Online Query-Based Information System Using GIS Model for Rural Development of Chhattisgarh

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Article History: Received: 05.10.2022 **Revised:** 23.12.2022 **Accepted:** 17.1.2023

Abstract

One of India's most fertile states is Chhattisgarh. Despite having agricultural land as its main economic driver, Chhattisgarh's rural sections are nevertheless lacking in technical advancements. The Chhattisgarh villages' cadastre boundaries need to be updated because they are extremely ancient. For the development of Chhattisgarh's rural regions, our work is based on the integration of the Global Positioning System (GPS) and Geographical Information System (GIS). We created a survey map, gathered the village's spatial picture, and geo-referenced the mussavi, or conventional map, which was created by the tax department during consolidation. For the validation of the area of calculated field boundaries, we employed GPS survey and the Field Measurement Book (FMB). To determine the discrepancy between the village's real borders and its position in the old revenue records system, which necessitates frequent updates in cadaster maps, a comparative study of these three was prepared. To represent physical objects and the mapping of spatial images with rural databases of villages, a web-based GIS model using a content management system (CMS) has been developed. This model includes assigning a unique property id, updating birth and death records, tracking the status of government programmers utilized by the villages, updating their crops detail, among other things. For the execution of government programmers and disaster management in rural regions, our study will serve as the foundation. Using the case study of the hamlet of Patan, this essay advises using these GIS and GPS methods..

Keywords-*Geographical Information System, (GIS); Geographical Positioning System (GPS), Field Book Mesuarment (FMB), Content Management System (CMS)*

I. INTRODUCTION

Most of India's land registrations and cadastre maps are still maintained manually. These two-dimensional cadastre maps are still in use for administrative and disaster management purposes, despite being created using outdated methods of measuring including tape measurement and chain measurement. Land consolidation information in the Indian state of Punjab was recorded in mussavis and revenue officials' registers. These land parcels are fairly ancient and in need of updating due to the possible movement of villagers and their property lines. New opportunities for updating these cadastre maps have opened up with the development of GIS and GPS technology and the availability of satellite imageries. We used a GPS survey, georeferenced village maps, and gathered spatial photographs of the area as part of our research. Our research has shown a discrepancy between the old income records system and the real limits of the village. To better depict physical bodies and connect spatial images with rural databases, a web-based GIS model was developed. The web-based GIS model also includes elements like the ability to update information such as birth and death certificates, the availability of government programmers in the villages, agricultural information, and more. This article suggests using E- governance at the rural level to better map land and resources.

II. ReviewofLiterature

As fallows, we evaluate the current literature on using GIS for rural development planning and on using Web-enabled GIS information systems in various locations.

Coplanar Concurrent Theory has been used to explore Rural Infrastructure Planning with a focus on road network connection, as proposed by Dr. K. M. Lakshmana Rao, Head, Centre for Transportation Engineering, IPGSR, Jawaharlal Nehru Technological University (2003). When it comes to rural development, agriculture, healthcare, education, forestry, fisheries, small-scale enterprises, trade, commerce, etc. all rely on efficient lines of communication, making rural roads an essential component. The infrastructure for moving people and goods around in rural areas will have a significant impact on the quality of life in these communities. Rural traffic infrastructure, which should be prepared for the extent of land growth, may be created through the appropriate combination of multiple linkages, both technically and economically.

The Bhuvan project is an effort to demonstrate the imaging capabilities of India, with a particular emphasis on the Indian subcontinent but also providing worldwide coverage. It is an ambitious initiative of the Indian Space Research Organization (ISRO) to bring Indian imagery and other value-added services in different spatial resolutions to the people of India through a web geoportal with the purpose of facilitating simple access to information on fundamental natural resources in the geospatial domain..

e-MANCHITRA-Dr.L.R.Yadav By creating themed atlases at the village, block, district, divisional, and state level based on SPIDER indicators, the project attempts to eliminate the inter-regional discrepancies that continue to be an issue in the decentralisation process. This grants more responsibility and power to the local bodies, allowing them to more effectively execute and supervise development plans. This assists in minimising the time lag, increasing the consistency and correctness of the data, increasing the cost efficiency, and increasing the transparency, which ultimately facilitates the superimposition of multiple layers on the same administrative unit..

KurukshetraVIS, There is information on the village's Tehsil, Sub-Tehsil, Kanungo Circle, Patwar Circle, Block, Gram Panchayat, Parliamentary, and Assembly Constituency that can be found in the Village Information System. One is able to obtain information on the Veterinary Hospital, the Health Sub Centre, the PHC/CHC, the Hospital, the Schools, the Electricity SDO/Sub Centre/Complaint Centre, the Panchayat Ghar, the AnganwariCentres, the Talab, the Stadium, and the Chaupals. The additional information that is readily available includes statistical data regarding the Total Area, Cultivable and Non-Cultivable Area, Population (males and females), Voters, Pensioners list, and Cattles, etc. On the system, you may view a list of the development projects that are currently being carried out by the Panchayat department as part of several programmes. These programmes include the Indira Gandhi AwasYojna, the Chief Minister BPL AwasYojna, the IAY Scheme, the TSC, MNERGA, and the Public Health Department.

RWASH
Rob Nieuwenhuis presented a talk in which he explained the sector online and GIS based Management Information System and how this system will be effective for making choices in Nepal's Rural Water Supply, Sanitation, and Hygiene. It is possible to access data in the form of maps or reports at any geographical level of your choosing. (from ward or scheme level up to national level). In the DSS section, you may use the filters and sorting tools to build tables for your analysis. It is possible to print or export any of the available maps, reports, or tables..

GIS Based Modeling for Rural Infrastructure Planning
Dr. S. K. Ghosh, an associate professor of civil engineering at the Indian Institute of Technology, and his colleagues (2004), with funding from the Department of Science and Technology in New Delhi, have created a strategic GIS-based model for the development of rural infrastructure. these ideas have been challenged. In the Indian state of Uttarakhand, the Laksar block of the Haridwar district has been chosen as the location for the development of the prototype model..

Aweb-basedapplicationforreal-timeGIS:
by O. Ozdilek, a, *, D. Z. Seker, Institute of Technology, Faculty of Civil Engineering, Maslak Istanbul, Turkey. Forecasting is important for everyone and everything that lives on earth since the weather is a statement of the current physical circumstances at that precise moment. As a consequence of this, weather forecasting has been an area of significant interest for physical scientists from the beginning of time. (Saseendran, 2003).

Web-based GIS and spatial decision support systemwatershedmanagement:

Richard L. Farnsworth, Jin-Yong Choi, and Bernard A. Engel are the authors of this study. The links between information technology and DSS for hydrologic and water quality studies are investigated throughout this study. In addition to this, a

conceptual framework for a web-based SDSS is described below in terms of the system components. In addition, a web-based watershed management SDSS that has been running based on this framework and making use of web-GIS for watershed delineation, map interfaces, and data preparation, a hydrologic model for hydrologic/water quality impact analysis, and web interface programmers for operation over the Internet has been developed..

III. METHODOLOGY

We have broken down our technique into four distinct steps: collecting the data, processing the data, analyzing the data, and reporting the results. During the process of collecting data, primary data has been gathered by locating control sites and carrying out field surveys. Secondary data has been gathered through the use of satellite photos, Google maps, traditional maps (mussavis), and census data. Following the completion of the data collection, we vectorized the maps using Auto CAD and continued our analysis using the free GIS programmer QGIS..

DataCollection

It was essential, prior to the design and development of an appropriate web-based GIS, to determine the actual needs of both the rural community and the district administration. An activity for this purpose was thus carried out, and it took the shape of conversations, surveys, and workshops with the Panchayat of the village and the inhabitants of the village..

Digitizingthedata

The traditional map of the village, known as the mussavi, was digitised using AutoCAD, and then other geographical features, such as roads, buildings, and bodies of water, were drawn on top of the digitisedmussavi. We determined the locations of control sites and carried out a survey of the community using GPS and field survey equipment..

User Management

The web-based Rural GIS that has been suggested here is a safe system that was built using Drupal, which is an open source content management system (CMS), in conjunction with the PHP programming language. In order to generate a variety of various scenarios in the form of shape files, the Quantum GIS programme is utilised. At various tiers, a variety of login identifiers have been made available..

IV. Database Management and reports

The database of the proposed system includes things like survey information, satellite photos, and topography data, among other things. We have created the database with Post GIS, and its architecture is a three-tiered design. During the process of creating the database, there was a focus on ensuring that it could be easily integrated with the database of the Punjab state land record administration system. This database is being administered at the village level at the moment, but it has the potential to be expanded to the district level and the state level as well. The user is able to search for non-spatial data by using a variety of queries that are made available in the web-based system, and the system generates a customized output in the form of reports in a web interface that is developed using the languages JSP and PHP.

The following is an outline of the numerous activities that will be carried out in accordance with this model developed by Google:

1. Discuss and then retrieve the relevant information in order to arrive at choices together.
2. To produce an integrated geo-referenced map of the community that shows physical points such as street lights, schools, hospitals, ponds and rivers, railway track, etc.
3. The digitization of cadastral maps through the use of satellite imagery and the integration of this information with the other informatics of the village, such as the birth and death records, etc.
4. Conduct helpful searches in the database pertaining to land parcels, village entities, various rural development programs, village residents' property details, crop details, birth and death records, and so on..

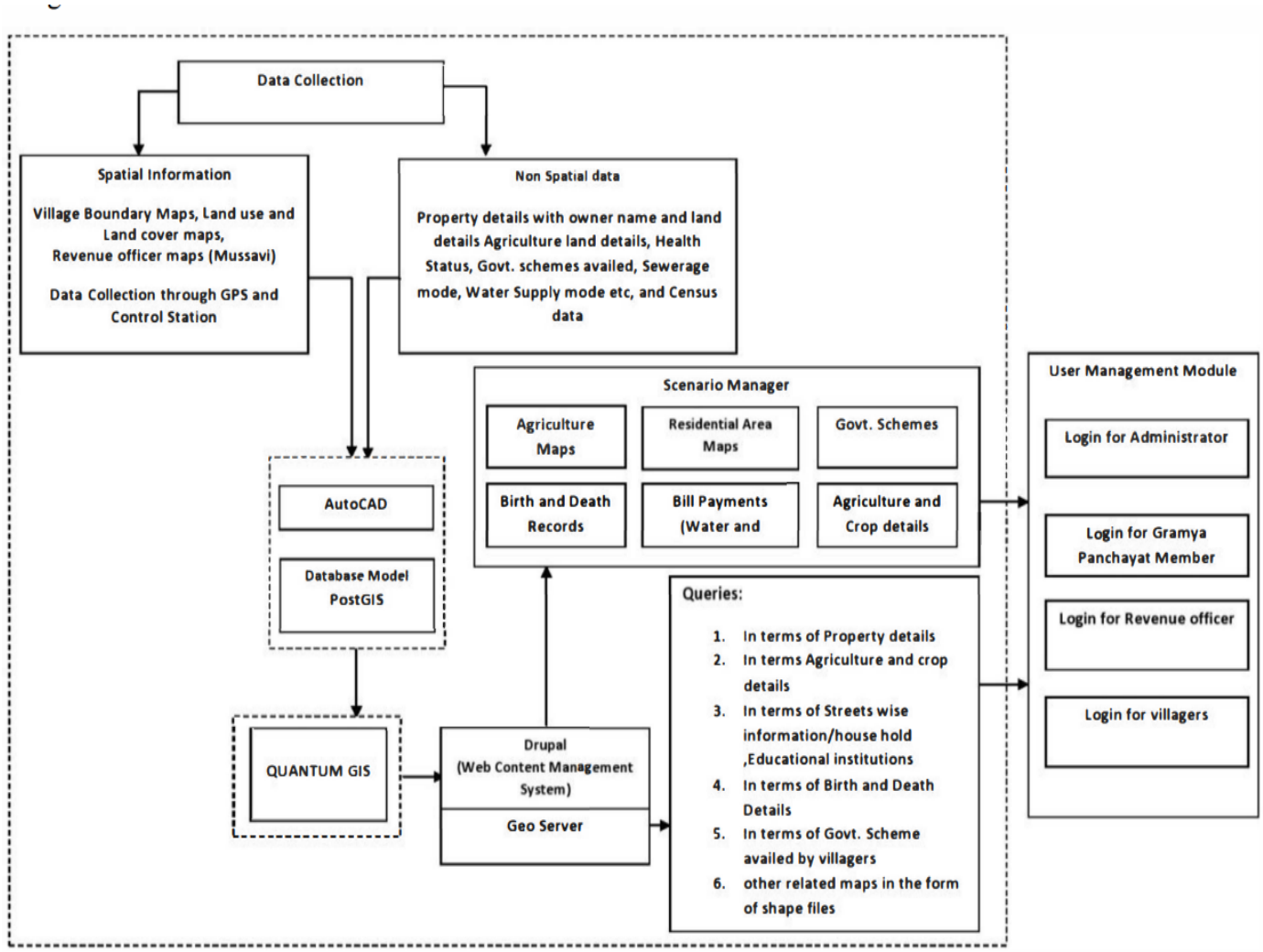
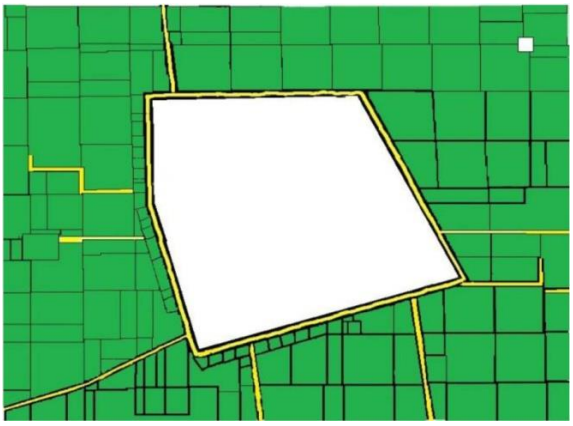


Fig 1: Village Model Based on GIS

STUDYAREA
Wehave chosen village for conducting ourprimarydatasurvey

Fig2:MapofvillagePatanas perrevenuerecord



The population of the community is quite close to 3500 people. The majority of the villagers make their living from farming, while the rest of them find work in a variety of different service industries. The residential area of the settlement is 2.6 square kilometers, while the agricultural area is 5 square kilometres. Patan. The current mussavi, also known as a manual map, of the village was obtained from the revenue officials as a first step. Following that, the CAD programme was used to construct the village's physical borders as well as other geographical features.
When we were gathering information regarding the area's roadways, water bodies, and other features, we also used toposheets as a reference. We georeferenced a picture that had been registered with the field borders using a spatial image of the settlement that had been obtained from Google.
picture with georeferenced coordinates and GPS data were compared. In order to determine the distance that separated the two regions, we further matched geo-referenced images using Field Measurement Books (FMB). In addition to this, we carried out the survey of the village boundaries and compared the GPS survey to the geo-referenced mussavi. Therefore, it is necessary to revise the village mustavi in accordance with the revised limits of the village. Following a comparison of the numerous control sites we found in the hamlet with the FMB, we were able to locate the gap that is depicted in figure. A comparison of these three demonstrates the disparity between the actual boundaries of the village and its status in the traditional revenue record system. This difference leads to the conclusion that changes on the ground should be incorporated into the revenue record on a regular basis, as well as an update of the village boundary.
As part of the process of constructing the database for the web-based model of the town, we gathered the specifics of each property in the village, such as agricultural land and other bodies such as houses, ponds, schools, and hospitals, and we gave each land parcel its own unique property id. In the course of the survey that was carried out, each home in the village was visited in order to gather information on the owners' records, the identification of birth and death records, as well as the economic, educational, and health circumstances of each villager.

Because of this, the government will have a better idea of how to formulate future health policies for rural regions, and we will have a better understanding of the factors that contribute to disease in a certain region. We have identified villagers who are suffering from serious ailments such as heart disease and cancer. In addition to this, we documented the numerous government programmes that each villager participated in. In this way, our model will be useful to the government, regardless of whether these initiatives are really implemented at the ground level or their status. For the purpose of digitising this data, a data entry software module that was built on ASP.NET was developed. The model of the database has a total of 30 tables. A main key that is 14 digits long and was constructed with the suggestions of the MDDS committee [12] in mind has been developed. It comprises a coding pattern for including multiple geographical entities such as the state code, which consists of two digits, the district code, which consists of three digits, the sub-district code, which consists of five digits, and the village code, which consists of six numbers. This pattern has been utilised to create a continuous code throughout India. The primary key for the Patan village is based on the number 0303700212030266. In addition to that, we have introduced a unique identification number with four digits for village bodies. The first two numbers, 03, designate the state of Punjab; the next three

digits, 037, designate the Jalandhar district; the following five digits, 00212, designate the tehsil Adampur; the following six digits, 030266, designate the village code; the remaining four digits are allocated to give a unique property id to village bodies such as houses, lands, and other such things. In order to create further query-based results on the web-based model, this data base has been integrated with a geo-referenced map of the village. The suggested web-based model was developed in the PHP programming language, and it has multiple login ids for panchayat members, the ability to connect each property id with, and connectivity with many other informatics of the village, such as birth and death records, amongst others.

V. CONCLUSION

After conducting a survey of the pilot village and locating the various control points inside the village, we came to the conclusion that there is a discrepancy between the real border of the village and the information that is kept in the conventional map along with the income record. We have successfully deployed our web-based rural Geographic Information System model in the pilot village, and it is possible for GIS to be further expanded in other places to give more effective rural development planning to the local government as well as disaster management. Our methodology, which is based on user logins, will serve to promote optimal resource usage, improved execution of government programmers and policies for inhabitants, and will be helpful for the viable development of rural regions..

Reference:

1) Olmo Zavala-Romero , Arsalan Ahmed , Eric P. Chassignet , Jorge Zavala-Hidalgo.: 'An open source Java web application to build self-contained web GIS sites', Environmental Modelling & Software, Volume 62, December 2014, Pages 210-220.
2) Agustin Fern_andezEguiarted, Anke Meyer-
BaeseZhenjie Chen, Manchun Li, ZhiliangBao, Feixue Li, Hao Zhang, Dong Chen.: 'A Village distribution optimization model is represented',
Geoinformatics, 2010, 18th International Conference' pp. 1- 5.
3) Alejandro F. Tongco.: 'Developing a GIS for Rural Village in the (Philippines)', 'International Peer Reviewed Journal' ,voU, 2011, pp 15-31.
4) Vinod Sharma, V. Mansotra and G.S. Sambyal.:'A Model for Electronic Health Communication in J&K State in India', Computer Science and Information Technology, ICCSIT, Aug 2009, pp.154- 158.
5) Jianlun Wang, JinyongDong , Lin Li, YongbinWang.: 'Design and Implementation of an IntegratedOffice Automation /Geographic Information System Rural E-Government System', World Automation
6) Congress (WAC), Sept. 2010, pp. 374- 384.
7) 1. Adinarayana, S. Azmi, G. Tewari, D.Sudharsan.: 'GramyaVikas:A distributed collaboration model for rural development planning', computers and electronics in agriculture, vo1.62, July 2008, pp. 128- 140.
8) Sitender, Satish Kumar, Reena.: 'VillageInformation System - A Case Study of Muklan Village, Hisar, Haryana (INDIA)" International Journal of Research in Social Sciences, vol. 2, May 2012, pp. 184-193.
9) M. Nagarajan, ChandanAshis Gupta', A GPSand GIS based model for an Empirical Study of Village Information System" International Journal of Scientific Engineering and Technology, vol.2, June 2013, pp. 496-504.
10) P. Jayaprasada, A. Nadeema, R. Ghosha, S.K. Pathana, Ajaia S. Kaliappanb, R. Vidhyab, M. Shanmugamb: 'updation and metrology of cadastre and village boundary using high-resolution satellite data' Forestry, Land use and Photohrammetry Group, Space Applications Centre, (lSRO), Ahmedabad, Gujarat. India
11) ShirelyBallany, Bindu Nair: 'Application of Satellite Imagery and GIS in the Preparation of Development Plans: A Case Study for TirupatiRegion',http://hcp.co.inIfile_manager/publications/Sat ellite-Imagery-and-GIS-in-Preparation-of-Dev- Plans_Research-Paper. pdf