TOURIST INFORMATION SYSTEM USING MOBILE GIS FOR THIRUVANANTHAPURAM DISTRICT

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Abstract

Tourism is considered as one of the world's largest industry. Tourism is the major sectors helping to obtain foreign currency in developing countries like India. When tourists visit a new place, they need to orient themselves in that place and for this purpose maps are used. Paper tourist maps are made available to visitors through Government Tourist Offices, showing main areas of interest as well as main streets and thoroughfares. Nowadays mobile and web based maps are replacing the conventional paper maps due to their dynamic property.

Smartphone's and Tablets are very useful for tourists to find new places, hotels and routes. Most of these maps are online like Google Maps, OpenStreetMap (OSM), and Yahoo Maps etc. The problems associated with online maps is that they need a high speed internet connection which may not be available in remote places. In such cases offline maps are very helpful for tourists.

The aim of the project is to prepare an offline tourism map in mobile for Thiruvananthapuram district. In this project we used open source software's like QUANTUMGIS in the creation of thematic layers. Four layers were created including Road, Hotels, Tourist Places and Place names. Then these layers are converted into mobile format and loaded in Android Phone.

OSMAND software is used in this project. OsmAnd is a turn by turn navigation application for Android Devices with online/offline features. The project has used this software for displaying tourism map and makes it freely available for public. This application is mostly suited for tourists who want to visit unknown places. We can use OsmAnd application online and offline for displaying a lot of online maps and pre-

downloaded very compact so called openstreetmap “vector” map-tiles. We can query the addresses, Point of Interest (POI) and routes to navigate with the help of Car, Bike etc.

1.1 INTRODUCTION

Mobile GIS applications for tourism range from tour planning, navigation support to yellow page services and mcommerce. Within the last few years, we were facing advances in wireless communication, computer networks, location-based engines, and on-board positioning sensors. Mobile GIS is an integrating system of mobile agent, wireless network, and some GIS capability which has fostered a great interest in the GIS field. Producing maps via these technologies in tourism has become widespread. But they are often quite simple in terms of adaptation to the user or context. Although the mobile computing has been increasingly developed in the past decade, there still exist some notable constraints which complicate the design of mobile information systems. The constraints include limitations of computational resources (e.g., processor speed), limitations of user interfaces (e.g., size of display), network problems (e.g., bandwidth of the communication channel) and limitation of energy source (e.g., battery).

Mobile systems are important assets for travelers visiting foreign environments, as they provide instructions on how to traverse the space. Tourist needs a range of information for completing spatial tasks such as way finding.

1.2 ANDROID (OPERATING SYSTEM)

Android is an operating system based on the Linux kernel, and designed primarily for touch screen mobile devices such as Smartphone’s and tablet. The user

interface of Android is based on direct manipulation, using touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching and reverse pinching to manipulate on-screen objects. Internal hardware such as accelerometers, gyroscopes, GPS and proximity sensors are used by some applications to respond to additional user actions, for example adjusting the screen from portrait to landscape depending on how the device is oriented. Android is open source and Google releases the code under the Apache License. This open-source code and permissive licensing allows the software to be freely modified and distributed by device manufacturers, wireless carriers and enthusiast developers. Android is the world's most widely used Smartphone platform. Android is popular with technology companies who require a ready-made, low-cost, customizable and lightweight operating system for high tech devices. The android applications can be downloaded from Google Play store.

1.3 SMART MAP

There are no differences between current maps on mobile environments and conventional maps. Recently, many studies and investigations have been focused on how to solve restrictions of mobile environments such as low memory and bandwidth. Current maps have same responses in various situations. Map is a tool for creation of communication between users and spatial data. Maps on mobile environments are different in three cases: Application, Spatial data type and Communication methods. Humans receives continues and analogue data through their sensors, interpret them and gain conceptual and perceptual cognition. Smart maps should be available every time, every day to do its role like humans.

Smart maps differ with custom digital maps in most aspects. The focus of most researchers have been loading digital maps in mobile instruments just from particular engineering points of view such as to reduce the memory in use, the transfer rate, etc. The main differences of information systems in mobile environments with static

environments need paying more attention to maps in mobile environments. Such maps have more possibility of having uncertainty with respect to static states.

1.4 LOCATION BASED SERVICES (LBS)

Location Based Services (LBS) is a general class of computer program-level services using to include specific controls for location and time data as control features in computer programs. As such LBS is an information service which has a number of uses in social networking today as an entertainment service, which is accessible with mobile devices through the mobile network and uses information from the geographical position of the mobile device. This has become more and more important with the expansion of the Smartphone and tablet markets as well.

LBS are used in a variety of contexts, such as health, indoor object search, entertainment, work, personal life etc. LBS include services to identify a location of a person or object, such as discovering the nearest banking cash machine (ATM) or the whereabouts of a friend or employee. LBS include parcel tracking and vehicle tracking services. LBS can include mobile commerce when taking the form of coupons or advertising directed at customers based on their current location. They include personalized weather services and even location-based games. They are an example of telecommunication convergence.

1.4.1Components of LBS

Most of Location Based Services require several components. The main components consists of a model of “5+1” components of LBS – five technological and one human related. These components are discussed below.

- **Positioning systems** – Allows geographically localizing the mobile device both outdoor and indoor using: satellite-based systems, Cell-ID, RFID, Bluetooth, WiMax, and Wireless LANs.
- **Communication Network** - The wireless network that allows for transfer of data between user (thought mobile device) and server (service provider). Nowadays it is in most cases wireless internet (e.g. GPRS, 3G, 4G)
- **Service and Application Provider** - The LBS provider, including the software (e.g. GIS) and other distributed services and components that are used to resolve the query and provide the tailored response to the user.
- **Data and Content Provider** - Service providers will usually not store and maintain all the information, which can be requested by users. Therefore geographic base data and location information data will be usually requested from the maintaining authority (e.g. mapping agencies) or business and industry partners.
- **Mobile Devices** – Any portable device that has capabilities to utilize stated above components of LBS, for example: mobile phones (including Smartphone's), tablets, palmtops, personal navigation devices, laptops etc.
- **User** – The person utilizing the potential of modern mobile device and infrastructures to get value added information or entertainment.

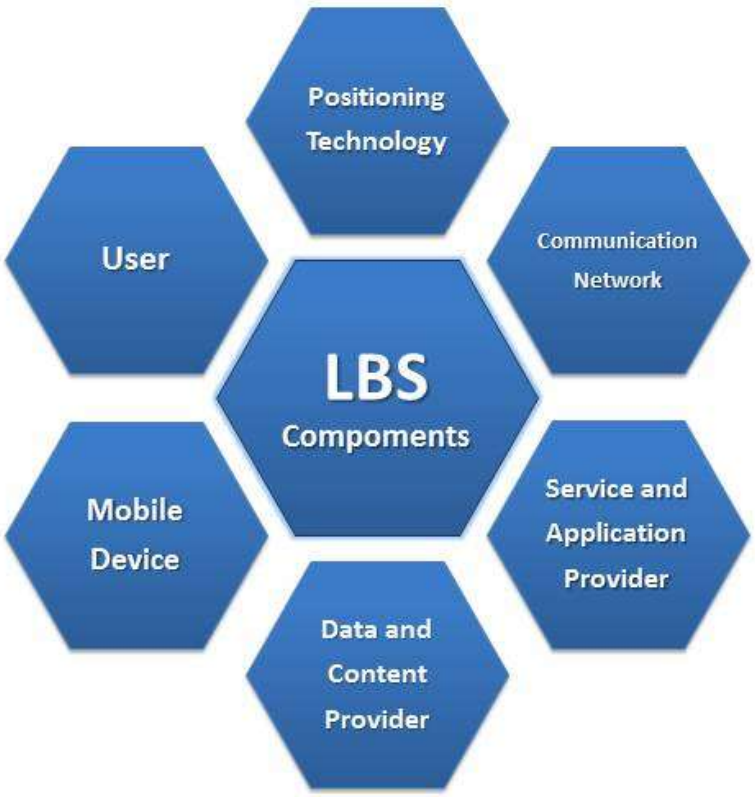

Figure 1.1 Components of LBS

1.4.2 LBS in mobiles

Location Based Service (LBS) is an emerging technology in mobile data services due to the rapid development in wireless communication and location positioning technologies. Users with location-aware wireless devices can query about their surroundings (e.g., finding the nearest restaurant or all shopping malls within 5 miles) at any place, at anytime. While this ubiquitous computing paradigm brings great convenience for information access, mobile environments, constrains spatial property of location-dependent data, and the mobility of mobile users pose a great challenge for the provision of location-based services to mobile users.

LBS have two major actions, that is:

- Obtaining the location of user
- Utilizing this information to provide a service.

LBS services can be categorized as triggered LBS services (push services) and user-requested LBS services (pull services). In a triggered (push) LBS service, the location of user's mobile device is retrieved when a condition set in advance is fulfilled. For example, a call to emergency center can automatically trigger a location request. Advertisement messages can be delivered to users who enter a specific area in a shopping mall, and warning messages can be delivered to users who are in the area where weather conditions will change (e.g. hurricane, rain).

In a user-requested (pull) LBS service, the user decides whether and when to retrieve the location of his/her mobile device and use it in the service. User-requested LBS service can involve personal location (i.e. finding the current location of the user) or services location (i.e. finding the location of the nearest restaurant or bank). Navigation and direction system is an example of pull LBS services.

1.5 OPEN SOURCE GIS

A few years ago the use of GIS was restricted to researchers, planners and government workers, but now almost everybody can create customized maps or overlay GIS data. Open Source GIS (OS GIS) is one of the most innovative approaches in the field of GIS. The free software like Quantum GIS provides the cost effectiveness and leads to new innovations in the field of GIS.

Open Source GIS consists of freely available GIS software’s and source code with limited licensing restrictions on distribution. Allowing programmers/ developers to read, redistribute, and modify the source code leads to the evolution of the software as the software errors (bugs) are fixed and capabilities expanded. With internet providing the backbone for these improvements and updates, the release of new

updated versions happen at a fasters rate as compared to the pace of conventional software development.

1.6 NEED OF THE STUDY

- To understand and study about mobile mapping applications.
- To provide a new mapping experience for travelers and tourists.
- To study the importance of offline maps.

1.7 OBJECTIVE OF THE STUDY

- Create a database of the study area.
- To develop an Offline Tourism Map for Thiruvananthapuram district.
- Create the maps using Open source Technologies and software's to make it freely available for public.
- Testing the Tourism Map layers in Android Mobiles.

CHAPTER 3

STUDY AREA

3.1 INTRODUCTION

Located in the southwestern tip of India, Thiruvananthapuram is bounded by the Arabian Sea in the west and Tamil Nadu in the east. Named after Anantha Padmanabha or Lord Vishnu, the city is home to many ancient temples. But the landmark is the Sree Padmanabha Swamy Temple around which the city has been built on seven low hills. The wooded highlands of the Western Ghats in the eastern and northeastern borders give Thiruvananthapuram some of the most enchanting picnic spots. A long shoreline with internationally renowned beaches, historic monuments, backwater stretches and a rich cultural heritage make this district a much sought-after tourist destination. Clean and green, Thiruvananthapuram, the capital of Kerala is one of the most beautiful cities in the country.

Thiruvananthapuram International Airport (6 km from the city) has over 30 air links with convenient connections to Colombo, Maldives, Singapore and the Middle East. Indian Airlines and Jet Airways operate domestic flights to different parts of the country. There are direct trains from Thiruvananthapuram to all the main towns in Kerala as well as the major cities in India.

3.2 LOCATION OF THE STUDY AREA

Thiruvananthapuram district is located between 8.5480° - 8.7794° Latitude & 76.7815° - 77.0990° Longitude. It is located on the west coast of India near the extreme south of the mainland. It is bounded by Kanyakumari and Kollam districts.

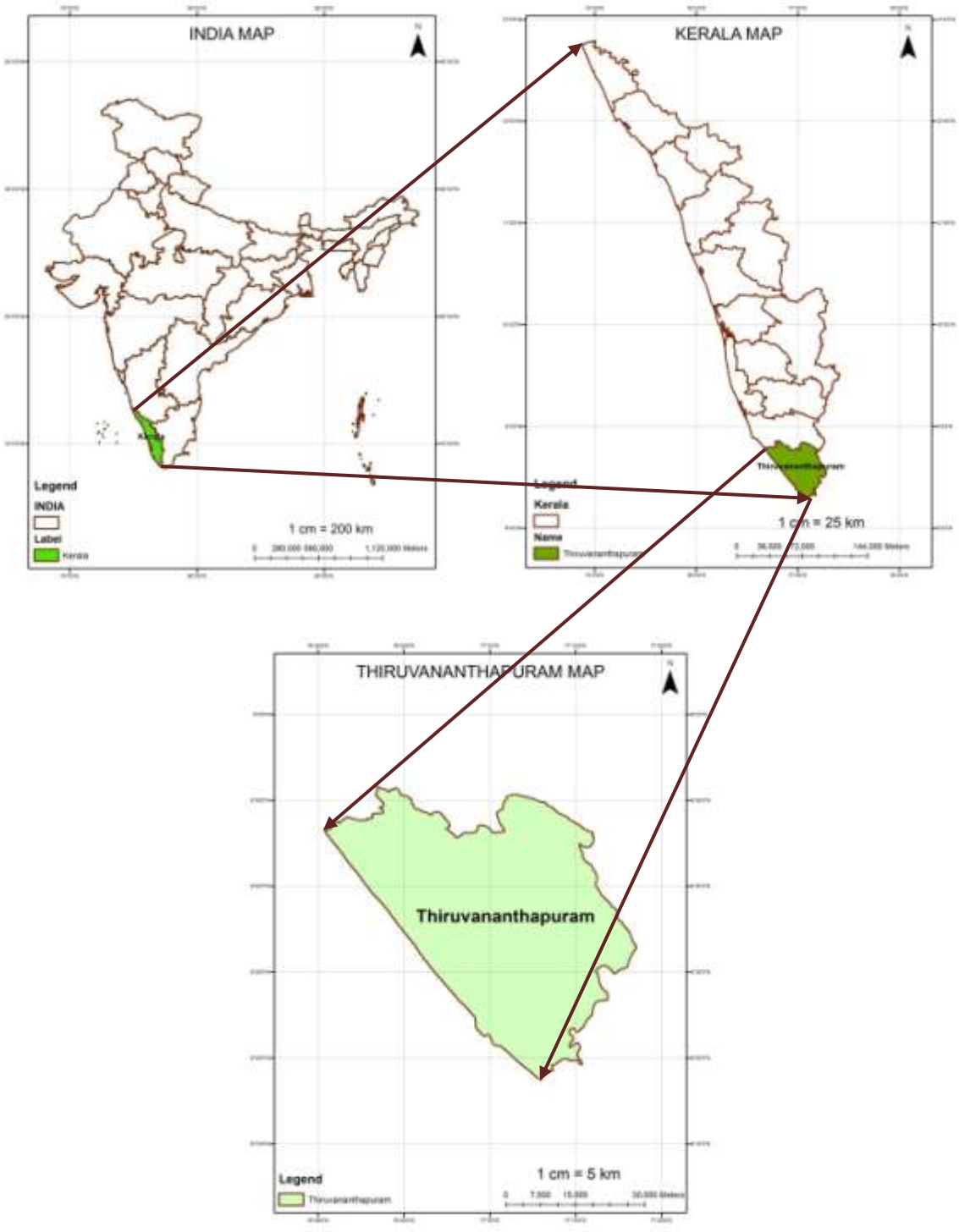

Figure 3.1 Location of the Study Area

CHAPTER 4
DATA AND SOFTWARE'S USED

4.1 INTRODUCTION

This chapter discusses the various software's and data used in the study. It also discusses how data collection is done in the project.

4.2 DATA USED

4.2.1 OpenStreetMap (OSM) Data

OpenStreetMap vector data is freely available and can be downloaded from internet. OSM data can be downloaded directly from the OSM website using the export option available. The problem associated with this download is that only a small area can be downloaded by this method. Since Thiruvananthapuram is a large area it is not possible to download the whole data from OSM website. So the OSM data is downloaded from 'CloudMade Downloads' which provides daily updated OSM data. The Roads and landmarks layers are downloaded directly in shape file format.

4.2.2 Hotels and Tourist Places

The information of all the hotels and tourist places in Thiruvananthapuram are collected from online sources. The websites from which data is collected are

- www.makemytrip.com
- www.tripadvisor.in
- www.holidayiq.com

The data collected from these websites contains the name and location of the Hotels and Tourist places in tabular form. These data are to be converted into point data in GIS.

4.2.3 Google Maps

Google Maps is a Google service offering powerful, user-friendly mapping technology and local business information-including business locations, contact information, and driving directions. Begin the search with a search term in the search box.

- When looking for directions, search for the start or ending address first.
- A zip code is better than a city and state.
- If Google does not understand the search keyword, it will give you suggestions.

4.2.3.1 Features

- **Paper Map –** The first search will turn the window into a virtual "paper map." It can stroll around the map and zoom in and out with the buttons on the upper left. This is a good way to see areas rather than specific locations.
- **Find Locations –** Once the initial search was done and are zoomed into an area, we can search that area for locations. A search for "pizza" or "sushi" will turn up local restaurants.
- **Directions –** If the initial search was for an address, enter a second address and get directions to and from the locations.
- **Satellite View –** At any time in the search, switch to Satellite View and see aerial views.

4.3.6 Wikimapia

Wikimapia is an editable interactive map. The goal of Wikimapia is to create and maintain a free, complete, multilingual, up-to-date map of the whole world.

4.3 SOFTWARE'S USED

4.3.1 GPX EDITOR

The software is used to Load, modify and save GPX files. Add and remove waypoints, edit track and routes, simplify tracks (reducing file's size), clean recorded data, add and edit GPX metadata, edit waypoint, route and track properties, all with real-time preview is possible. GPX Editor is a Windows application to do everything with GPS tracks. The version used in this project is GPX Editor 1.3.83.1509.

- analyze and clean up GPS tracks
- make a clear structure of track segments
- viewing the trajectory in color
- inspect track points
- extract parts of a track
- import from NMEA, NGT, KML and GPX formats
- save as GPX, KML, HTML or CSV file
- merge several tracks into one
- generate anonymous timestamps

4.3.2 GPS BABEL

GPSBabel converts waypoints, tracks, and routes between GPS receivers and mapping programs. It returns to us the ability to freely move our own waypoint data between the programs and hardware we choose to use. GPSBabel is Free Software licensed under the GNU Public License. We can download it from: http://www.gpsbabel.org/download.html

This program can read any GPS file format that are likely to have and produce either a KML (recommended) or GPX file that can be placed online or viewed in GIS software's. GPSBabel can be run with a graphical interface or from the command line. GPSBabel can be used to convert a GPX file to a KML file and then displays that KML file on the map. The option "**points=0**" will prevent each of the trackpoints from also becoming a waypoint in the KML file.

4.3.3 TEXT PAD

TextPad is a text editor for the Microsoft Windows family of operating systems. First released in 1992, this software is currently in its seventh major version. It is produced by Helios Software Solutions.

4.3.3.1 Features

Key features include:

- The ability to maintain block indents
- Automatic code indentation
- Regular expression based search and replace, including multiline regex
- Macro recording feature to facilitate complex text transformations and data processing.
- Macro feature supports multiple regex searches (and replacements) within a macro
- Syntax highlighting (extendable to many different languages)
- Ability to call external programs (such as compilers)
- Regex matching can be used to jump to a line number in a file given in the output from external programs
- Automatic integration with Java JDK, if JDK is already on the machine
- Large file support
- Support for editing multiple files, with tabbed document selection

- Block select mode
- Synchronized scrolling of multiple files
- Clip libraries – snippet management for reusable portions of text to insert into documents
- Clipboard history – Allowing TextPad to function as a multiple clipboard tool
- Bookmarking of lines, therefore allowing users to copy specific lines (e.g. log file error messages), and then paste them to another document.
- Multi-lingual support: User interface is available in seven languages with spelling dictionaries available in ten languages.

4.3.4 OSMAND

The OSMAND online and offline can be used for displaying a lot of online maps, pre-downloaded very compact so-called OpenStreetMap "vector" map-files. It is possible to search and find Addresses, Point of Interest (POI) and Favorites, find routes to navigate with car, bike and by foot, record, replay and follow self created or downloaded GPX tracks by foot and bike. It can find Public Transport stops, lines and even shortest public transport routes. Very expanded filter options are available to show and find POI's. It is possible to share our position with friends by mail or SMS text-messages. Navigate by voice is also available. If only online features (loading map only to see, searching addresses, routing) are needed, there is no need to prepare data. Some map features will be available such as auto-zoom, rotating map, choose map source, find addresses, routing by car, bike and foot, and many other features. Some features will be not available, like seeing POI over maps, seeing preloaded map tiles, looking for transport and others.

Another option is available to download data right in the application from internet tile sources such as Google, OSM, Bing, Bicycle maps, through which we can download very compact OSM vector data right from the application. We can even

create our own map files with OSMANDMAPCREATOR. For that SD card should be available in the mobile because all map tiles will be saved on SD card.

4.3.5 QGIS

QGIS (also known as Quantum GIS) is an open source GIS application enabling the user to visualize, manage, edit, analyze data, and compose printable maps. It runs on Linux, Unix, Mac OSX, Windows and Android and can be downloaded free of charge from qgis.org (http://qgis.org/).

4.3.5.1 Licensing

As a free software application under the GNU GPL, QGIS can be freely modified to perform different or more specialized tasks. Two examples are the QGIS Browser and QGIS Server applications, which use the same code for data access and rendering, but present different front-end interfaces. There are also numerous plug-INS available which expand the software's core functionality.

4.3.5.2 OpenStreetMap Plugin

The QGIS OSM Plugin loads in vector data from OpenStreetMap, and even edit and upload changes. Menu "Vector -> OpenStreetMap -> Load data" will connect to the OSM server and download data.

4.3.5.3 Data formats

QGIS allows use of shape files, coverages, and personal geodatabases. MapInfo, PostGIS, and a number of other formats are supported in QGIS. Web services, including Web Map Service and Web Feature Service, are also supported to allow use of data from external sources.

CHAPTER 5

METHODOLOGY

5.1 INTRODUCTION

The study is intended to create an offline tourism map which can be loaded in Android mobiles. This chapter discusses the methodology of the project. It deals with the data collection, preparation of various thematic layers and creation of data in binary mobile format.

5.2 METHODOLOGY FLOWCHART

This section describes the Method followed in the creation of maps and loading maps in Mobile. The methodology is shown as a flowchart.

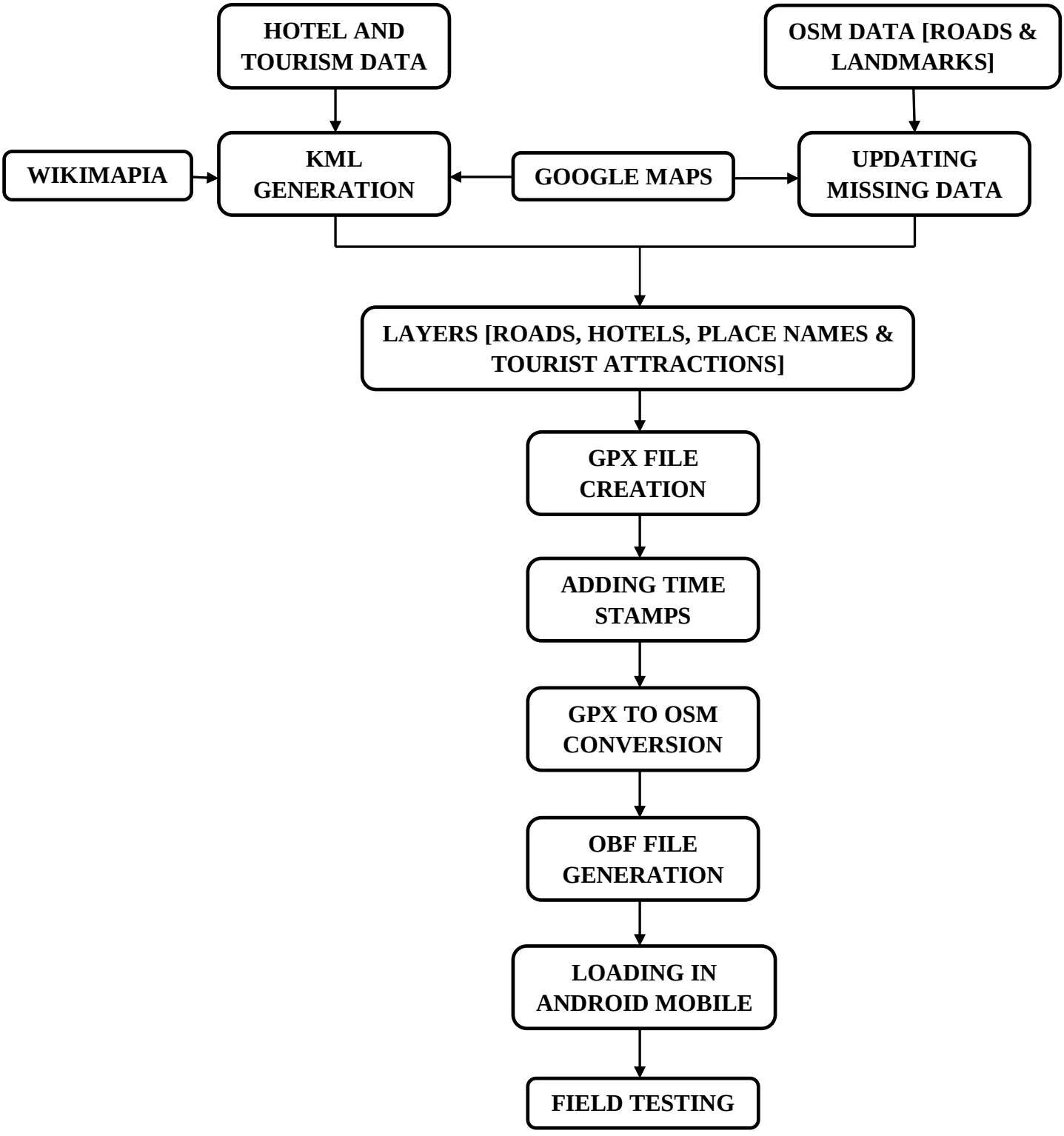

Figure 5.1 Flow Chart of Methodology

5.2.1 KML Generation

The tabular data about the Tourist Places and Hotels are converted into spatial information using Google Earth. The search of a Place name or Hotel is carried out in Google Earth. A Placemark is added in the location and the details about the point are added. If the search in Google Earth returned no results then wikimapia is used to find the spatial location of unknown points. The position of the Hotel or Place is searched and found in wikimapia and the latitude/longitude values are copied. These latitude/longitude values are searched in Google Earth and added as a Placemark.

The Tourist Points and Hotels are all collected in separate folder in Google Earth. These points are saved as KML files in the hard drive using the save as option in Google Earth.

5.2.2 Updating missing data

OpenStreetMap contains only little information. So the data obtained from the freely available OSM will contain insufficient information. Hence the Roads and other layers need to be updated using other techniques. The missing data is updated in the 'Quantum GIS 1.8.0-Lisboa' software. The downloaded Road layer is loaded into the QGIS and editing is started. The Google Maps layer is added into the software using OpenLayers plugin.

Plugins -> OpenLayers plugin -> Add Google Streets Layer

Missing roads were digitized by overlaying updated Google Maps and existing Road Layer. Also the attribute information such as Road Name and Type are added during the time of digitization. The files are saved as shape files in an external database. The same procedure is followed for the Place Names. The Junctions are attached exactly to the road layer using snapping option.

5.2.3 GIS Layers

In this project four layers are used.

- Roads
- Hotels
- Place names
- Tourist Attractions

The Road and Place names layers are downloaded as shape files and updated. The Hotels and Tourist Attractions are created using Google Earth and saved as KML file. The KML file is converted to shape file in QGIS. Finally four shape file layers are obtained. For the Roads layer the topology is run and the errors are all corrected. The various errors such as overlapping features, dangles, snapping mismatches etc are checked. The networks geometry is also checked using the Geometric network to find the geometric errors.

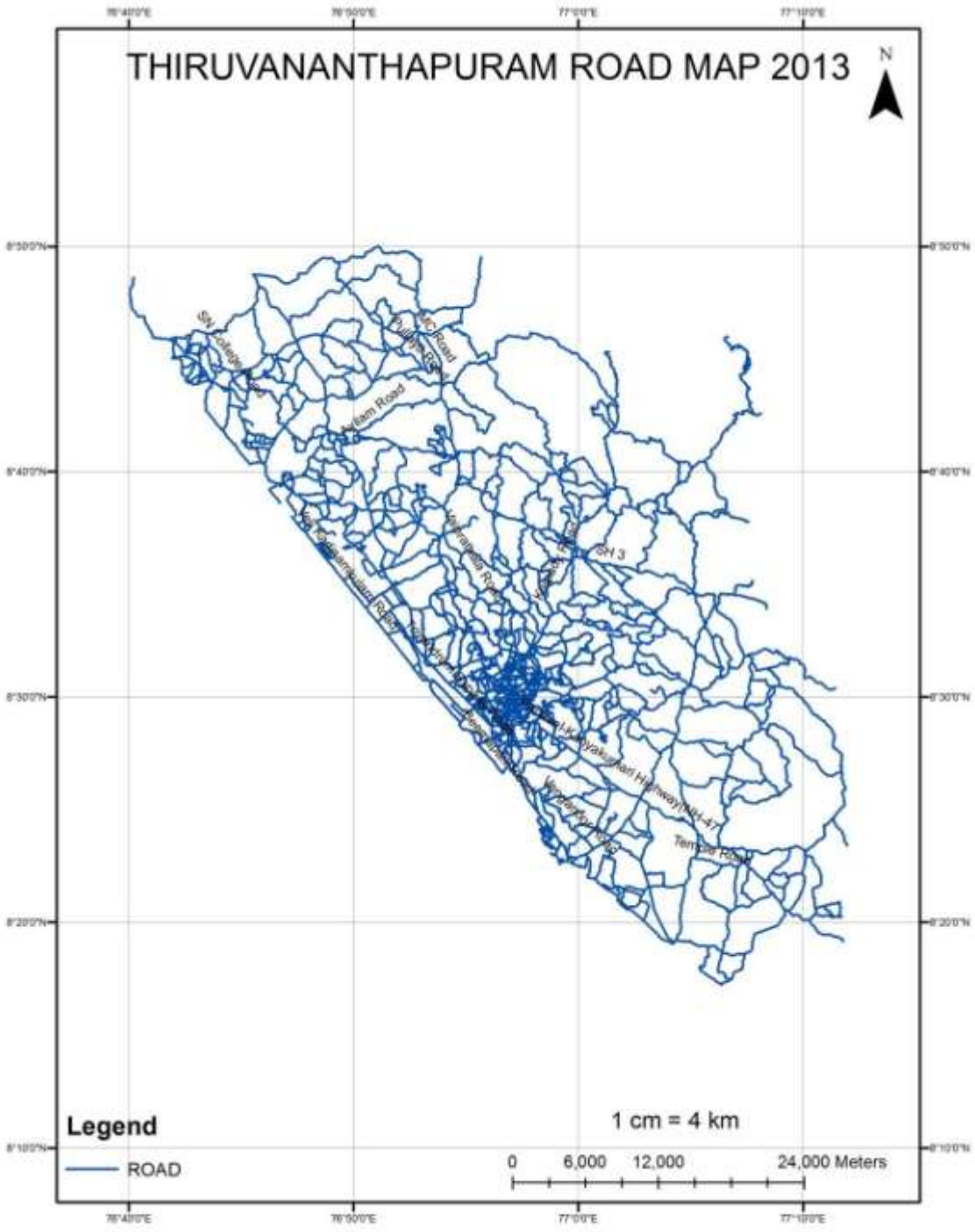

Figure 5.5 Final Road Map

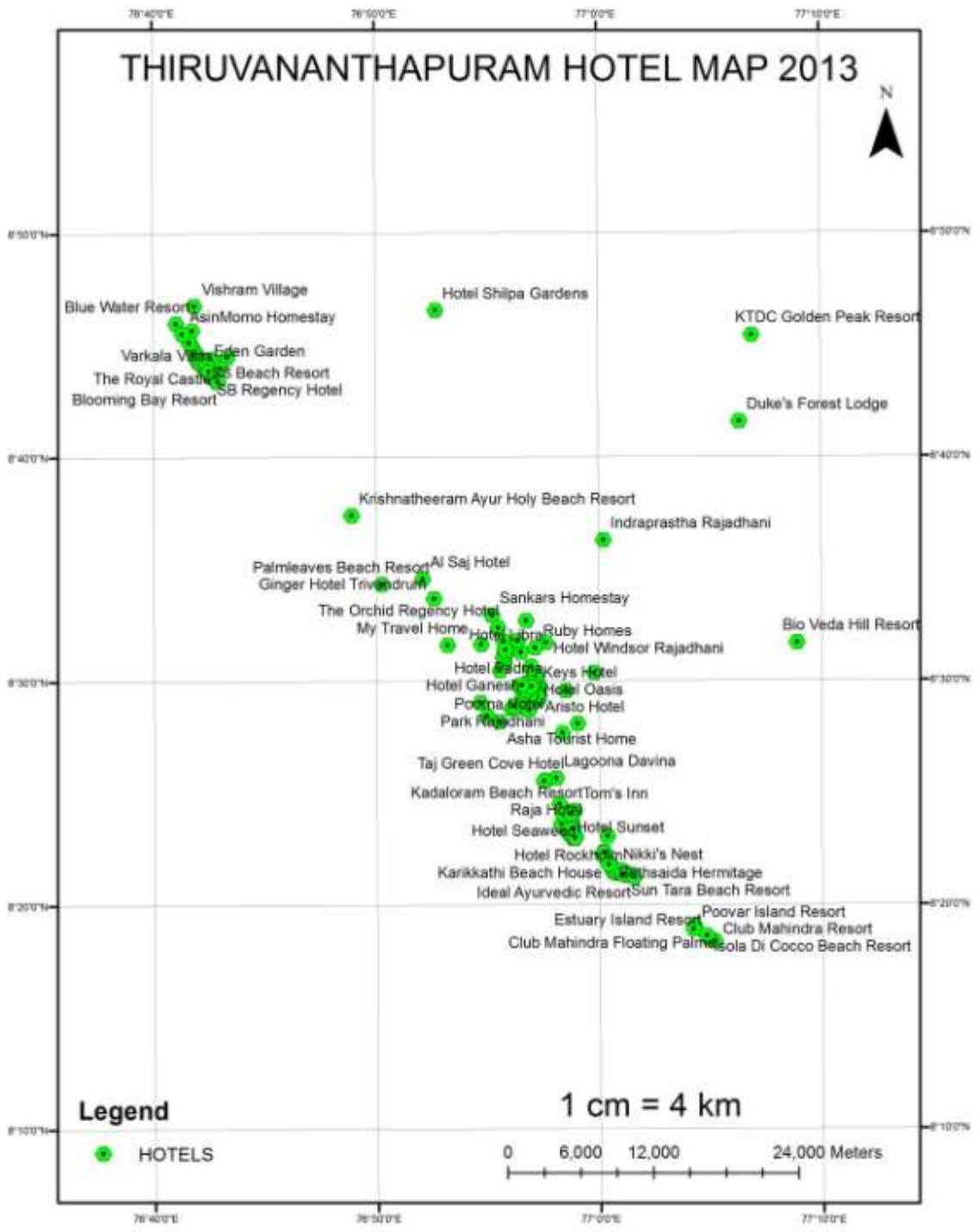

Figure 5.6 Hotel Map

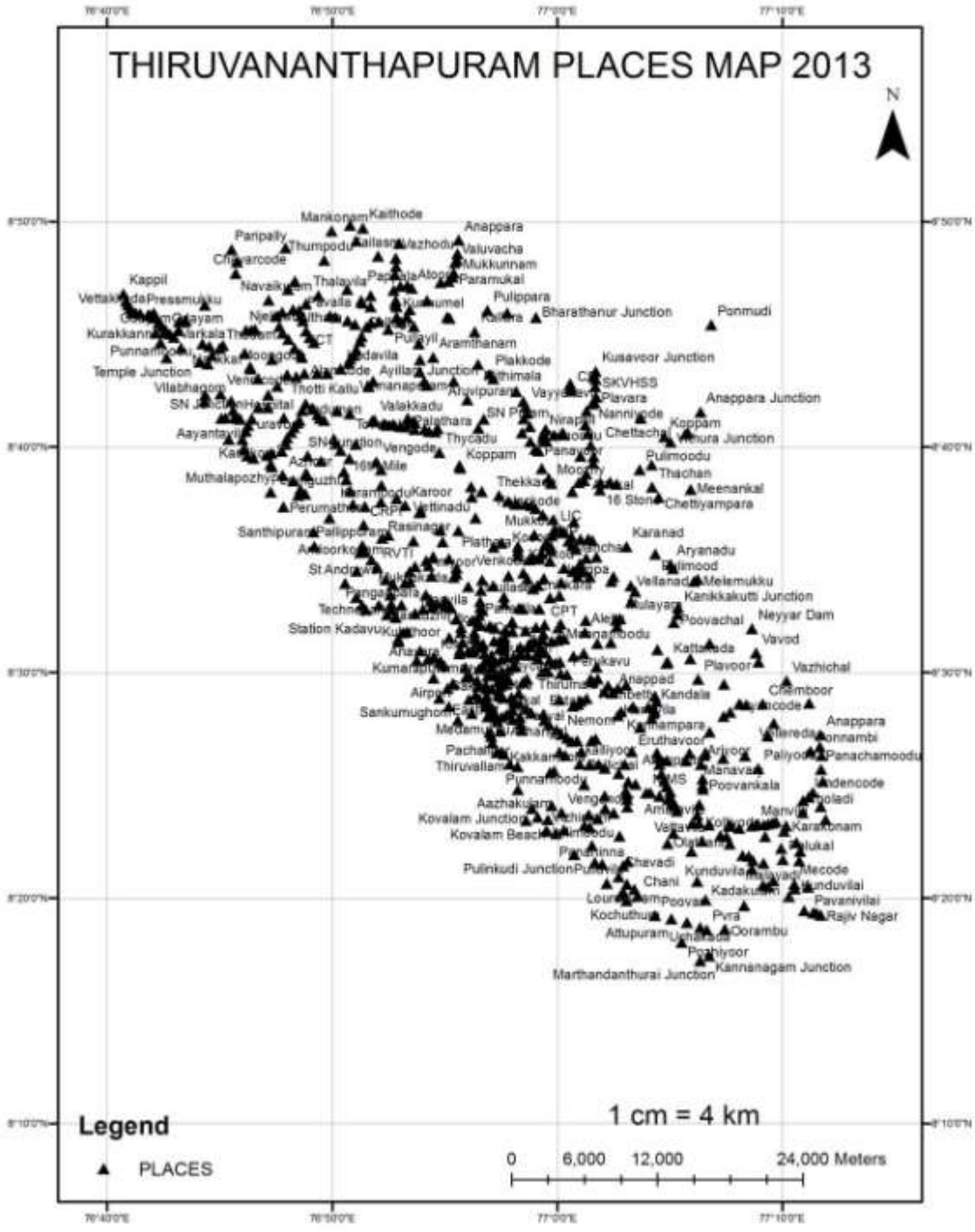

Figure 5.7 Places Map

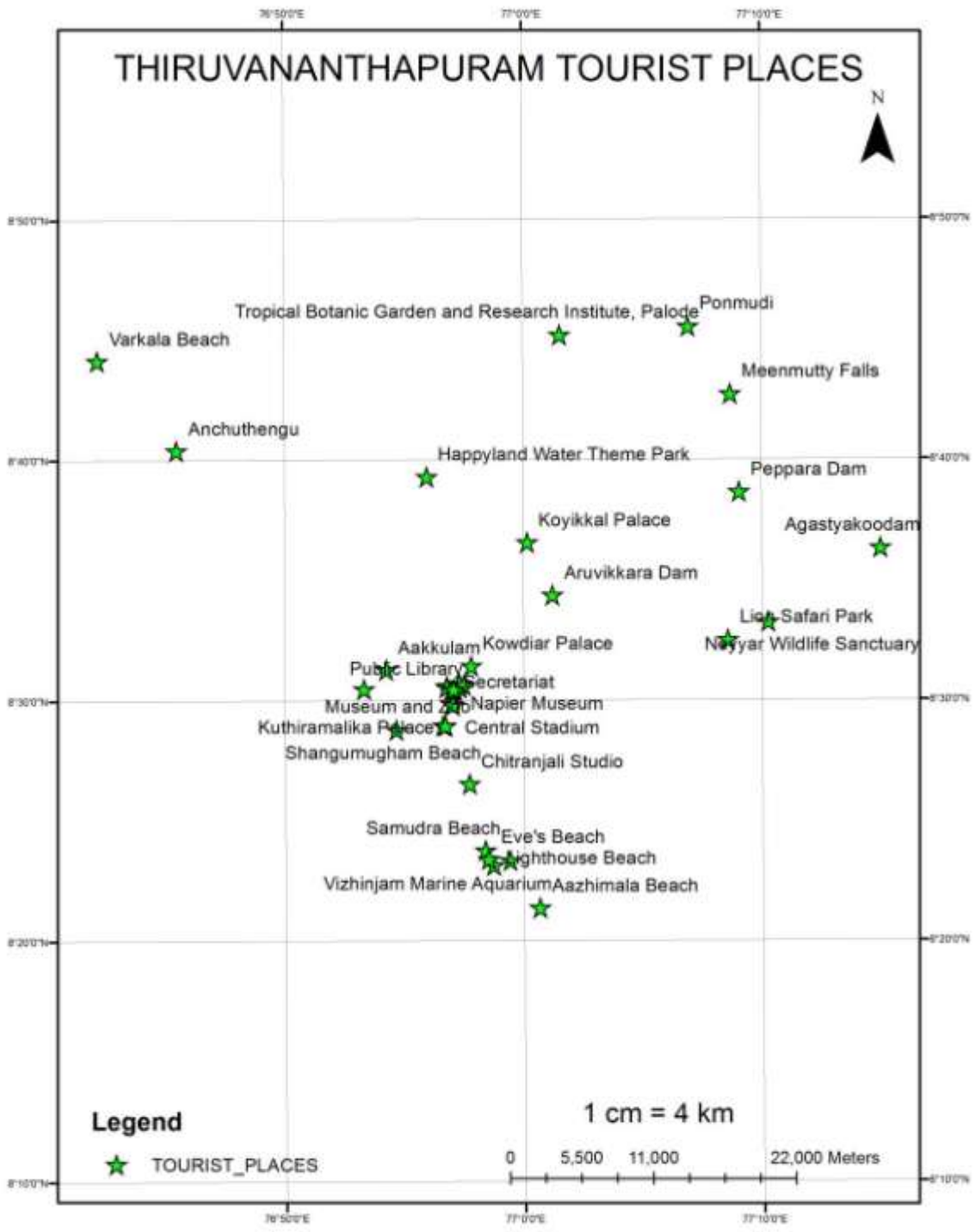

Figure 5.8 Tourism Places Map

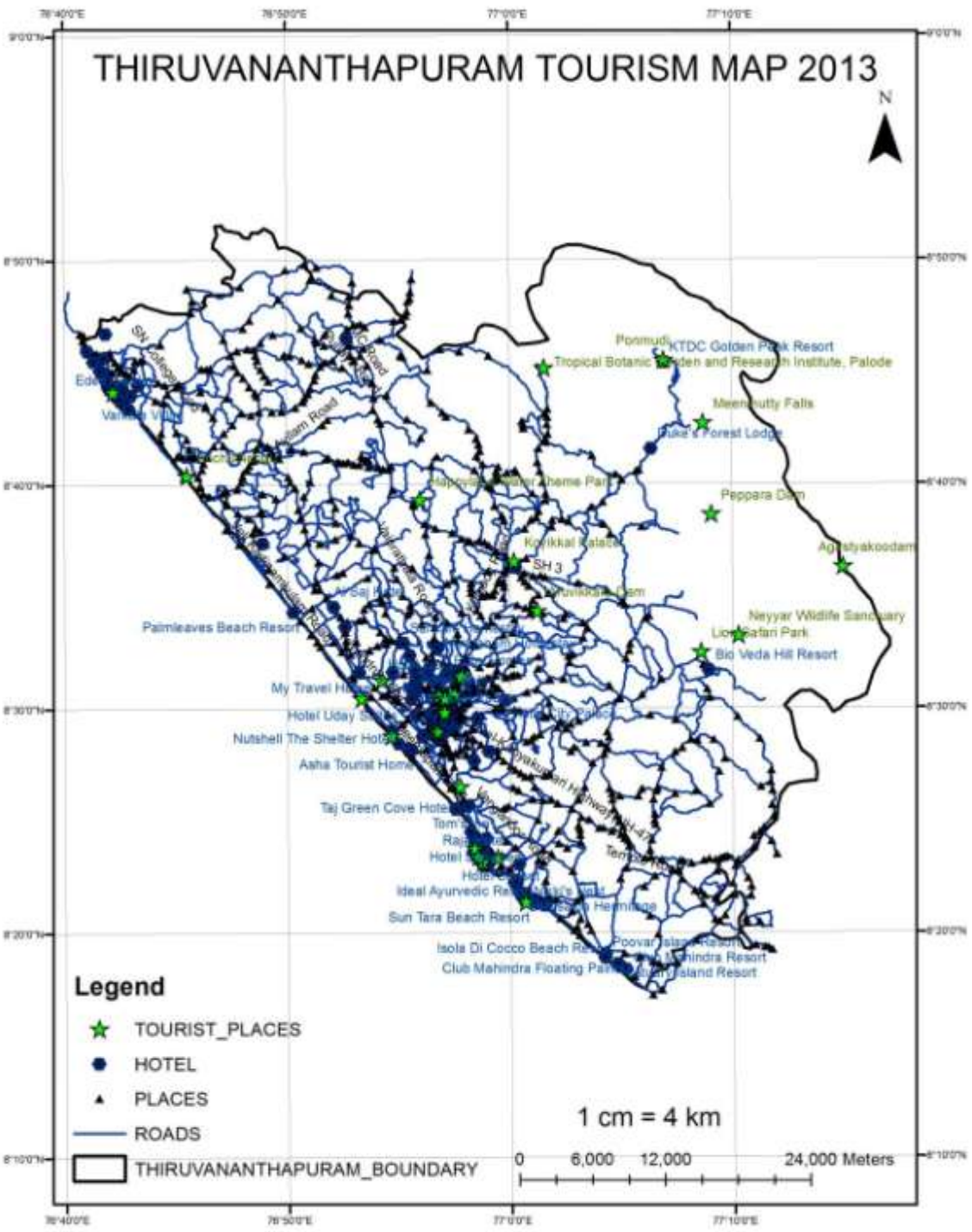

Figure 5.9 Final Tourism Map with all Layers

5.2.4 GPX File Creation

GPX or GPS exchange Format is an XML schema designed as a common GPS data format for software applications. It can be used to describe waypoints, tracks, and routes. The format is open and can be used without the need to pay license fees. Its tags store location, elevation, and time and can in this way be used to interchange data between GPS devices and software packages. The file is converted to GPX format because it can check routing errors. The GPX conversion will work correctly only if the file is of exact format.

The shape file is converted into GPX file using QGIS. Initially a new GPX file is created using the 'Create New GPX Layer' tool available. The created GPX file has three layers- waypoints, routes and tracks. All the data in the shape file is copied and pasted in the corresponding layer in GPX file. Then using the 'save as' option the file is saved to local hard drive.

5.2.5 Adding Time Stamps in GPX

The GPX file is opened in GPXEditor1.3.83.1509 software. Using the OpenStreetMap Tools anonymous time stamps are added to the GPX file. This is done to avoid problems in the creation of the OSM file.

5.2.6 GPX to OSM conversion

5.2.6.1 OSM Generation

This conversion is done in the GPSBabel-1.4.4 software. The file is opened in GPSBabel and the output format is set into OSM. The necessary tags for OSM data are added in this phase. The output is saved to the particular location. The file is converted into OSM format because the OSMAND MapTileCreator software can only accept OSM inputs.

5.2.6.2 OSM Editing

The editing of the OSM data is done in Textpad-6.2.2 software. The created OSM files will contain tags in the wrong format. The data can be converted into mobile format only when the tags are correct. The OSM file is opened in the Textpad software. It is basically a text editor, but the inner structure of OSM data is visible with its nodes and path. Initially the version of OSM file is changed from .5 to .6. Then the tags are replaced using the find and replace tool. The correct tag names are given to all the data. The path will be in the format as shown below.

```
<way id='-11563' visible='true'>
<nd ref='-233'/>
<nd ref='-234'/>
<tag k='created_by' v='GPSBabel-1.4.3'/>
<tag k='name' v='Road Drawing'/>
<tag k='note' v='Road Drawing'/>
</way>
```

This is changed by adding the tags we need.

```
<way id='-11563' visible='true'>
<nd ref='-233'/>
<nd ref='-234'/>
<tag k='highway' v='tertiary'/>
<tag k='name' v='Road Drawing'/>
<tag k='note' v='Road Drawing'/>
</way>
```

The complete list of all the OSM data types is available in the website https://github.com/OSMANDapp/OSMAND/blob/master/DataExtractionOSM/src/net/OSMAND/OSM/rendering_types.xml. By checking this page different tags of all the OSM tag formats are found.

5.2.7 OBF file generation

OBF file is created using the OSMAND MapTileCreator software. The software converts the OSM file into OBF format in the working directory.

5.2.8 Loading in Android Mobiles

The data is placed in the OSMAND folder in the memory card of the mobile. The indexes and files should be put to appropriate folders on SD card. Directory structure of OSMAND application is pretty simple:

/sdcard

OSMAND

Address

POI/

Once copied the files, choose menu option Settings -> Data for offline usage -> Reload offline data to be sure these data is loaded, or exit and restart OSMAND, which does the same refresh task.

CHAPTER 6
TESTING AND RESULTS

6.1 INTRODUCTION

The present study attempts to develop a tourism map for tourists and travelers visiting Thiruvananthapuram. Updated road and other thematic layers are obtained from free sources and an offline map is developed. These maps need to be checked in field by checking the route and other attributes. This chapter discusses about the Testing and the results obtained. The routes and Point Of Interest are calculated and is described in the following section.

6.2 OSMAND NAVIGATION

Navigation is the most important part of Tourist Information System. OSMAND has features to find the current location, route to an unknown place, searching point of interest etc.

6.2.1 Finding on map

For example: Find "Where am I", Where is a certain address or zip-code, where is closest restaurant, where is the closest park, where is my car, getting history data etc. To accomplish these tasks probably offline vector data is needed (for POI).

- **Current Location.** Enable GPS or network positioning and wait until the device find current location. When it will be done a blue curved arrow at the right top corner is visible. Clicking on it, the map will be centered to current location showing a blue dot or a blue circle at the center. The center of the map is black circle; it is useful to calculate the distance to other objects. To see distance from current location, press at arrow and map will be linked to location.

- C**losest POI.** Pre-loaded vector maps should be available to use this feature. Press the search button on the map or go through main menu -> Search -> Top Left POI button. Next select the category or predefined filter. In order to find all POI select POI. After that, select closest POI or amenity in relation to the last centre point of the map, or related to actual location (Search nearby). Search radius can be increased as we like. A short click moves map position directly to the chosen POI. Long click shows a choice:
  1) Show additional information if available,
  2) Show on map and
  3) Navigate to.
- **Searching by address.** Press the search button on the map or go through main menu -> Search -> Second Left button: Address. Choose Internet button after that, if there is no vector map file, download one. If there is an offline Map downloaded, choose Settings -> Data for offline usage, we have the possibility to browse through city and street names in the downloaded index. It is also possible to go search by address and select whether you want to search using offline index data or using internet OSM Nomination. After that select any one of the two options: Show on map or Navigate To.
- **Favorites.** First of all it is possible to find favorites on map using other possibilities and mark that point as favorite by pressing long click over map and click on the box on Map. Alternative is: selecting Menu button -> More -> Point Options. (Which is nearly the same as long click, however point location is the center on the map is no point click on the map is done.) After creating favorites they are visible as favorite points in the main menu > favorites.
- **Lat/long coordinates.** Click Menu button > Specify point. Then view the current map coordinates, copy or save them and specify other coordinates.

- **History.** Go to search form and go to the right most tab: history. All search items which are previously checked will be visible.

6.2.2 Navigation to a point

First of all select a point on the map. After searching the address or POI, directly choose the To button, or show the location on the map. When showing the right location on the map, use a long press on the map. A box will appear on the Map. Click this box, and a context menu appears. Another alternative option is to click Menu button -> More -> Point options. Then the same context menu appears. Then click Navigate to point. There is a Red Dot placed on the map, but nothing happens yet. Click Menu button -> Directions button to create a route. Now select the option to create a route with car, bike or foot, and whether to start navigation directly, or only create the route and show it on the map with the Show button. The distance to that navigation point is shown in the left top corner. There is a box with a Red point and a distance to your point of navigation. Also, the bearing to that point is shown on the map as Red arrow.

6.2.3 Customize map view

To customize map view, first of all select Settings/Application mode and choose Car/bicycle/pedestrian. Some settings will be changed automatically like (auto-zoom, rotate map, show POI over map, save track, show aspect of view). The predefined settings can be changed manually in Settings/Map.

Figure 6.1 Tourism Map loaded in OSMAND showing Location

Figure 6.1 shows the Tourism Map loaded in Android Mobile. It also indicates the current location which is shown as a blue circle. Double clicking on the position circle will open a window as shown in the Figure 6.2. By setting the current location as destination we can start the Routing.

Figure 6.2 Setting destination in OSMAND software

Figure 6.3 Showing direction preferences in OSMAND

Figure 6.3 shows the map showing direction preferences. The software can calculate routes for Car, Bicycle and Pedestrians.

Figure 6.4 Calculated shortest route between two points

Figure 6.5 Showing descriptions and directions of the route

The Figure 6.4 shows the shortest route between two points. In the Figure 6.5, the description of the route through major Junctions is shown.

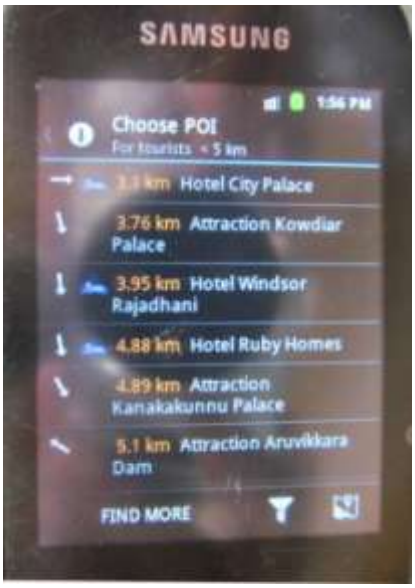

Figure 6.6 POI search

Figure 6.7 Map showing the travelling speed and direction

A search of hotels and attractions displays the nearest POI as shown in Figure 6.6. Also during travelling OSMAND shows the travelling speed as in Figure 6.7.

CHAPTER 7
CONCLUSION

7.1 INTRODUCTION

Smart map, is a multimedia graphical and spatial databases which is integrated with different sensors such as GPS and gravimeter in mobile environment. The smart map is different with paper and digital maps. The maps on mobile devices are uncounted with uncertainties more than familiar case in desktop and static system. For Tourist database, GIS is an efficient tool for the cost effective collection, storage and analysis tasks. Mobile Tourist Information System will not replace tour guides or guidebooks, but they could help better by showing the spatial location and routes. In any project, for the developing countries like India, cost is the primary consideration for the adaptability of GIS technology. Under these circumstances, OpenStreetMap and QGIS Provides all the data storage and analysis for free.

Tourism map available in mobiles will help Tourists in finding hotels, explore new locations etc. The state tourism departments can upload these types of maps in their website so that everyone can download and use it in their mobiles. The users can run routing and searches without an internet or mobile connection. But with GPS, mobile and internet connection we can get a precision of 3 meter.

7.1.1 Advantages

- Since offline routing is used it is helpful in areas where there is no network coverage.
- Fast and efficient routing.
- Search and find locations of nearest point of interest.
- Accuracy up to the range of 3 meter is obtained due to the combination of GPS and Mobile networks.

7.1.2 Disadvantages

- ❖ Accuracy of the data is very important.
- ❖ The updating of maps in offline mode is difficult as compared to online techniques.

7.2 SUGGESTIONS

The suggestions for future tourism map in mobile platform are as follows:

1. More features can be added to the maps to increase the visual suitability.
2. Details can be added into the road database such us width of the road, no of lanes etc. This will help in advanced routing were preference can be given to one ways and other similar features.
3. More efficient routing algorithms can be implemented to improve the speed and efficiency.
4. Voice navigation features can be added to the software in local languages.
5. Develop dedicated software for tourism application which can be used in a variety of mobile operating systems.

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