Geo-Search using web services for Rural Madhya Pradesh

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Abstract:

Mahatma Gandhi advocated Panchayati Raj, a decentralized form of Government where each village is responsible for its own affairs, as the foundation of India’s political system. The Ministry of Panchayati Raj is responsible for Panchayati Raj under the Constitution (73rd Amendment) Act, 1992.

Madhya Pradesh is a large state with 55,393 (Census’2001) villages and more than 22,000 Gram Panchayats. Facility for identification of location of a Village/Panchayat in the state along with its neighborhood details using modern ICT tools can facilitate decision support & planning.

This paper aims to describe the development of 'GeoSearch' (Internet Geomatics-based Application for Village/Panchayat search) which can facilitate identification of the location of a Village/Panchayat in the entire state. GeoSearch is based on Service Oriented Architecture (SOA) using web services and Flex technology. It is a G2G & G2C solution which has access via internet http://gismp.nic.in/GeoSearch available in public domain.

GeoSearch uses Enterprise GeoDatabase on villages, Panchayats and major road network. It facilitates display of Village/Panchayat on map on providing its first three letters. Panchayat is displayed along with its constituent villages. Online distance can be measured (aerial as well as traversed) between selected locations, area calculation of user-specified circle, polygon and profile of villages/ Panchayats are some of the salient features of this open-ended system.

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Introduction

Panchayati Raj is a decentralized form of Government where each village is responsible for its own affairs, as the foundation of India’s political system. Through the 73rd Amendment in 1992 on April 23, 1993 the Institution of Panchayati Raj was accorded the Constitutional status. Thus Constitution (73rd Amendment) Act, 1992 mandates provisions for:

- Establishment of a three-tier structure (Village Panchayat, Panchayat Samiti or intermediate level Panchayat and Zilla Parishad or district level Panchayat).
- Establishment of Gram Sabhas at the village level.
- Regular elections to Panchayats every five years.
- Proportionate seat reservation for SCs/STs.
- Reservation of not less than 1/3 seats for women.
- Constitution of State Finance Commissions to recommended measures to improve the finances of Panchayats.
- Constitution of State Election Commission, etc.

The Ministry of Panchayati Raj, which came into existence on 27th May 2004 looks after all the matters relating to Panchayati Raj. The Ministry is responsible for the work of advocacy for and monitoring of the implementation of Constitution (73rd Amendment) Act, 1992 and the Provisions of the Panchayats (Extension to the Scheduled Areas) Act, 1996, to ensure that the State Panchayati Raj Acts adhere to the provisions of the above mentioned two Acts and are implemented in letter and spirit. The Ministry attaches great importance to the capacity building of elected representatives and officials of PRIs as well as functionaries involved in the Rural Development Program.

Looking to the importance of Panchayats in a Panchayati Raj, identification of Panchayats and their constitution becomes very important. In present scenario village level data is maintained in the form of tables/tabular reports but the geo-graphical locations of villages along with other spatial features (road, forest, railway, rivers etc.) are not available. Constitution of Panchayats should be such that all the villages covered in the Panchayat should be in the neighborhood for effective & efficient implementation & monitoring of various schemes.

Role of GIS in Planning & Management

The governance process, which involves the use of geo-information (spatial) & communication technologies (Geo-ICTs), can be called G-Governance. The Geo-ICT encompasses synergy & convergence of technologies dealing several aspects of spatial data management including data acquisition, assimilation, analysis, information generation, decision support & information dissemination.. Most of the economic, social & environmental processes are inherently spatial. Decision-makers have to sieve through a large amount of data. Perception of spatial information – information in map format, with proper scales, legend, symbolization, colors etc. enhance the understanding of information interrelationships and thus contribute to more appropriate location-specific development strategy definition. Hence Geo-ICT becomes essential in such scenario & thus role of G-Governance becomes far more important when governance of citizen-centric socio-economic development is taken into account.

Identifying the emphasis and essence of spatial component in Panchayati Raj & the expertise of Geomatics Division, National Informatics Centre (NIC) M.P. in the development of enterprise Geomatics-based solutions, development of GeoSearch was initiated.
Birth of a Solution

Need is felt amongst the decision makers & planners for a digital system which may facilitate the search of any village/ Panchayat of the state of Madhya Pradesh geographically, verify the constitution of Panchayats based on the proximity / distance. As of now, there is no such system available on the web. Thus it was envisaged to develop such system & make it available on public domain with no restriction.

It is in this context Geomatics Division of NIC M.P. took initiatives & offered GeoSearch, a web-based solution for searching the location of a Village/Panchayat in the entire state of Madhya Pradesh.

Development Methodology

**Study Area**
The study area covers entire forest area in the of Madhya Pradesh. It is created using the geographical extents and true origin (74o N 21o E) of the state of Madhya Pradesh.

**Spatial Data Dictionary**
As per the requirements, base features viz., Village/Panchayat locations and major Roads of the state are identified as main entities in the spatial data dictionary. These features represent the essential components of spatial database over which non-spatial information is superimposed for display purpose.

**Spatial Database Creation**
As per the methodology and guidelines described above, state-of-the-art ArcGIS 10 has been used for creation of the required spatial database in digital form. The digital information is stored in the enterprise GeoDatabase appropriately in the form of layers, each layer representing a unique entity in the spatial data dictionary.

**GIS Platform**
ESRI ArcGIS Server 10 provides a standard framework for developing Web-based GIS applications. It allows you to share your GIS resources across an enterprise and across the web. ArcGIS Server provides SOA architecture & same has been utilized for the development of GeoSearch.

**Development Environment**
Application is built under Adobe Flash Builder (version 4.3) framework environment using ArcObjects API. Apache Tom Cat 6.0.20/ JBOSS are the Web Servers. MS Sql Server is chosen as GeoDatabase. Eclipse (Version 3.5.1) is the development IDE using Java Version 1.6.0_17.

**Deployment Environment**

**Software**
ArcGIS Server 10
Enterprise GeoDatabase – MS Sql Server
Application Web Server JBOSS
Java Runtime Environment 6
OGC compliant WMS (Web Map Service)

**Hardware**
Rack-mounted server
Dual Core Processor
Salient Features

The following are some of the salient features of GeoSearch.

- **Easy Remote Access**

  GeoSearch is an internet-based application in the public domain (http://gismp.nic.in) where a user sitting at any remote location is able to access the application through internet. User need to have only computer having high speed internet connection.

- **Open-ended Design**

  Presently, it exhibits basic attributes attached with Villages/Panchayat for illustrative purpose only. However, GeoSearch offers a seamless integration of any additional thematic feature/attribute owing to its open-ended design.

- **Search**

  This option facilitates search of a Village/Panchayat in M.P. User has to provide minimum three characters of the desired village. List of villages matching with given criterion appears along with their block name & district name as shown in Fig 1. On selection of desired village, its location along with its neighboring villages appears on the screen. Similarly any Panchayat in M.P. state can also be located. With Panchayat location, the villages covered under this Panchayat are also highlighted. Fig. 2 depicts spread of a Panchayat.

![Fig 1: Selection of a village](image)
• **Display of Profile**

Profile is a template containing a set of predefined attributes of various entities like Village name, Panchayat Name, total population, SC/ST etc. of a village. User can view the profile of the village by clicking on the map as shown in Fig. 3.

• **Built-in Traverse-aid**

GeoSearch has a built-in traverse-aid which can be used for calculation of distances. It provides facility to measure distance between two points by drawing a line between them. In addition user can also freely traverse on map and find length of total traversed path as shown in Fig. 4.

• **Area Measurement**

It facilitates measurement of user defined area. User has option to draw a definite shape like circle/ellipse/polygon of any size around a selected location and obtain its area. Facility for construction a free hand polygon and obtaining its area is also available. Fig. 5 shows area calculation.

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**Fig 2: Display of Village Profile**

- Village information:
  - Village Name: Anasawada
  - Panchayat Name: Anasawada
  - Block Name: Kalmansari (Ghasrau)
  - District Name: Soneri
  - Census Code (2001): 05296500
  - NIC/ECG Code: 49194
  - SC/ST Population (%): 8.4

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**Fig 5 shows area calculation.**
Fig 3: Spread of a Panchayat

Fig 4: Distance Measurement
Fig 5: Area Measurement

Fig 6: Anomaly in constitution of Panchayat.
• **Verification of Panchayat formation**
  Thematic map Fig. 6 shows that the spread of villages in a Panchayat is not suitable / appropriate. Such anomalies / errors may be brought into the notice of decision makers for corrections. This way Decision makers can harness the potential of GeoSearch for various planning activity.

• **Legend**
  It helps the user to correctly read the map by providing information about the spatial features/symbols/ colours being displayed on the map.

• **Scale-based display of Labels**
  System is designed such that labels ( Village name, Road name etc. ) start appearing once a particular scale/Zoom is attained. This provides convenience to the user to read the map.

• **Printing Facility**
  The displayed map can be printed on the attached printer.

• **User-friendly Interface**
  GeoSearch provides an interactive and user-friendly interface and it does not require any GIS expertise for its operation. Help option illustrates step-by-step procedure on use of various functions available in the application.

• **SOA Architecture & OGC compliant**
  Service oriented arch. facilitates spatial data sharing amongst the govt. dept.

**Conclusion**

In a world where about 80 % of data has a geographical component, the geo-spatial context forms as important aspect of human knowledge, information interpretation, reasoning and decision making. Thus in all areas of governance, where there is a special emphasis on spatial dimensions, its G-Governance (Geomatics-Governance) coupled with emerging Spatial technology. It provides not only decision support system (DSS) for macro-level planning but also state-of-the-art models to the government in the context of decentralized planning for sustainable development. Digital system provides timely, accurate, and easier way of acquiring information, which are very vital in taking prompt and accurate decisions necessary in the development of any sector.

GeoSearch is an Internet Geomatics-based application to search Village/Panchayat developed by Government of India, Dept. of Information Technology, Geomatics Division, National Informatics Centre, M.P. State Centre, India for any user in public domain. It is concluded that OGC compliant Enterprise DSS on SOA architecture can be built in a cost-effective manner and it can play vital role in providing basic information to a end user in a very convenient manner. The easy availability of such information empowers citizen to planner. Open ended architecture enables accumulation of information /resources from different department/sources and its dissemination through a single platform.

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