A Technique for Importing Shapefile to Mobile Device in a Distributed System Environment.

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Abstract
Mobile GIS emerged in the 1990s, with integration of GPS is one of the leading technique. It is a Location Based Services which can be defined as any application that extends spatial information processing or GIS capabilities to end users (based on their geographic location) (ESRI 2000 & 2001d). In other words it can be used to gather information from any place, and in no time. It's where wireless and GIS technologies meet on the Web and it is changing the way businesses and individuals operate"(ESRI 2001a). The technology of mobile devices has been improving since 2000.The various improvements has resulted in developing a high promising technology by taking into account issues like

- Portability
- 'Ruggedness' and
- All-day battery life.

Presently we are designing a mobile application for importing shapefile to a mobile device which on other hand support geospatial vector data format of geographic information systems software. It was firstly developed and regulated by ESRI A "shapefile" commonly refers to a collection of files with ".shp", ".shx", ".dbf". To import a shapefile we need to use an open source software known as geoserver which helps to fetch the desired vector image.
With the help of wireless technology like Bluetooth we can import shapefile to mobile even if the shapefile is located on different system. This will help in fetching information associated within the shapefile ,thus helping to obtained important information without considering its place of storage and location. In this work we have taken MNNIT Allahabad as area of research.

Keywords: Shape file, geoserver, personnel digital assistant (pda) and wireless technology

Introduction
Mobile GIS is the expansion of GIS technology from the office into the field. A mobile GIS enables field-based personnel to capture, store, update, manipulate, analyze, and display geographic information. Mobile GIS integrates one or more of the following technologies:
Mobile Devices,

- Global Positioning Systems, and
- Wireless Communications for Internet GIS access
- GIS applications are software applications that process large amounts of geospatial data, involving heavy computations. Traditionally, these applications have resided on high performance workstations and servers equipped with the necessary resources: large amounts of primary and secondary memory, fast CPUs and graphics processors, and large screens for displaying the data. The recent decade, however, has seen a move of GIS applications onto smaller platforms, including mobile platforms such as personal digital assistants (PDAs). These platforms offer a number of attractive features, primary among which are their extreme mobility: because of its small size, a PDA can be carried and used practically anywhere[1].

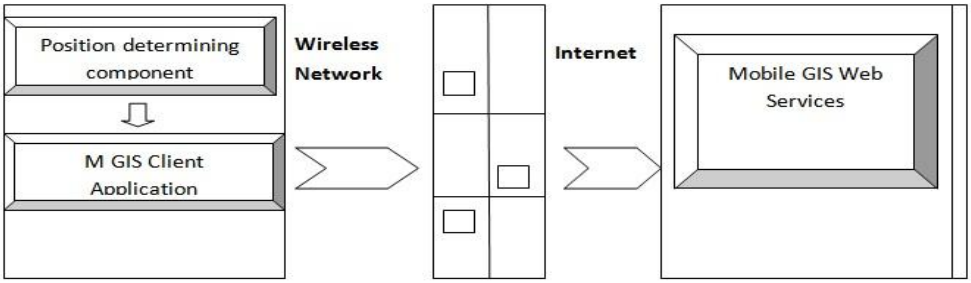

Figure 1: Overall Architecture of Mobile GIS (Ali Monsourian *et.al* 2008)

M-GIS Components

A Mobile Geographic Information System (M-GIS) project consists of several components which represent individual technological fields conceptual to the architectural design of the project (Sarjakoski & Lehto 2003). Client components consist of all the physical mobile devices that are compatible with the front-end requirements of an M-GIS application; in other words, they are the mobile devices that the application can run on. The communication technologies and infrastructure components ("middleware") allow for the transmission of requests and responses between the client and server components. The server components are all the hardware and software involved in serving the client-side of the M-GIS project on the web server and the map server.

Importing Shapefile in Mobile

Basic Aspect of Shapefile

The ESRI Shape file or simply a shape file is a popular geospatial vector data format for geographic information systems software. It is developed and regulated by ESRI as a (mostly) open specification for data interoperability among ESRI and other software products. A "shape file" commonly refers to a collection of files with ".shp", ".shx", ".dbf"[2].

The Shape file Format

ESRI (Environmental Systems Research Institute) is a leading developer of GIS software and the Shape file format used by their products is one of the most popular mediums for storing vector map data. An ESRI shape file is actually composed of three separate files: a main file with a .SHP extension, an index file with a .SHX extension, and a dBase file with a .DBF extension that contains the associated attribute data. The three files must have the same base name and follow 8.3 naming conventions as shown in the figure below

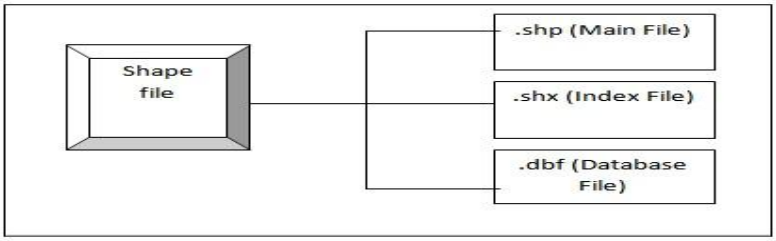

Figure 2: Component of Shape file.

The main file (with a .SHP extension) is the primary component and its structure begins with a fixed-length, 100-byte header containing information about the total length of the file, the file version, and the type of shapes it contains. This file header is then followed by a list of variable-length records, with each record defining the geometry for a single ESRI shape[3]. An ESRI shape might be a polygon that represents the political boundary of a country, a polyline that represents the path of a city street, or a point object that indicates the location of a city. The figure below illustrates the format of a .SHP file. It contain record file, header file with a header name constituting 100 byte. The other supporting file which are required are to collect information about File number, File version, File code, File length and Shape type. We use class ShapeFileHeader to read the content of the shape file which usually contain the address of 100 byte header file.

Reading Database Attributes

The dBase file associated with a shape file contains the attribute data and essentially represents a single database table. There is a one-to-one correspondence between the rows in this table and the shape records in the .SHP file. A typical attribute field that you may find in a dBase table is a field that identifies the name of the corresponding shape (such as a state or province name).

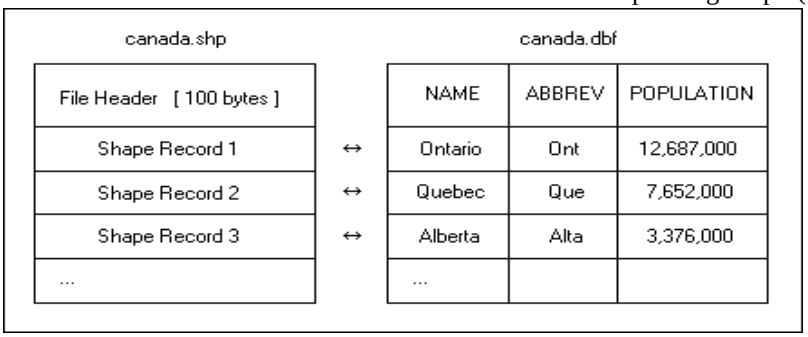

Figure 3: Mapping between shape file and data base file

Methodology

The methodology adopted for the present work has been shown with the help of a flow diagram in Figure.

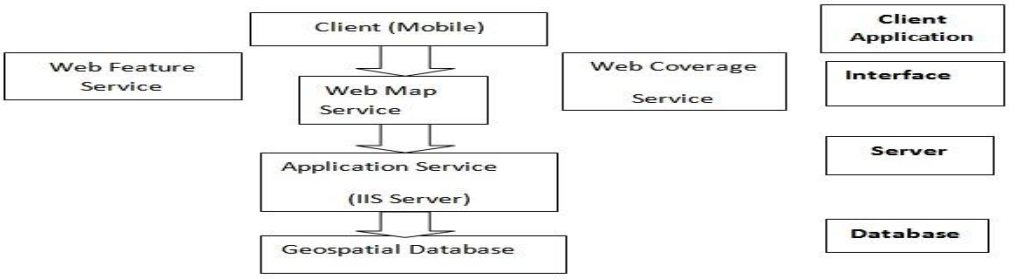

Figure 4: Designing Mobile Web Services

Detailed Planning

The methodology adopted for the thesis work is based on the following factors:

- Availability of the maps of MNNIT Allahabad with respect to the different functionality to be analyzed for the establishment of a mapping application.
- Preparation of the mapping application for the purpose of designing the required functionality.
- Preparing Shape file using ARC GIS. The different layer that are prepared using this software are

a. Road Layer,
b. Railway Layer, and
c. Mnnit Poly Layer.

- Developing a Mobile Device Application and,
- Deploying the overall application on the client side that is on Mobile.

The approach is defined by the above flowchart in section. This flowchart indicates the process of work been carried out. Basis for the work comprises of the literature review which is done to develop a methodology. This literature review helps to find out the objectives of the work and further far. The Web Feature Service defines interface for describing data manipulation operations of geographic features. Data Manipulation operations include the ability to

- Query feature based on spatial and non spatial constraints.
- Create a new feature instance.
- Delete a new feature instance.
- Update a new feature instance.

A Web Map Service (WMS) is a standard protocol for serving georeferenced map images over the Internet that are generated by a map server using data from a GIS database WMS specifies a number of different request types, two of which are required by any WMS server:

After identifying the prime objectives the next was to carry out the detail analysis of the work to be carried out. The individual parameters are identified.

Prepration Of Geo Spatial Database

The following aspect has been considered for the design of the Geospatial databases for the present work: Firstly, the map for MNNIT campus is scanned. Then, this has been used as the base map and its coordinate system has been adopted for integrating other maps with this map. The image to image registration has been carried out to geo reference institute map. From this scanned map, digitization of the institute campus, hostels and staff colony were carried out.After the completion of registration, the on screen digitization process was followed for creation of various thematic layers. This is an important part of project as different layers can then be derived as per the requirement of the study. This will help in populating the database of the project. The various layers prepared in the present work are:-

Institute Campus Block,
Staff Colony Block,
Hostel Block, and

Road Map.

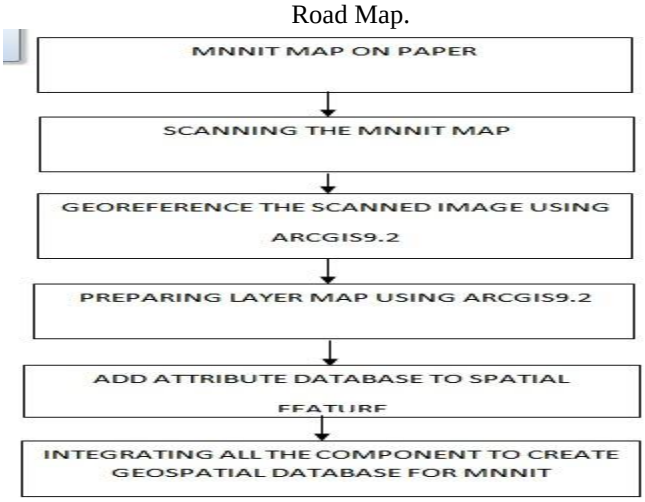

Figure 5 : Creation of Geospatial Database

Integrating Geospatial and Mobile Gis

The application runs on the user mobile phone and gets the required data from a database server on the wireless toolkit. In this case, we keep the data that is the shape file on one computer (172.31.100.62). The application resides on the second computer and we use Wireless Connection to access the data that resides on first computer.

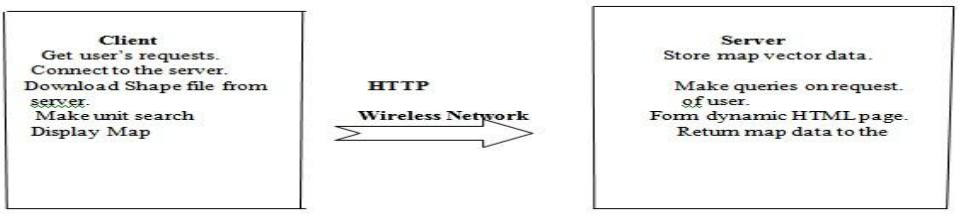

Figure 6: Client Server Functions

Hyper Text Transfer Protocol (HTTP) is assumed to be as the underlying protocol for communication between the client and the server. The graphical user interface of the client contains a canvas for displaying the map. We have used the vector data format in this application because vector graphics are better than bitmap images for querying, manipulating the data. The WAP Gateway can optimize the communication process and may offer mobile service enhancements, such as location, privacy, and presence based services. The WAP Gateway communicates with the client (WAP micro browser) using the WAP protocols and it communicates with the Web Server using the standard Internet protocols such as HTTP/HTTPS.

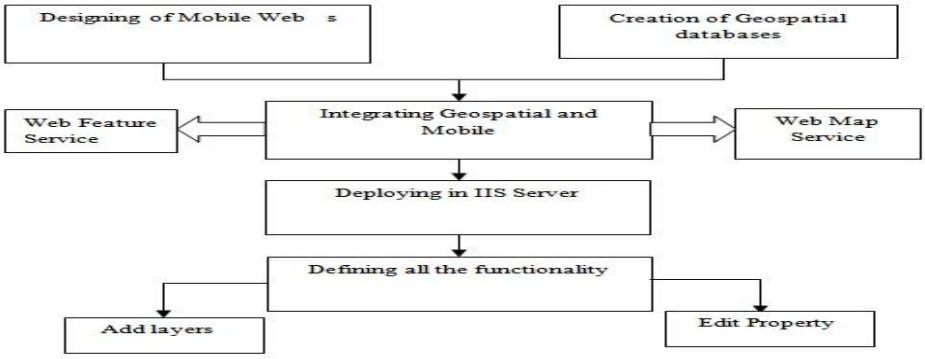

Figure 7: The Overall Methodology adopted in this study.

RESULT

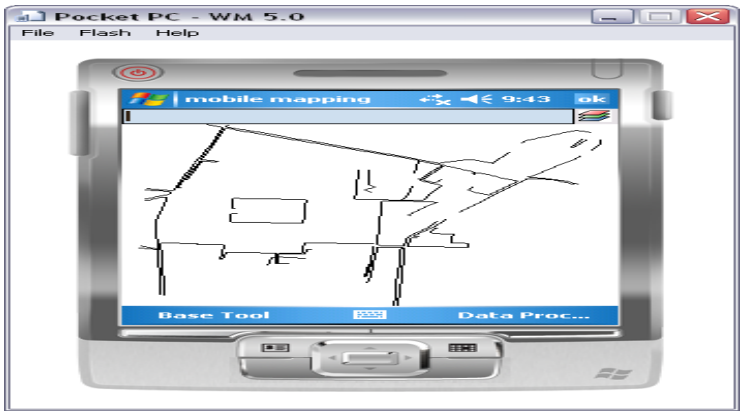

Figure 8: Road Layer: MNNIT

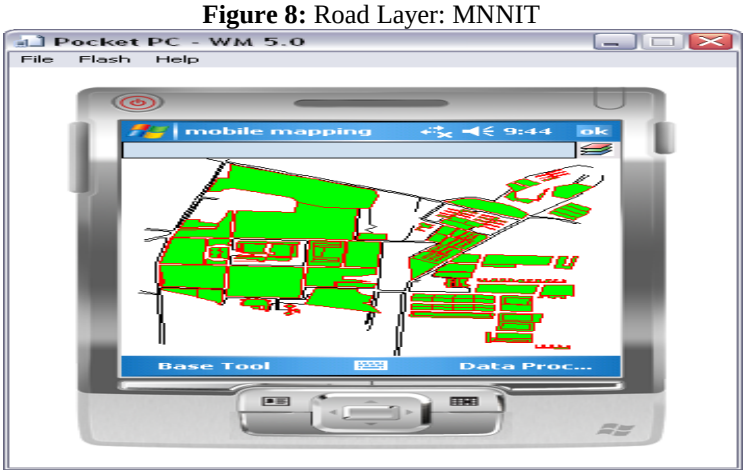

Figure 9: MNNIT POLY NETWORK

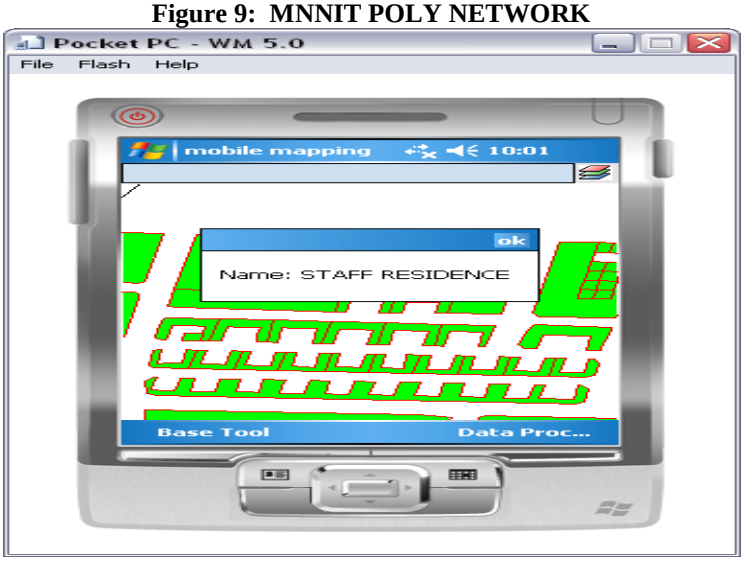

Figure 10: Deriving Information

Conclusion Drawn

Maps or Shape file have a definite role to play in a Mobile GIS environment. In their interactive and dynamic appearance they will guide and assist the user in solving geospatial analysis problems. This can be proved with the help of this work that with the increased availability of mobile devices, proper software and abundant data, maps can play these various roles anywhere and at any time. It uses wireless network and communication network and communication protocol by getting the mapping data from the server and displays shape file on the phone along with many functionality.

In traditional GIS, spatial object were primary focus while in Mobile GIS, the focus has been changed to a particular scene or of a particular location

Future Recommendations

The future recommendation for this work can be in implementing:

- A dynamic Database Application for Mobile GIS.
- It may take a long time to establish a connection between a client and the server on a wireless network. So, the latency time should kept minimum.

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