

The Development and Customization of Desktop GIS Application with Map Window & Dot Technology

Akhilesh Kumar Yadav¹ Dr. Shruti Kanga² Rakesh Kumar Chauhan³

¹M.Sc. Student ²Assistant Professor ³Scientific Professional

^{1,2,3}Department of Applied Science

¹Centre for Land Resource Management Ranchi, India

²Central University of Jharkhand, Ranchi, Jharkhand, India

³Aryabhata Geoinformatics & Space Application Centre, Shimla (HP), India

Abstract— In this paper we focused on customization of different Geo-databases as Rural and tourism to develop desktop application using open sources GIS Software (Map Window) and .Net Technology. Map Windows is free widespread open source software to process geographical data for mapping and monitoring, planning & management, decision support system. This is basically related spatial database and MIS used open sources map windows GIS to display layers. Using map window and visual studio 2010, SQL Server 2005 and Ms-access project is designed and programmed for desktop application. By desktop application end user can view all detailed spatial information on his computer/laptop without having internet connection. It provides basic details using the geographical information system (GIS) for the planning and the development activities of the local area. The focus area is Shimla district (HP) where different spatial database is generated using Arc GIS and providing ease of access to view these information to end user using map windows GIS.

Key words: GIS, .NET Technology, Geo-databases, Desktop Application, MIS

I. INTRODUCTION

In the recent times there has been rapidly increasing complexity of the real world situations such as knowing about geographical feature of earth, planning and decision making processes, the GIS-based applications are needed to make possible the routine work for governmental and nongovernmental organization. A Geographic Information System (GIS) is a software system that manages georeferenced information. GIS systems are an automated system used for storing, analysing and manipulating geographical information. Geographical information represents objects and actions where geographical location is indispensable information (Aronof, 1989 Bull, 1994). A Desktop GIS is vastly powerful computer mapping system that provides solutions for telecommunications, utilities, agriculture, defence, oil, health care, transportation, mining, environmental management, petroleum, water/wastewater, and many other industries as well as local, state, and federal government agencies through Geo-database. In this application VB.Net and ASP.Net is used for the development of front end Application and SQL server is used for Database creations. This application provides various facilities on the system for user such as Display a map with multiple map layers, like as roads, streams, boundaries, Pan and zooms in/out throughout a map Draw graphic features as points, lines, ellipses, rectangles and polygons along with descriptive text, Identify features on a map by pointing, Select features along lines and inside boxes, areas, polygons and circle.

A. Cost Effectiveness of GIS Software:

There is various GIS Software such as Arc-GIS, IGIS are very effective and unlimited scope to process, analyse and provide a Decision support Tool for various processes. But this software is very expensive so research and GIS application becomes expensive. The high cost of GIS software restrictions the possibilities of GIS application for different organizations that can afford this costly software. Due to this reason, open sources GIS software is helpful to develop GIS project as standalone and web enable application. The Map Window application is a free, extensible geographic information system (GIS) that can be used in many ways as an open-source alternative desktop GIS, to distribute data to others and to develop and distribute custom spatial data analysis tools as an open-source tool, Map Window is free to use and redistribute to the user clients and end users. It may also be modified to fit the user needs, or embedded into proprietary software. The advanced users or developers can write plug-ins to add additional functionality (models, special viewers, hot-link handlers, data editors, etc.) and pass these along to any number of the users clients and end users. It includes standard GIS data visualization features as well as DBF attribute table editing, shape file editing, and data converters. Dozens of standard GIS formats are supported, including Shape files, Geo TIFF, ESRI Arc Info ASCII and binary grids.

B. Concept of Open Source GIS:

In the previous year GIS dataset is restricted to use of researcher, planner, government and non-government worker, or any organization but now it is partially free for GIS analysis for planning and developing decision support. To continuing innovation and improvement of GIS, open sources GIS has been developed which is freely available for everybody for analysis of GIS data.

Open Sources GIS software is a free, extensible Geographic Information System (GIS) that can be used as an open-source desktop GIS to develop and distribute custom spatial data analysis tools which capable of handling raster, topological vector, image and geographic data. It provides integration with other open source GIS packages, including Post GIS, GRASS and Map Server to give users extensive functionality. Plug-in, written in Python, extend the capabilities of QGIS.

Open Sources software allows to programmer or developer to read the source code, debugs (error) and modify to continue innovation and improvement of software capabilities. To insure the use of various programming language such as C, C++, Perl, Python, or different

technology like .Net is used to customize the software for analysis, visualizing for GIS data.

Open Sources GIS is basically used to develop cost effective GIS projects by individual, small and middle level organization. The main objective of the research work is to study the future prospective of OS-GIS to build a web-enabled portal which provides all the amenities on GIS based software. This work has been carried out to generate and display GIS data for a field whichever user want to know. The main aim is to build a Tourist Information System using OS GIS with the specific objective.

II. STUDY AREA AND DATA COLLECTION

A. Study Area:

The Study Area of the research is Shimla Municipal Corporation of Shimla district which geographic location is at 25°36'40" N latitude and 85°08'38" E longitude; spread over an area of 3,202 sq. km sq. km .It is at a height of 173 ft. from mean sea level and experiences an annual rainfall of 1205 mm. This is situated at northern part of India. The total population of Shimla Municipal Corporation, according to 2011 census data is 36, 18,211 whereas literacy rate is 72.47%.

B. Data Collected:

The data is collected for study area in form spatial and attribute form. The Spatial Data are following below: Survey of India, Topo Sheet NH 43-4 (1:250,000). Cartosat-

2 Satellite image of Shimla of 0.81 meter Resolution. GPS data using Handheld GPS.

III. TECHNOLOGIES AND METHODOLOGY

A. Technologies:

- Front End Software: Map Window, ASP.Net 4.0)
- Operating System : Windows XP SP3, Windows 7
- Database Server : Microsoft SQL Server 2008, MS-Access
- Languages : HTML, CSS, JavaScript
- Environment : Visual Studio 2010
- Geo Data Base : ArcGIS 9.1, Arc Catalog

B. Methodology:

The customization of map window OS software have followed three tier architecture Data Tier is basically the server which stores all the application's data. It contents Database Tables, XML Files and other means of storing application data. Business Tier is mainly working as the bridge between data tier and Presentation tier. All the data passes through the business tier before passing to the presentation tier. It is the sum of Business logic layer, data access layer and value object and other components used to add business logic. Presentation Tier is the tier in which the users interact with an application. Presentation Tier contents Shared UI code, Code Behind and Designers used to represent information to user.

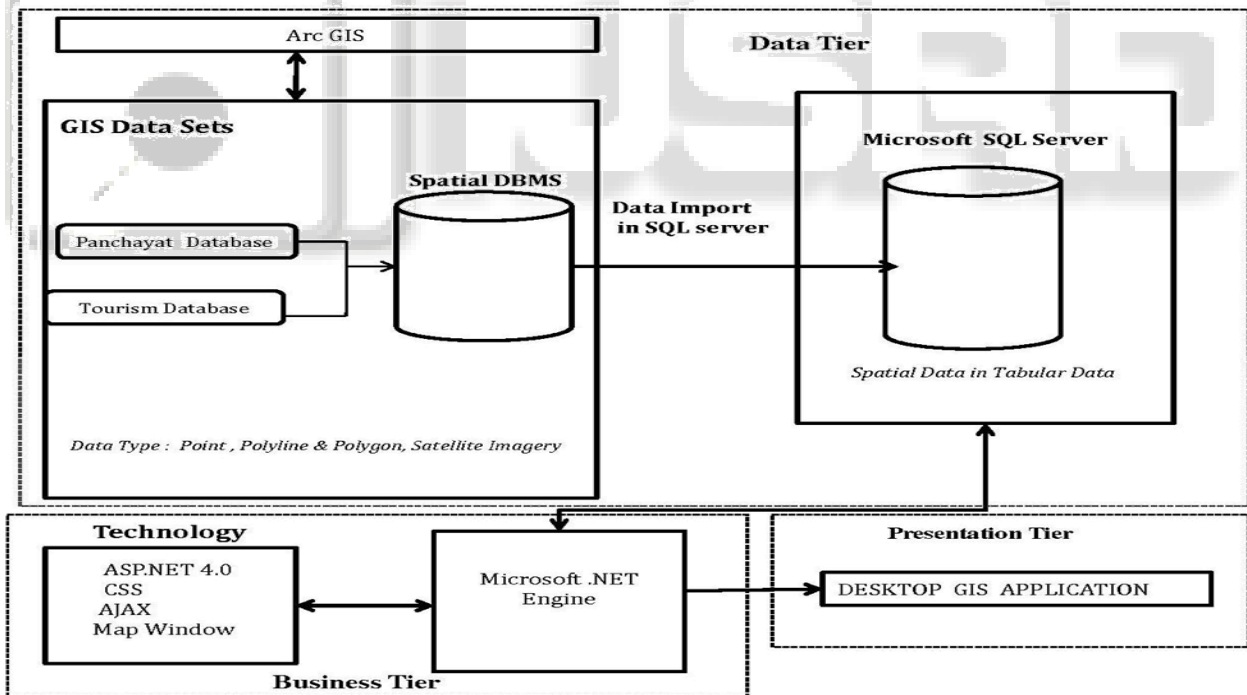


Fig 1: Methodology Architecture

C. Software Development Life Cycle (SDLC):

SDLC is a process followed for a software project, within a software organization. It consists of a detailed plan describing how to develop, maintain, replace and alter or enhance specific software. The life cycle defines a methodology for improving the quality of software and the overall development process (Fig.2).

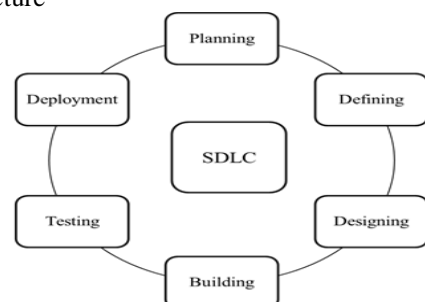


Fig. 2: Software Development Life Cycle

D. Development Architecture:

A desktop application is application software that can be installed on a single computer (laptop or a desktop) and used to perform specific tasks but some desktop applications can also be used by multiple users in a networked environment. The Desktop development is an extensive term for the process of writing software that will run on standard computers including your desktop, laptop or general purpose computer. The architecture process following step (fig.3):

1) Installation of Map windows: To install map windows software GIS software on the system.

- 2) Installation of ODBC Driver: To install ODBC driver (Visual FoxPro ODBC Driver) for connection with map windows plug-in to Geo database.
- 3) Geo-database Creation: To create database using ArcGIS9.3 as shape file or Geo-database software for displaying various layer to end user.
- 4) Program Creation Steps for integration with MapWindow4.0: Open Visual Studio and go to file menu >NEW>Project and Select windows (Desktop).
- 5) Run the class: To run the form or class

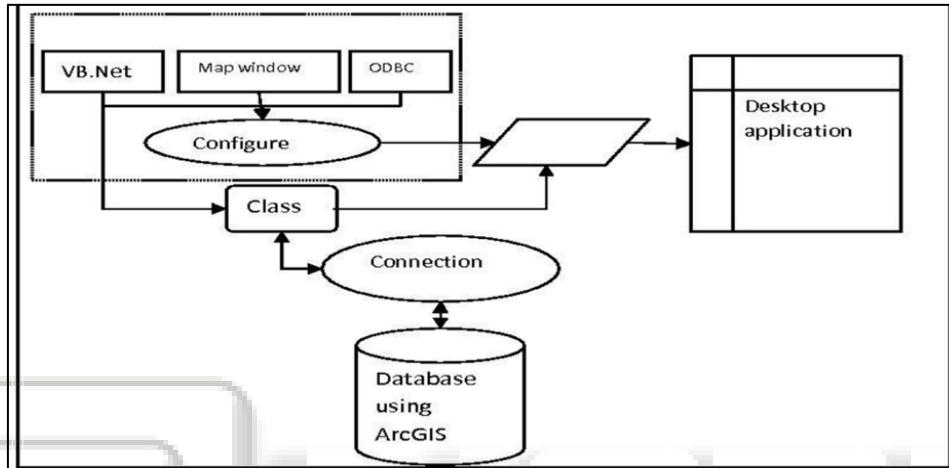


Fig. 3: Desktop Application Architecture using VB.net

IV. USER INTERFACE FOR END USER

A user interface provides a friendly interface which users can interact with the system to process inputs and obtain an output. It establishes the communication between users and System through various hardware, software, screens, menus and functions. This project is focused on customization of different Geo-database as Rural, and tourism to develop desktop and web application using open sources software and .NET Technology.

A. Rural Desktop GIS Application:

Rural Desktop GIS Application provides basic details using the Geographical Information System (GIS), for the planning and development activities of the local area. It keeps the necessary information regarding land parcel, road network (Fig.5.), population, socio-economic condition, drainage, Education, water bodies, health centre etc. at Rnajhana Panchayat in Shimla district of HP state. It also applicable in decision making, that helps in the development activities of the departments like Planning, Agriculture, Soil Survey, Soil Conservation, Irrigation, Groundwater, Rural Development, etc. at Panchayat level(See Fig.4).

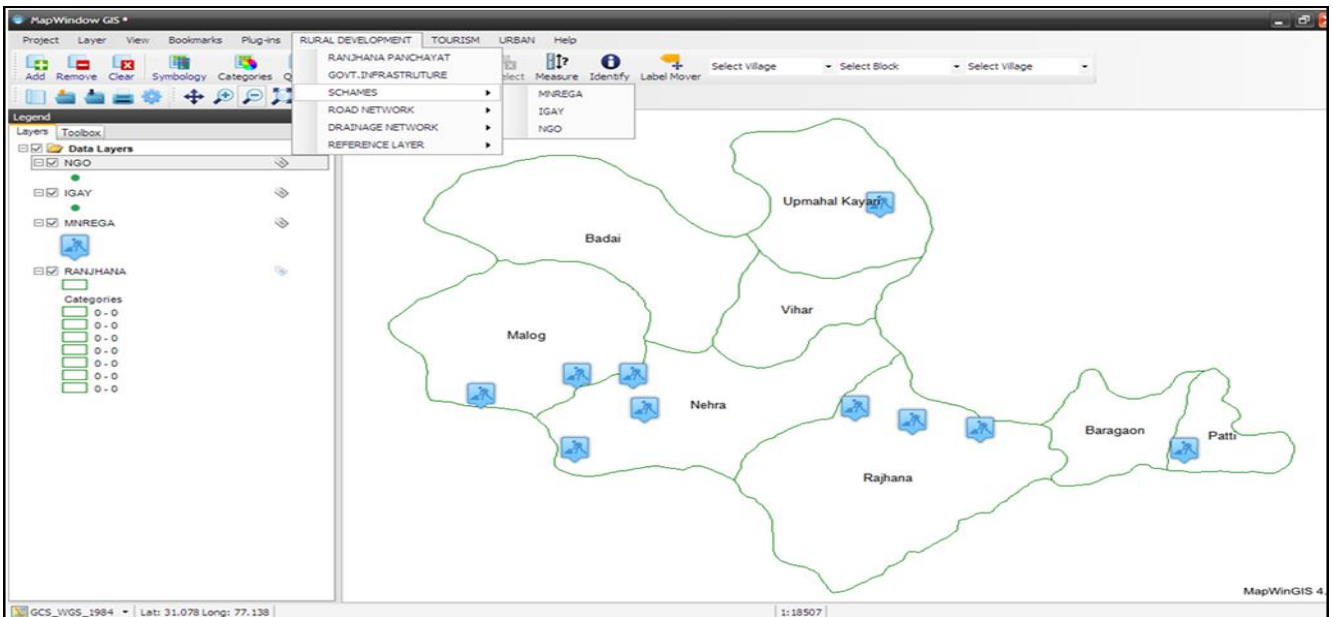


Fig.4.Geo-Referenced and digitized Panchayat Boundary

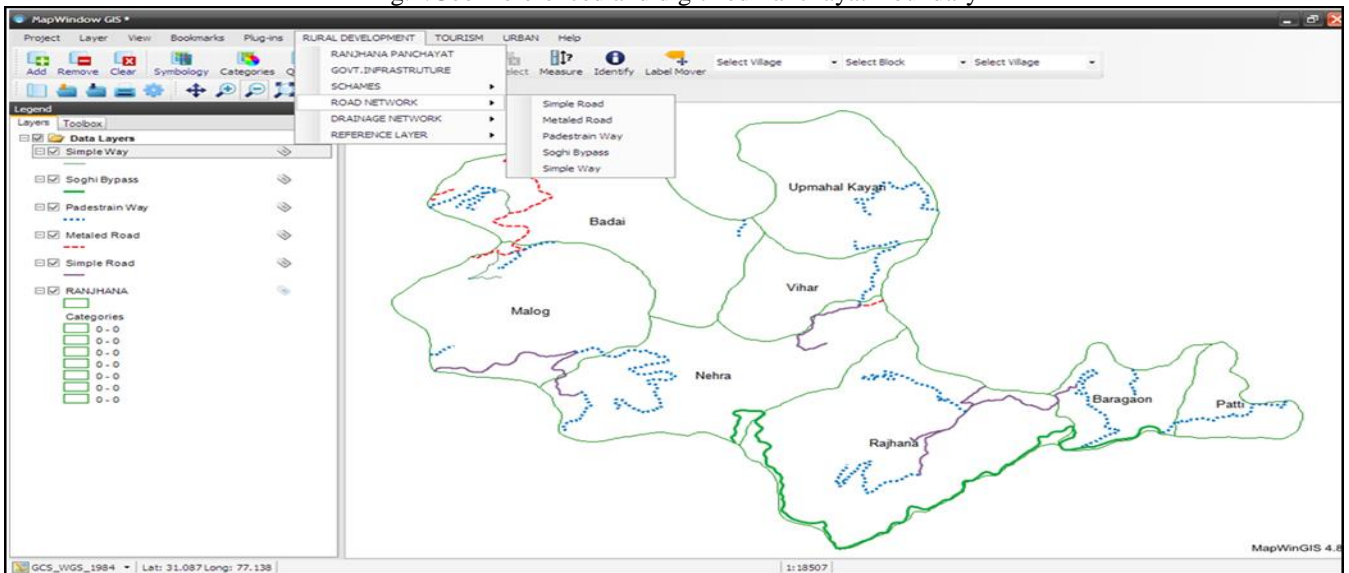


Fig. 5: Road Network

B. Tourism Desktop GIS Application:

Tourism Desktop GIS application provides basic information using GIS for facilitating, planning and increasing the tourism. This application keeps the necessary

information regarding visiting place, food, accommodation, transportation and other services like ATM, Post-office, health, education, parking etc at Simple Municipal Corporation in Shimla District(See Fig.6).

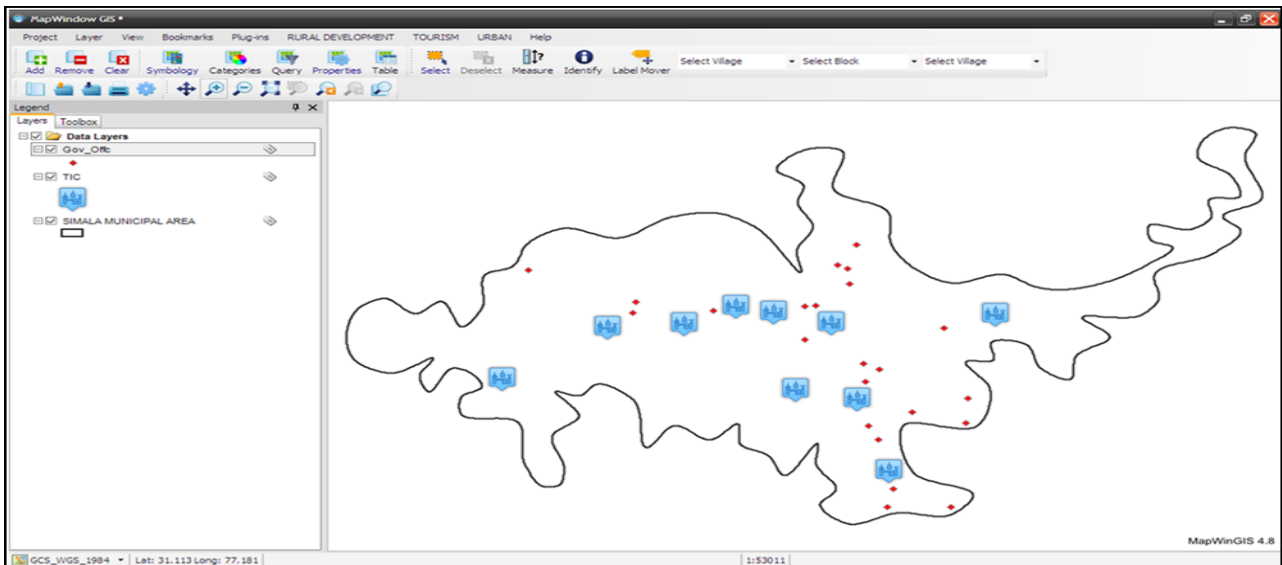


Fig. 6: Municipal Corporation in Shimla District (HP)

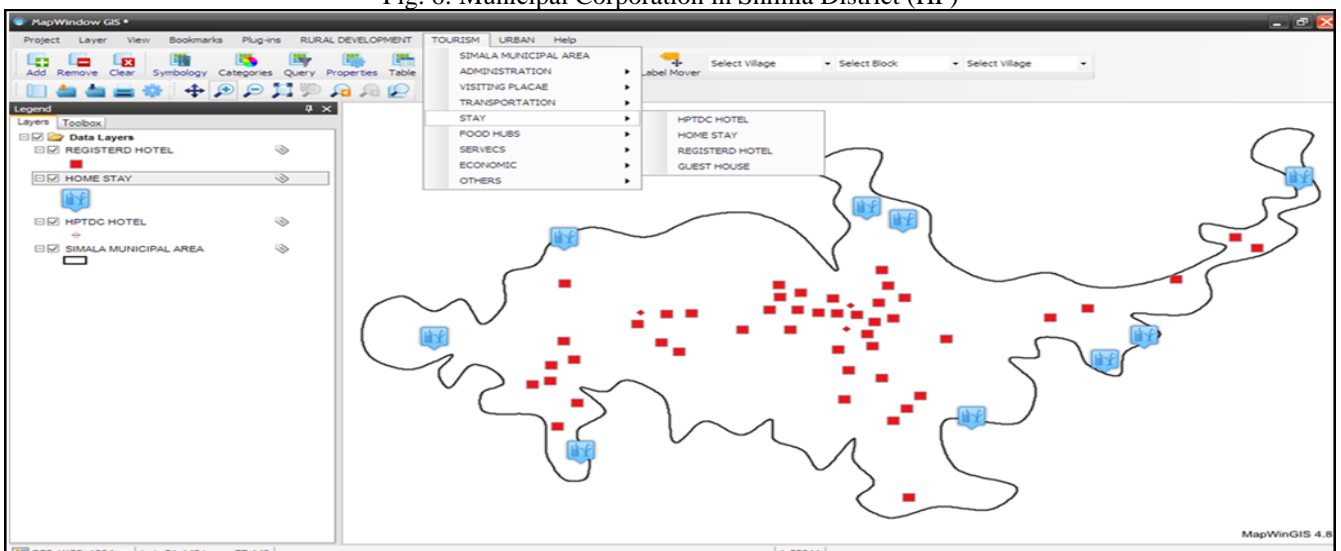


Fig. 7: Tourism Services

V. ACKNOWLEDGMENT

I would like to thank Dr. Hemant Gupta, Joint Member Secretary, AGiSAC, HP State Council for Science Technology & Environment Shimla for providing available facilities during research. I acknowledge Dr. Suraj Kumar Singh for their help and guidance. I would also like to acknowledge Mr. Santosh Kumar & Mr. Shashi Prakash for providing datasets and reviewers for their comments and suggestions in improving the quality of this research.

REFERENCES

- [1] Ali Khan Z, Adnan M (2010), Usability Evaluation of Web-based GIS Applications a Comparative Study of Google Maps and MapQuest M.Sc (Thesis), Blekinge Institute of Technology, Sweden, 13-15.
- [2] Ali, John (2012), GIS Fundamentals, Basic Spatial Analysis, Overlays, Chapter 9 Part 5, PPT Ithaca College.
- [3] Aronoff S (1989) what is a Geographic Information System? Chapter Two Geographic Information Systems A Management Perspective, Ottawa, WDL Publication Canada 31-44.
- [4] Bull, G., 1994. Ecosystem Modelling with GIS. Environmental Management, 18(3):345-349.-438.
- [5] Chris Bates (2012), Web Programming: Building Internet Applications, 3rd Edition WileyDreamtech.
- [6] Doyle J, Han Q, Weakliam J, Bertolotto M, Wilson D (2004), Developing Non-proprietary Personalized Maps for Web and Mobile Environments, SpringerIn. Goyang, Korea.) 181-194.
- [7] Gopalan N P, Akilandeswari J (2007), Web Technology: A developer perspective, PHI Learning Pvt. Ltd New Delhi.
- [8] Houssaini SEI, Sadri A (2012), A web-based spatial decision support system for effective monitoring and routing problem, IEEE 669 - 674.
- [9] Junghoon .KIA (2011), Developing a geospatial web-GIS system for landscape and urban planning, International Journal of Digital Earth Vol. 6, No. 6, 580-588.

- [10] Longley P A, Goodchild M F, Maguire D J, Rhind D W (2005) Geographic Information Systems and Science 2nd Edition John Wiley & Sons, Ltd.
- [11] Mac D A, Redlands CA (1999), Building a Geodatabase, ESRI Press 327.
- [12] Ming-Hsiang Tsou (2004), Integrating Web-based GIS and image processing tools for environmental monitoring and natural resource management, Journal of Geographic System 155-174.
- [13] Patrick Dalton (1997), Microsoft SQL Server Black Book 10th Edition The Coriolis Group.
- [14] Ponce j, Torres A H, Escalona M J Mejías M Dominguez-Mayo F J (2012), Developing Web Geographic Information System with the NDT Methodology Licensee InTech Chapter 18 <http://dx.doi.org/10.5772/47971> .
- [15] Singh S K , Saklani B, Prakash S, Chauhan R Gupta H ,Geospatial approach for decentralised planning at rajhana panchayat, himachal pradesh IJARSGG (2014) Vol.2, No.2, 27-43
- [16] Kanga S, Thakur K, Kumar S, Gupta H.(2014) ,Potential of Geospatial Techniques to Facilitate the Tourist & Administration: A Case Study of Shimla Hill Station, Himachal Pradesh, India in IJARSG, volume 3, pp.681-698.
- [17] Robert W S (2012), Programming the World Wide Web, 10th Edition Pearson.
- [18] STEINIGER S, BOCHER E (2009), an overview on current free and open source desktop GIS developments, International Journal of Geographical Information Science. Vol. 23(10), 1345-1370.
- [19] Stuckenschmidt H, Wache H, Vogele T, Visser, U. (2000). Enabling Technologies for Interoperability. In Information sharing: Methods and Applications Bonn, German 35-46.
- [20] Vanmeulebrouk B, Rivett U, Ricketts A, Loudon M (2008), Open source GIS for HIV/AIDS Management Biomed Central Ltd.vol 7(53) 1-16.
- [21] Wolfgang Kainz (2004), Geographic Information Science (GIS), Cartography and Geoinformation Department of Geography and Regional Research, University Of Vienna 22-47, 57-60, 80-89.
- [22] Worboys, M., and Duckham, M., (2004), "GIS: A Computing Perspective", 2nd Edition CRC Press chater-2(910).
- [23] www.mapwindow.org
- [24] <http://msdn.microsoft.com/en-us/library>
- [25] www.esri.com/library/whitepapers_pdfs_esri-cartography
- [26] <http://www.techopedia.com/definition/24352/web>
- [27] <https://www.e-education.psu.edu/geog583/node>
- [28] www.geog.ubc.ca/courses/.../u07.html
- [29] http://en.wikipedia.org/wiki/Web_server
- [30] <http://oreilly.com/catalog/progxmlrpc/chapter>
- [31] www.ncgia.ucsb.edu/.../aware_intro.html
- [32] [http://link.springer.com/static content/lookinside/597/chp%253A10.1007%252F978-3-540-76993-4_32/000.png](http://link.springer.com/static/content/lookinside/597/chp%253A10.1007%252F978-3-540-76993-4_32/000.png)
- [33] <http://www.agisac.gov.in>
- [34] <http://www.google.co.in>
- [35] www.npwrc.usgs.gov/.../analysis.html