Web based Geo-Spatial Village Information System

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ABSTRACT

The geographical technologies have potential to assist in planning, monitoring and exchange of information between various agencies in Rural Development administration. This study describes the decision-making based on their existing resources and capabilities. A study was undertaken in Tallasingaram village, Chotuppal Mandal, Nalgonda district, Telangana state to demonstrate the integration of village-level spatial and non-spatial data into a useful tool called geo-spatial village information system (GSVIS) for decentralized planning. This simple and robust tool will assist the decision-makers to generate various ecological and socio-economic views for identifying villages for prescriptive and executive level planning. The study also envisages future development and usefulness of this community-level geo-spatial tool for grass-root planning.

*Keywords:*GIS, GPS, remote sensing, Open source software's, decision support system, rural development, village level information system.

INTRODUCTION

India is a nation of villages. The rural mass in the nation comprises the core of Indian society and also represents the real India. The government of India has started many programs aimed at improving the standard of living in villages or rural areas [1]. An information system is required which contain both spatial and non-spatial data comprises of all information related to facilities, infrastructure, population, cropping area, natural resources, weather information etc., at village level to give planning and development a more effective and meaningful direction, at micro level.

The rapid development and integration of spatial technologies such as Geographic Information Systems (GIS), Global Positioning System (GPS), and Remote Sensing (RS) have been created many new tools for spatial decision support systems. GIS applications enable the storage, management, and analysis of large quantities of spatially distributed data. These data are associated with their respective geographic features. A GIS can manage different data types occupying the same geographic space. GPS is a satellite and ground-based radio navigation and locational system that enables the user to determine very accurate locations on the surface of the Earth. Remote sensing technologies are used to gather information about the surface of the earth from a distant platform, usually a satellite or airborne sensor. Most remotely sensed data used for mapping and spatial analysis is collected as reflected electromagnetic radiation, which is processed into a digital image that can be overlaid with other spatial data [2]. With these emerging technologies can reduce the time and cost to the planners in organizing the data and coming to precise conclusion and decision. The sustainable development challenge is to optimize often conflicting needs and demands.

The main objective of this geo-spatial village information system (GSVIS) is to develop a village database providing complete information for decision-making based on their existing resources and capabilities. This database has been developed in order to generate maps, which would provide relevant information for developmental activities and also act as source information authentication about the village. These informations are needed to analyze the existing scenario at the development stage in the village. Its provides detailed spatial information pertaining to demography infrastructure and natural resource for a particular village. This geo-spatial database is then analyzed in a web GIS platform to create thematic maps, once the maps are ready they are published over Internet on a user friendly interface. User can browse through the interactive maps and get detailed information on spatial data, user can also create queries to get some specific data, print maps and so on. This information system can support the planners in information retrieval by integrating the spatial and non-spatial data.

Study Area

The village Tallasingaram lies between 17.250 N to 17.270 N latitude to 78.917 E to 78.920 E longitude covering an area of 1455.24 acres. It is situated on the NH 9 highway about 52.7 km from Hyderabad city, Nalgonda district, Telangana State (Fig.1). In Tallagingaram village agriculture is the dominant land use type and is the prominent occupation of the villagers. Total village population is 1597 and the total households are 389. Total literacy of the village is (64.18%).

METHODOLOGY

In this study, both primary and secondary data is used to develop this GSVIS (Fig.2). Secondary data like Survey of India toposheet (56 K/15/SE) with 1:25,000 scale and Cadastral map of the village was acquired from concerned departments.

The household level information related to population and household size, land use, type of housing, electricity, farm machinery, vehicles, accessibility to water and occupation of the households was collected during field survey using Participatory Rural Appraisal (PRA) techniques method and afterwards, transferred on the map.

PRA

It is a way of learning from, and with, community members to investigate, and evaluate constraints and opportunities and make timely decisions regarding development projects. It is a method by which a research team can quickly and systematically collect information for the general analysis of specific topic, question, or problem, needs assessment, feasibility studies, identifying and prioritizing projects, and finally, the project evaluation. The PRA tools are implemented to achieve increased accuracy at low costs both in terms of time and money. Participatory appraisals methods are useful for accelerated knowledge, not just overall speed, but rapid rounds of field relations that result in the increasingly precise knowledge [3, 4]. Participation is the process through which stakeholders influence and share control over priority setting, policy-making Resource allocation and access to public [5].

Geospatial data include geographic coordinates that identify a specific location on the Earth and data that are linked to geographic locations or have a geospatial component like socio-economic data, land records, land surveys, crop pattern information etc., Free Open Source Software's (FOSS) are those software that have licenses that allow users to freely run the program for any purpose, modify the program as they want and also to freely distribute copies of either the original version or their own modified version [6].

Quantum GIS (QGIS): QGIS is a Geographic Information System that runs on Linux, Unix, Mac OS X, and Windows. The QGIS supports vector, raster, and database formats. It can access databases like PostGIS, in addition to the dozens of other vector and raster formats. It supports feature labeling and has a great user community. Extensibility is provided through a plugin environment [7].

PostgreSQL: It is an object-relational database management system (ORDBMS) based on POSTGRES, developed at the University of California at Berkeley Computer Science Department. POSTGRES pioneered many concepts that became available only in some commercial database systems much later. PostgreSQL is an open-source descendant of this original Berkeley code. It supports a large part of the SQL standard and offers many modern features: complex queries, foreign keys, triggers, views, transactional integrity, multi version concurrency control [8].

PostGIS: It adds support for geographic objects to the PostgreSQL object-relational database. In effect, PostGIS 'spatially enables' the PostgreSQL server, allowing it to be used as a backend spatial database for GIS, much like ESRI's SDE or Oracle's spatial extension. PostGIS follows the OpenGIS 'Simple Features Specification for SQL' and has been certified as compliant with the 'Types and Functions' profile [9].

GeoServer: It is an open source software server written in Java that allows users to share and edit geospatial data. Designed for interoperability, it publishes data from any major spatial data source using open standards. Being a community-driven project, GeoServer is developed, tested, and supported by a diverse group of individuals and organizations from around the world. GeoServer is the reference implementation of the Open Geospatial Consortium (OGC), Web Feature Service (WFS) and Web Coverage Service (WCS) standards, as well as a high performance certified compliant Web Map Service (WMS). GeoServer forms a core component of the Geospatial Web [10].

Expression Web: Expression Web is a full-featured professional tool for designing, developing, and publishing compelling, feature-rich, high-quality, standards-based websites. Its supports sophisticated CSS design capabilities and visual diagnostic tools. It provide a platform for user to work with PHP, HTML/XHTML, JavaScript, ASP.NET or ASP.NET AJAX to makes faster and easier web sites [11].

HTML: Hyper Text Markup Language (HTML), the main markup language for web pages was used for scripting. Usually HTML elements are the basic building-blocks of web pages and allow images/objects embedding to create interactive forms. It provides a means to create structured documents by denoting structural semantics for text such as headings, paragraphs, lists, links, quotes and other items. It can embed scripts in languages such as JavaScript which affect the behavior of HTML web pages [12].

JavaScript: JavaScript is a prototype-based scripting language that is dynamic, weakly typed and has first-class functions. It is a multi-paradigm language, supporting object-oriented, imperative, and functional programming styles. JavaScript was formalized in the ECMA Script language standard and is primarily used in the form of client-side JavaScript, implemented as part of a Web browser in order to provide enhanced user interfaces and dynamic websites. This enables programmatic access to computational objects within a host environment [13].

Leaflet: It is the leading open-source JavaScript library for mobile-friendly interactive maps. It has all the mapping features most developers ever need. Leaflet is designed with *simplicity*, *performance* and *usability* in mind. It works efficiently across all major desktop and mobile platforms, can be extended with lots of plugins, has a beautiful, easy to use and well-documented API and a simple, readable source code [14].

GeoJSON: It is an open standard format for encoding collections of simple geographical features along with their non-spatial attributes using JavaScript Object Notation. The features include Point, LineString, Polygon, MultiPoint, MultiLineString, and MultiPolygon. GeoJSON features need not represent entities of the physical world only, It also describes the mobile routing and navigation apps service coverage using GeoJSON [15, 16].

Results and Discussion

An attempt has been made to develop GSVIS model to integrate spatial village maps with data of soil, weather, crop, farmers socio-economic, census etc., to generate a GIS-based decision support system for grass root level rural development planning. GSVIS model will provides cadastral level former information, soil type, soil nutrient information, drainage system, crop information along with historical data. With these data GSVIS decision support system will guide farmers to what to grow, when to grow and right time for applying agricultural inputs etc., Using these ready reckoner database, set of maps can be produced to assist decision-making on various aspects of the rural management in the village.

A web based Graphical User Interface provides very comprehensive and fast access to information on both graphically and non-graphically. This makes the system more robust in terms of its communication with a variety of users and also the village informatics are now spatially part of a common coordinated system, a number of useful combinations can be performed (Fig. 3).

Conclusion

For the development of a web based information system, large volume of data is gathered and integrated within GSVIS. Village information system is the study of village at micro level with help of GIS, RS, GPS and web technologies make this work easier. The forming and sustaining of the information systems in an effective manner depends on construction of up-to-date and accurate base map in digital environment. High spatial resolution satellite data shows the potential in the development of parcel level base map, which is a common data source for information systems. It supports to fulfill a range of planning tasks in an appropriate way at blocks, districts and even at higher levels. The demand for rapid information is encouraging the development of new instruments and takes advantage of the rapid advancement in computer and information technology.

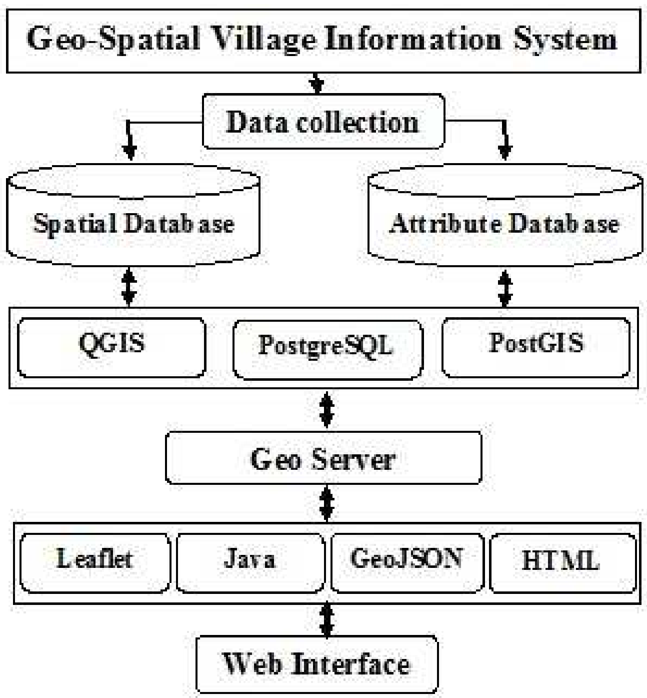

Fig. 1: Architechture of GSVIS

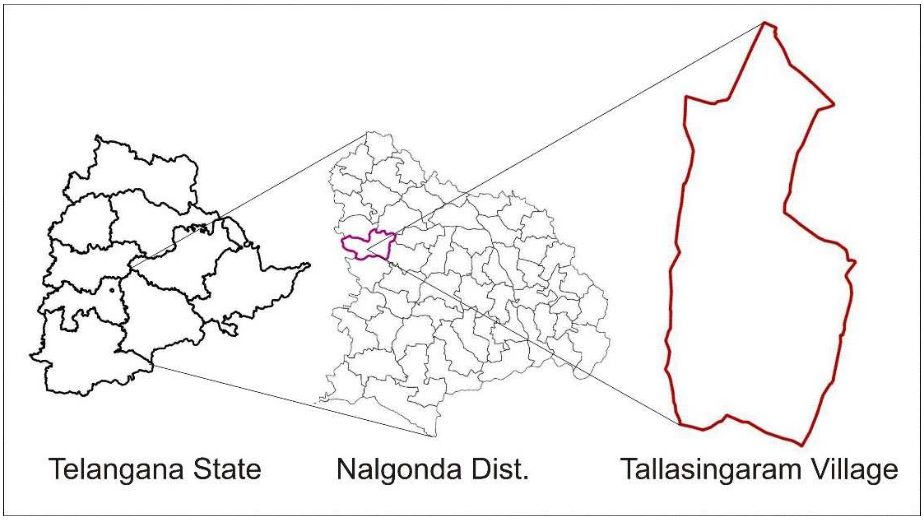

Fig. 2: Study area

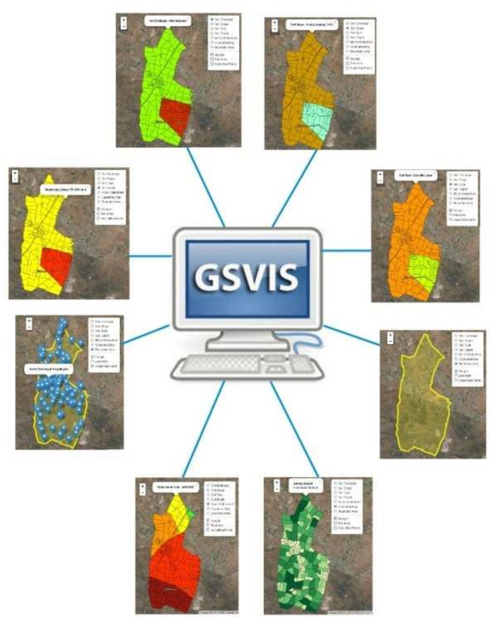

Fig. 3: GSVIS web interface

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Mobile Communication for the Conservation of the Ecosystem in Pulicatlake

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ABSTRACT

Pulicat Lake is the second largest brackish water lagoon after Chilika Lake of Odisha along the east coast of India. Estuaries and lagoons have brackish water that shows high biological productivity than foreshore seawater. Hence it has wide range of aquatic, terrestrial flora and fauna. The World Wide Fund for Nature has declared it as a protected area. The present study aims to explore the flora and fauna of the lagoon along with the various threats for its eco-degradation to help plan conservation methods. The lake spreads over an area of about 620 km and numerous islands lie in it. Out of the total area of the lake, about 360 km in the southern part is active whereas the rest of the lake is in its northern part is desiccated and now it appears more or less like a mudflat. It has 20 islands, the largest being Sriharikota Island. The other large ones are Pernadu, Irrakam and Venadu. Three major rivers that feed the lagoon are the Araniriver, the Kalangi river and the Swarmukhi river. The Buckingham Canal, a navigation channel, is part of the lagoon on its western