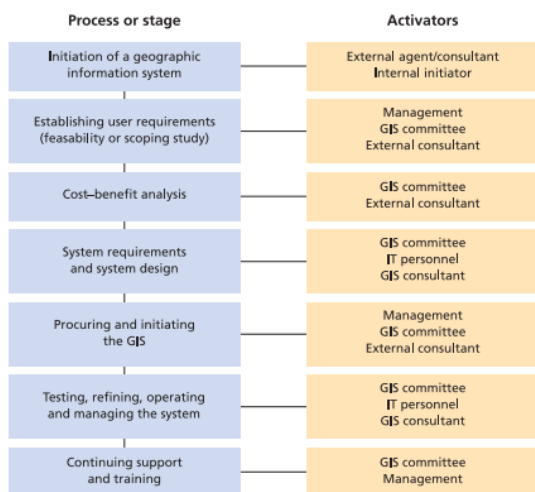


Figure 3 – Implementation of GIS
(<http://www.fao.org/docrep/017/i3254e/i3254e.pdf>)

Literature Review

Goodchild 1991 defined Geographical Information Science in their one of the chapter in which the researcher has also defined the standards that allows the greater data interchange between the systems. US Geological Survey (USGS) is used to develop the data on the basis of national cartography is finally coming to the standard of National Institute of Standards and Technology (NIST). The accuracy, applications and new models of data of GIS system is also discussed in detail.

Mennecke and Crossland 1996 has researched on the geographic Information Systems in which they discussed the applications and research opportunities for Information System. This paper explains briefly the important GIS features, functions and the capabilities that includes research framework for GIS. Various opportunities for research purpose are recommended that involves those related to the management of GIS, organizational impacts ,

effectiveness of decision making and impacts of society in both developed and developing countries. The main purpose of this research paper is to describe GIS and to explore how researchers of information system examine this particular technology. The paper lasts with a discussion that defines all those areas where the faculty of information systems can focus their research efforts.

Rob 2003 discussed the applications of Geographical Information Systems in understanding the spatial distribution of Asthma. GIS systems are also used in companies to expand and consolidate the business that exists, market analysis performance and to determine the optimum routes for delivery. This paper uses the GIS system for to illustrate the analysis that should be distributed spatially for the prevalence of asthma among the school students in New York City.

Abalson, Jankowski and Lesniok 2004 performed the research based on the GIS system whose aim is to prepare the thematic maps that should be environmental and hydrographic, whose scope is discussed in this present paper. MapInfo is a software for the creation of both maps in which the screen captures from this software. Both kinds of maps are available in printed versions in 1:50 000 scale. The requirements and usefulness of both these thematic maps in the arena of environmental research is considered as unquestionable and their use guarantee issues which are connected with the environment of a given area. The map values can most probably be over predicted, that is majorly made in the GIS system.

Rusko, Chovanec and Roskova 2010 proposed a paper that describes the GIS data classification of the formats such as vector, raster, relationships, geometric features and the organization of the data structure. This paper have also discussed about how the data of GIS can be further used in applications of GIS with relation to the formats of data that involves the elevation of surface and the slope formation from the model of digital elevation model data (DEM), which has the appropriate application in the water industry. The GIS system is considered as the effective and powerful tool for the purpose of producing the intelligent maps such as systems of storm water and wastewater. The integration is performed by GIS of all the types of information and the applications along with a one system that is manageable and having a geographic component. GIS includes a benefit that it has a ability to divide

and then perform the analysis of all the data spatially to support the process of decision making. The technology of GIS has the capability of integration which is empowering the organizations for better and proper informed decision that is based on all the factors which are relevant.

Awadhi, Shukili and Amri Q 2011, worked on the use of remote sensing and geographical information systems for the identification of vegetation. This study examines the approaches to the vegetation extraction from satellite images and examine each method present within the environment of GIS. They have used three different approaches which are Normalized Difference Vegetation Index (NDVI), supervised classification and unsupervised classification. The examination was done using these three methods.

KM and Patil 2011 suggested a procedure that creates awareness in the world about the overall technology of GIS and also helps in exploring the possible opportunity having competitive advantage. This paper answers most of the questions about the market needs and also tries to define the scope of the methods which are innovative in nature such as GIS as this describes how the technology of GIS uses classical methods and other advance tools which are further then used for the analysis of the site suitability and profiling of the customer.

Baros and Stojanovic 2015 presented their research on Geographic Information System in suspected areas for mine and also describes the ability to provide consideration of the particular displacement of surface because of the severe cases of flooding in Serbia. For the purpose to manage the natural resources in a sustainable way, the accurate information on time is required to make changes in their action. So to fulfill this purpose, it is important to develop a system that will integrate all the data that is relevant to achieve the objective of this paper.

According to **Baig 2017**, a major part of the population residing in Islamabad is vulnerable to

diarrhea, which has recently become a major health program for public. This research is restricted to various residential sectors of city, Islamabad to understand the Diarrhea epidemiology through the residents mapping with the incidence of diarrhea, then several tests were conducted for the cluster detection that is based on the covariate parameters by using Geographic Information System i.e., GIS.

Conclusion

This paper describes GIS and also explores how this systems of information help researchers in examining this technology. All the features, functions and capabilities of GIS system is summarized in this paper along with the GIS various applications .As the GIS is quickly moving into the public sector but the members of the community in information systems research examined this technology actively. In today's scenario, additional information about the GIS management by the phases of implementation and operation of its life cycle is required. This particular research requires to examine the concerns related to the GIS organizational influence, effectiveness of the decision making process and factors or parameters that affect the perception and cognition of human. Some technologies are used to examine the impacts of society on GIS in both the developed countries and the countries who are in the urge of development.

As the GIS has become the vital part of the information systems and some of the issues that involves the spatial components and thus GIS is also been considered as the powerful decision makers that assists in the decision making process. With the increase in the technology that is diffusing into the private sector, the researchers of information systems should be ready to underwrite the expertise to produce a good understanding to this technology..



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