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Exploring The Use Of Geographic Information Systems For Rural Development Under Primary Healthcare

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Abstract
The development of rural areas is an initiative which should hold prime importance in our exponentially growing modern world. Owing to the high demand of better quality, consistency and accurate geographic data in the 20th century we have seen an unprecedented change in how rural development can take place. Areas such as irrigation, soil testing, pest control, impact of urbanization have greatly improved by the use of accurate Geographic Information.
There is a growing agenda to prioritize healthcare and the monitoring of available primary healthcare resources in its raw form, such as the location of medicinal plants and its distribution. Thus using GI we can accurately identify these locations and various other details for use in primary health care in rural areas of the country.

Keywords: Geographic Information, Rural Development, Irrigation, Primary Healthcare, Medicinal plans, Distribution

1. Introduction

A Geographical Information System (GIS) is a system designed to capture, store, manipulate, analyse, manage, and present all types of spatial or geographical data[1].

This technology has gained a vital importance in real time monitoring and development of nations in the 21st century. Students, planner, educationalists, surveyors all use GIS in fields such as medicine, forestry, mining, heath care, agriculture etc. in both rural and urban areas alike. But to ensure the uplifting of the country and with a sustainable development and socio-economic development as well, we need to concentrate primarily on the rural centres around India.

1.1 GIS in India

India maintains a dominant position in the use of spatial imagery. The capabilities in the development of high-

resolution satellites and extensive network of associated infrastructure have contributed to the growing interest in the application of GIS for a variety of India's development needs. Indications are that these applications will continue to grow even more rapidly in the coming years. Since the spatial imagery is becoming easier to use and more affordable, the user base for GIS is expanding in several directions in seeking holistic solutions beyond image processing capabilities [2].

Major states in India have initiated GIS studies to monitor ground water, power transmission and transportation infrastructure and a large number of private firms of Indian and foreign origin have been active a undertaking GIS projects. They have been particularly responsible in introducing in the country instruments, soft wares and educational programmes. Central Mining Research Institute (CMRI), one of the premier laboratory of Council of Scientific and Industrial Research (CSIR) is fully equipped with latest IT related infrastructure and their Scientist are capable for undertaking any GIS related projects of India and abroad. NIC is also providing assistance to several Central, State and Local bodies in fulfilling their specific GIS requirements. For these tasks, acquisition of Global Positioning System (GPS) has been increasing. Despite these noteworthy achievements in GIS in India, there are still some limiting factors that need to be addressed, such as the restrictions on the availability of high-resolution data in sensitive areas, lack of nationwide control points, absence of more convenient repository and retrieval systems and lack of standardization of map scales [2].

2. Description

GIS deals with "SPATIAL DATA" i.e. data which is associated with a location on earth. It has various attributes such as data management, analysis and visualization. This aspect of GIS enables the user to

"view" the project in multiple ways, such as the database view, model view and map view respectively.

2.1 Data Management

This deals with the managing of various kinds of GIS data including vector, raster, images, tables, other data files. It presents various data models and architectures and enables the conversion between such formats. It also provides import and export utilities of such data and interacts with the RDBMS i.e. the SQL server, Oracle.

2.2 Analysis

The analysis phase includes the understanding of spatially aware data and helps to attribute and spatial query the various data models and architectures implemented. We also provide a proximity and overlay of multiple "layers", which utilizes advances geo-processing techniques. A flexible and custom environment can be established as well as the need for decision support. A strong background of programming and scripting to perform analysis is also recommended

2.3 Visualization

Every data model and architecture is now implemented into a pictorial form i.e. a map. This uses open sourced and/or paid soft wares such as QGIS, ARCGIS etc. which are professional cartographic tools. These help to implement raw data into charts, graphs, tables etc. and provides functionalities to read various coordinate systems in 2D and 3D.

After which these can be embedded onto websites or formatted onto desktops or even onto handheld mobile applications on Android, IOS.

2.4 Existing System

Rural development has been a very non-technology oriented approach and only recently has it seen the advent of technology for health care and agricultural purposes. A major handicap in mass application of IT in rural areas is that the information content is generally not directly relevant to people for whom it is developed. The contents are written or designed by people who have themselves not lived in rural areas. As a result, these systems have a heavy urban-bias.

A GIS repository with spatial database of herbal plants and its clinical uses is very rudimentary and is not viable at a local level. Such data is non-structured and variable across districts of Karnataka.

2.5 Proposed System

A database of the medicinal plants and traditional healthcare services around centres of large population would be effective in monitoring as well as integrating traditional community health knowledge and practises with modern science.

Taluk level inventory of medicinal plants and knowledge documentation would help not only in curing but preventing of common illness such as fever, acidity as well as help physicians refer for more complex remedies or request help via an online communication portal.

Fig.1 Basic GIS block diagram

The basic GIS block diagrams depicts how the raw data collected at the source and managed via various data management soft wares and accessibility of spatial data is controlled on desktop and mobile clients by the use of web browsers or applications. The rendering of raw data is done by spatial data compiling soft wares which splits and organizes into multiple "layers".

2.6 Data flow in GIS

The data flow describes the complex data interactions between various sources of data, its compilation and rendering. We utilize various internal and external sources so aggregate the multiple points of interests as well as the availability of localised plant data and its clinical uses.

External data sources consists of various points of interests such as hospitals, schools waste dumping sites and location of primary health centres as well as geographic latitude and longitude markers of plant distribution.

Data is collected as stored onto servers or small modular databases with specific information on the POI and it can be retrieved as and when required dynamically.

When we refer to clinical usage, it is crucial to get the medicinal properties of herbal plants to be 100% accurate due to its impending social implications. Thus government aided or privately funded organizations who maintain such data comes into picture. ENVIS, I-AIM are few such organizations which provide detailed information on Ayurvedic herbal plants located in India [3].

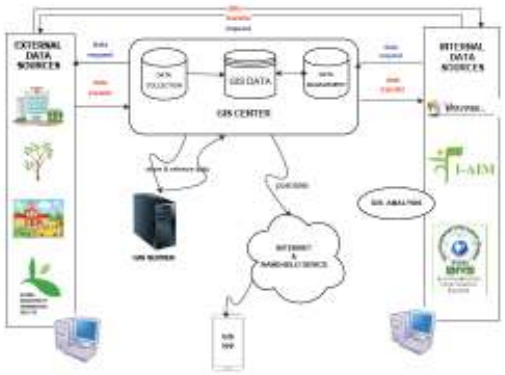

Fig.2 GIS data flow diagram

The extensive use of GIS over the decades has been put to a question mark whether to shift it to more superior alternative i.e. Cloud Computing Paradigm. Geographic Information Systems (GIS) applications have been moving into the cloud with increased drive, Global organizations like ESRI, GIS Cloud Ltd have already taken the quantum leap and taken a technological shift to Cloud Computing Paradigm and are committed to provide on-demand services to their extensive shades of users. World's largest GIS Cloud infrastructure providers are Amazon (Amazon EC2 & S3), Microsoft (Microsoft Windows Azure, Windows Server Hyper-V), and IBM (IBM Cloud) which provide reliable and secure cloud IT infrastructure to the customers on-demand [4].

GIS enables the monitoring various POI's such as railways [5] and its extensive pattern over India as well as rivers, lakes and distribution of rare animal species in controlled environments [6].

3. Conclusion

Thus, utilizing such monitoring technology we can ensure the proper conditioning and development of rural areas and rationalize the Health Services Infrastructure to serve allocated population via the use of cloud infrastructure GIS and presents a strong contender when compared to traditional and more manually oriented healthcare services. The use of IT technology is at its peak, utilizing such vast resources to the benefit of the people at large. Applying GIS to commonly available community- and patient-level data can rapidly identify areas most in need of increased access to primary care services.

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