



Base Mapping of Urban GPS (Case Study: Yazd City)

S. Ali Almodaresi^{1*}, M. Mohamadpour¹, M. Noujavan²

¹Department of GIS&RS, Yazd Branch, Islamic Azad University, YAZD, IRAN

²Department of Geography, Meybod branch, Islamic Azad University, MEYBOD, IRAN

Received: March 6, 2014

Accepted: September 15, 2014

ABSTRACT

Nowadays, using new GIS technologies and navigation systems for developing welfare and creating more proportion of efficiency in societies has become an important and considerable point. And every city needs to use these facilities to earn necessary standards in citizens and tourists view. Today's citizen expectations in a developed city are easy and up to date access to locations and needs which is dealing with them. And today's tourist searches about location- based knowledge before choosing the appropriate place to visit and therefore he will choose the easiest one. Yazd city which has the title of Second city with buildings made of adobe, needs necessary location-based Infrastructures to develop tourism and citizenship welfare. This research has produced basic GPS maps of Yazd city and all of the Places, mosques, ATMs, touristic places, Buildings and service centers including, Welfare, Therapeutic and Public centers are registered according to software structure, in a way that all of the attachments and researches could be done using this basic software. The applicable URL software that can be installed on Symbian cellphones is the other product of this research which guides the tourists to get to the destination easily with an appropriate accuracy. By installing XT Gramin GPS Navigator software on cellphones who can handle Bluetooth GPS, and also by uploading Yazd city map from appendix disc to the cellphone and running that, the ability to search banks location, gas stations, mosques, ATMs, touristic places, and the ability to registering movement path accurately would be available.

KEYWORDS: Global position system, Shap file, Geographic information system, Arc GIS, YAZD

1. INTRODUCTION

It has been a long time since navigation systems are used all over the world and nowadays they are known as a necessary companion in within the city and suburban travels. In developed kinds of these systems, even traffic information is sent to the user's receiver. And the system, selects the path considering this information. Considering that all of these systems are produced by American companies or companies having relation with the US, and noticing problems in relation with our country and the US, most of these systems do not support our country or if there is a map of Iran in these systems, it is very old and incomplete.

Generally, navigation systems made by big companies are encoded and it is not possible to change maps in these systems. These systems initially were made by gargantuan automobile and ship manufacturing companies. It has been more than a decade since the application of satellite positioning systems in Iran. But there is not a public navigation system all over the country yet. In addition to not supporting by these companies, there are some other effective reasons. Lack of access to updated information, lack of appropriate and complete information systems, being ignored by automobile manufacturing companies, high cost of the initial investment required for and finally lack of an existing law for stopping copying and misusing of presented information are some of the most important reasons. In the last decade, the mapping organization of the country considering the national need and support of the government and management and planning organization, has made a huge evolution at making maps and locative information in all over the country that completing about 90% of digital coverage map 1:25000 of the country and making 1:2000 maps of about 500 cities are some mentionable activities [15].

According to the historical and archaeological Sites antiquity, Yazd city is one of the cities that many domestic and foreign travellers visit it each year that contributes to this guide, most of their problems such as finding path and places and ... could be solved. By the way, by using this tool, a lot of traffic problems and people confusion led to damaging results, would be solved. Considering the country's need and facilities of mapping organization of the country and also existence of high locative information, preparation of basic GPS map of Yazd city as a comprehensive and functional in navigation system was proceeded that was studied in this research. In this software system, map of the city and its streets are determined on the GPS device and an icon

*Corresponding Author: S. Ali Almodaresi, PhD Geomorphology, Assistant Professor, GIS&RS Department, Hesabi Blv, Safaie, Yazd, Iran. Email: Almodaresi@iauyazd.ac.ir

software system, map of the city and its streets are determined on the GPS device and an icon or a symbol shows the path direction. Using this software and a GPS device, the user can determine his locative position in the city accurately. The user can also determine his required places such as gas station, hospital, drugstore, university, fire department and In this research project, collecting the existing situation of the city from metropolitan divisions, places, privacy, municipal utilities and ... would be a great help to metropolitan planning. Also by transferring prepared maps to the GPS devices or cellphones, they would be a very appropriate guide for people in finding their required path or location, which this method can be used in taxis, buses and travel agencies to help people.

2. MATERIALS AND METHODS

2.1. The studied area

Yazd city is the province of Yazd state and is located at the center of Iran. This city is between Shirkouh and Kharanegh mountains and is located in a vast valley. Yazd is located in south east of Iran [16].

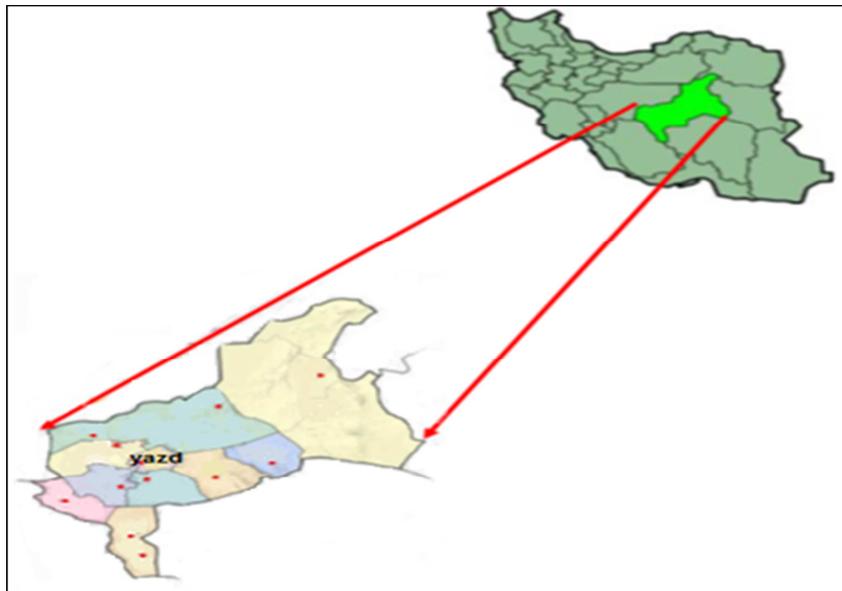


Fig.1 location of Yazd in the country

Present research of the city is a typical research and it had been done by field methods and statistical data and valid sources at the related field to the subject and also aerial maps and satellite images.

In general, structure and study of present project can be expressed as below:

2.2. Necessary statistical data for this project such as aerial maps and satellite images are collected.

At this project, after studies and performed considerations to create basic GPS map for Yazd city, raster and vector formats were considered. Then necessary aerial maps and satellite images were gathered. Some of the maps don't have coordinate system and most of the systems are local.

2.3. The city map is geo-referenced (integrating coordinates) by Arc View GIS software.

Initial and raw data of all of the sensors have different geometric errors. Although the satellite images after being received from satellite at ground station would be corrected initially, but they still have some errors like relocating errors resulted from ups and downs. Before the analyzing data, they should get supplementary geometrically corrections and from coordinates view, they should be matched with some basic standards. Satellite data can be corrected geometrically by one of the ways of ground control points, using satellite orbit parameters and regression. And match them with one basic. Geo-referencing of maps and images is done in Arc View GIS software.

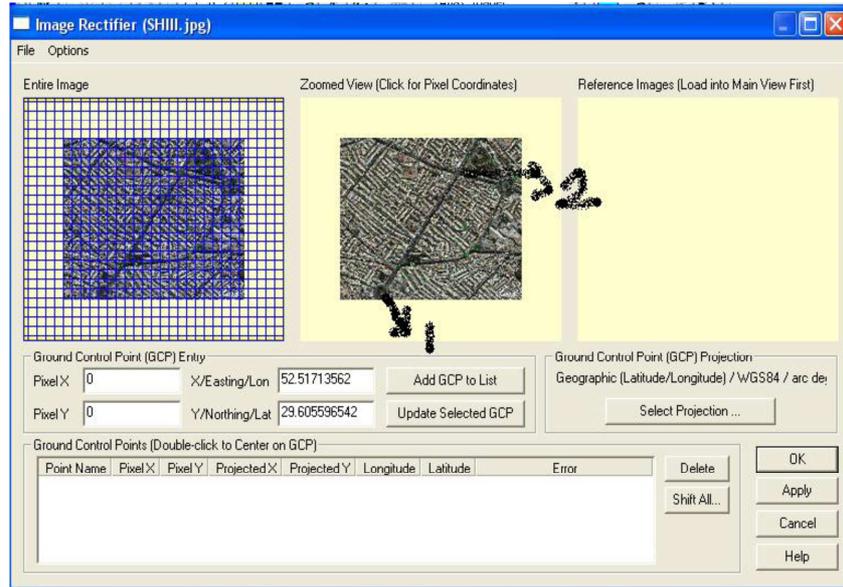


Fig.2 Geo- referencing of image

2.4. Locational gathered data are digitized on maps

After geo-referencing images and aerial maps, the next step is digitizing satellite and aerial images. In modern mapping procedures, computer techniques play an important role. Most of the mapping organizations, use modern and computerized techniques of mapping during operating geographical information systems. Using these systems, the first and the most important step is to transform map data from linear and non-digital condition to digitized and compatible with computer. Transforming traditional paper maps or other graphical evidences to digital data compatible with computers is called digitizing.

2.4.1. Digitizing point features

Side points usually are showed with a symbol in all paper maps. Therefore to digitize point features, it should be determined that which part of the symbol should be digitized and the coordinates should be documented.

2.4.2. Digitizing polyline features

There are 2 ways for polyline feature digitizing which are point documenting status or point mode and constant documenting or stream mode. In point documenting status or point mode, the digitizing factor registers the points resulted from matching digitizer cursor on the slightly points at fracture of coordinate lines. In stream mode, the existing constant factor tracks the line in a way that digitizer cursor exactly sits on the line and the points of the line are registered.

2.4.3. Digitizing Surface features

At this kind of digitizing, the constitutive lines of these surfaces or in other words, audit lines of the surface or polygon gets digitized exactly like polyline features. The problem occurs when the border of two surfaces is needed. At this situation the joint line between the two surfaces or polygon, should be digitized only once to bridle construction of sliver between two surfaces (figure3).

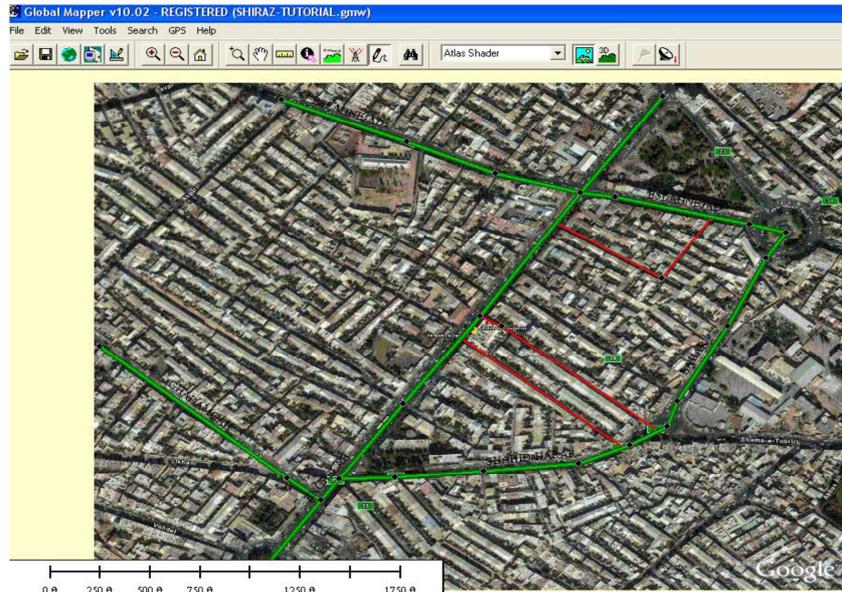


Fig.3 Digitizing a map

2.5. Edit and correction

The edit and correction step is an essential part of digitizing. Because digitized data should be without any errors. Edit and correction step is performed in 3 steps:

Discovering error- location of feature having the line- correcting them (figure4).

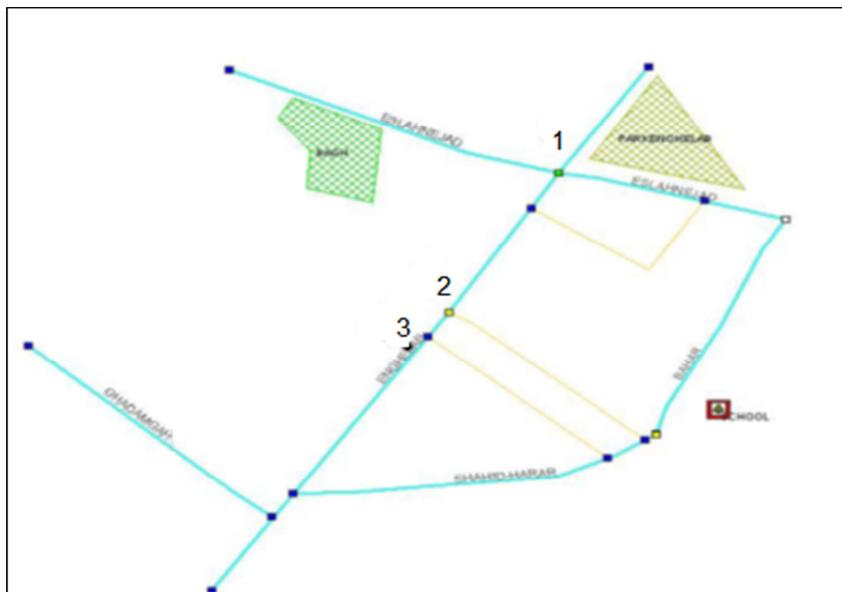


Fig.4 The digitized map

2.6. Used software

Steps below are considered in selecting the software:

- Operating hardware: Pocket PC
- Used operating system: Microsoft Windows Pocket PC or Microsoft Windows CE

In general, different applications were checked that among them, Arc Pad from ESRI Inc which has the ability of using Shape format was took into consideration and finally, Arc Pad software was chosen as the main software. This software permits the user to run the maps at Arc GIS environment and send it to related software.

2.7. Transferring data to cellphone and running the program

This section in fact, is acknowledging characteristics of the interface program for making digital data produced from Yazd city operational and transforming data formats and transferring to cellphone in different models and finally running program successfully and giving service capability to the user in a way that he could simply search and find the path to all of the necessary locations and centers.

By installing XT Gramin GPS Navigator software on cellphones who can handle Bluetooth GPS, and also by uploading Yazd city map from appendix disc to the cellphone and running that, the ability to search banks location, gas stations, mosques, ATMs, touristic places, and the ability to registering movement path accurately would be available.

3. RESULTS AND DISCUSSION

Geographical complications such as city span, streets and ... cancels the use of this method greatly. In any case, in the current circumstances by expanding different technologies, this problem has been solved by a modern satellite system which is global position system or GPS. In fact the world today, is a world that nobody would be lost in that and everything is identifiable in every spot of the earth. And this power of positioning systems used by the man is because of satellite and computers basically.

General descriptive information is stored in the database. The descriptive information can perch in database before, after or concurrent by digitizing features. There are two methods to communicate descriptive information and spatial data. When the logical method is not used, both corresponding descriptive information and spatial data should be determined by a unique username. This unique username for ever feature should be introduces at digitizing and entering descriptive information step. When positional method is used, the descriptive information set belonging to a feature should be fixed with a point besides the feature that should be connected to it.

Now, considering that produced data which were produced to be used in cellphone, are in shape file format and could be used in all of the GIS environments. The outputs of images and basic and thematic maps made from Arc GIS software are mentioned for people who are more interested in capabilities of the program. Also, all of the main files are registered in an appendix disk which could be read and edited by related software.

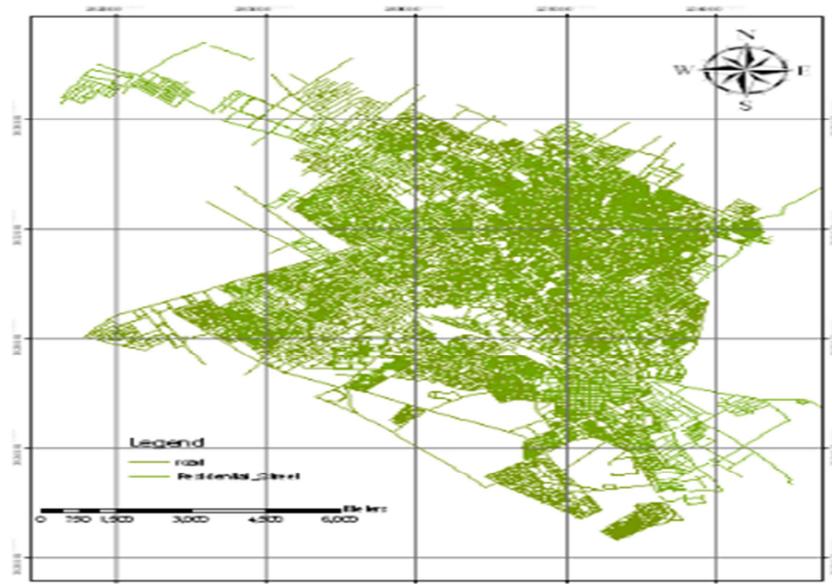


Fig.5 Digitizing all of the streets, alleys and urban districts of Yazd city

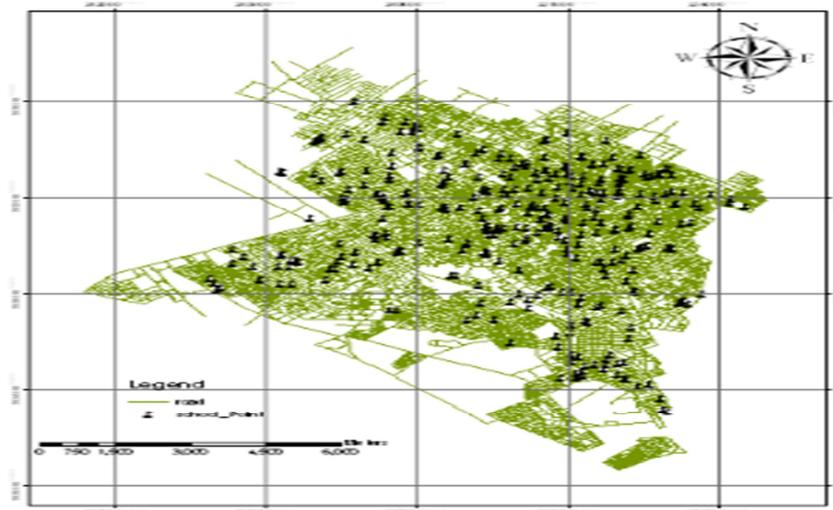


Fig.6 Location of schools in Yazd city

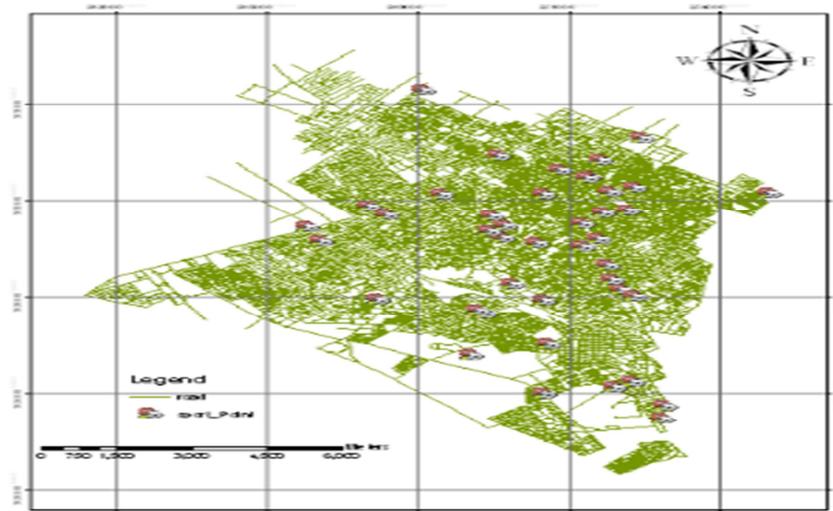


Fig.7 Location of gyms in Yazd city

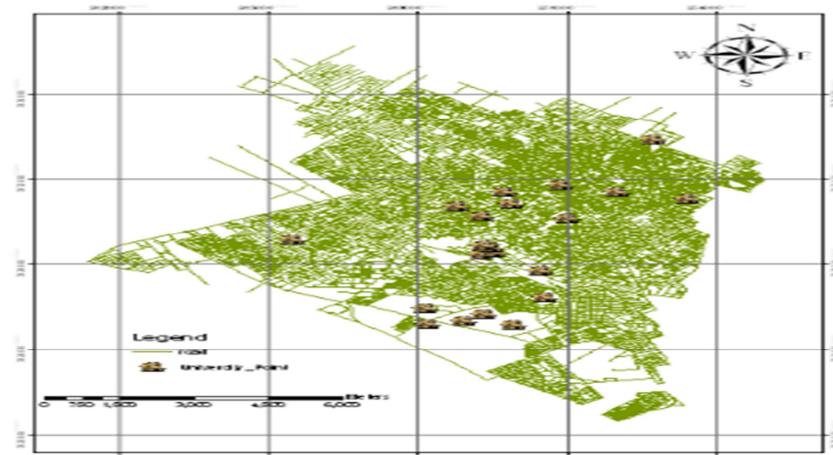


Fig.8 Location of universities in Yazd city

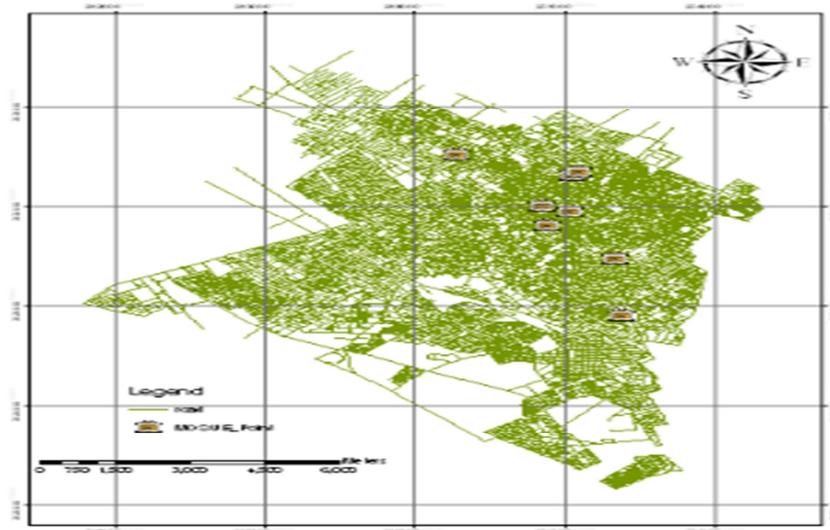


Fig.9 Location of museums in Yazd city

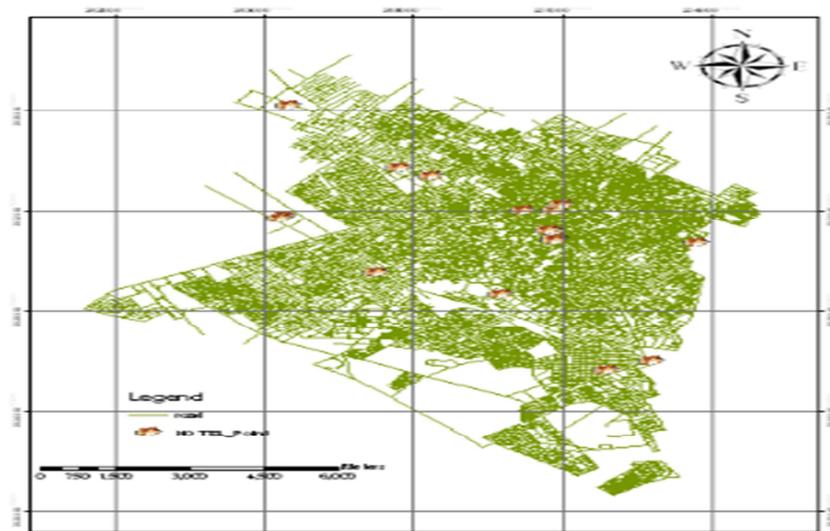


Fig.10 Location of hotels in Yazd city

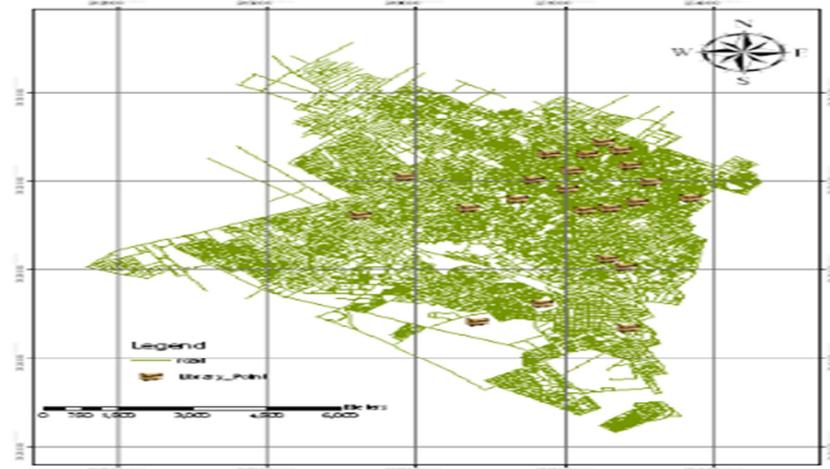


Fig.11 Location of libraries in Yazd city

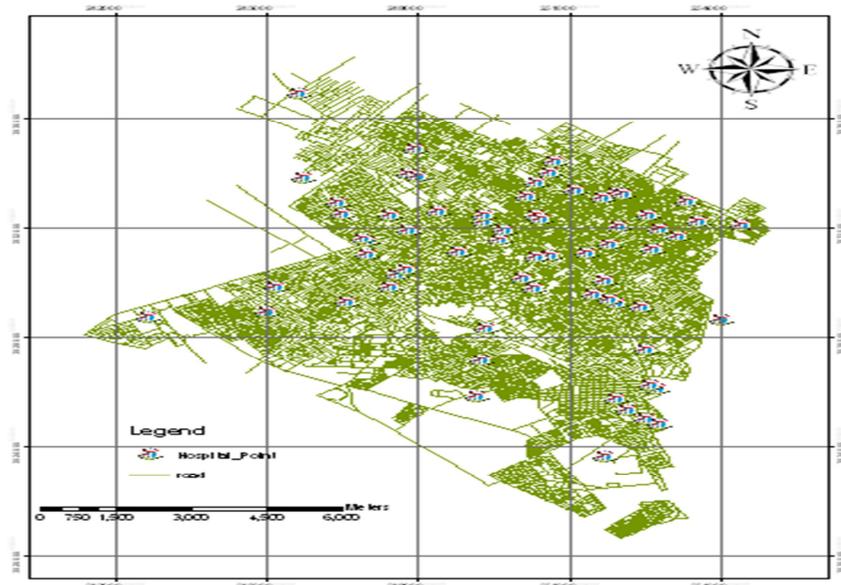


Fig.12 Location of hospitals in Yazd city

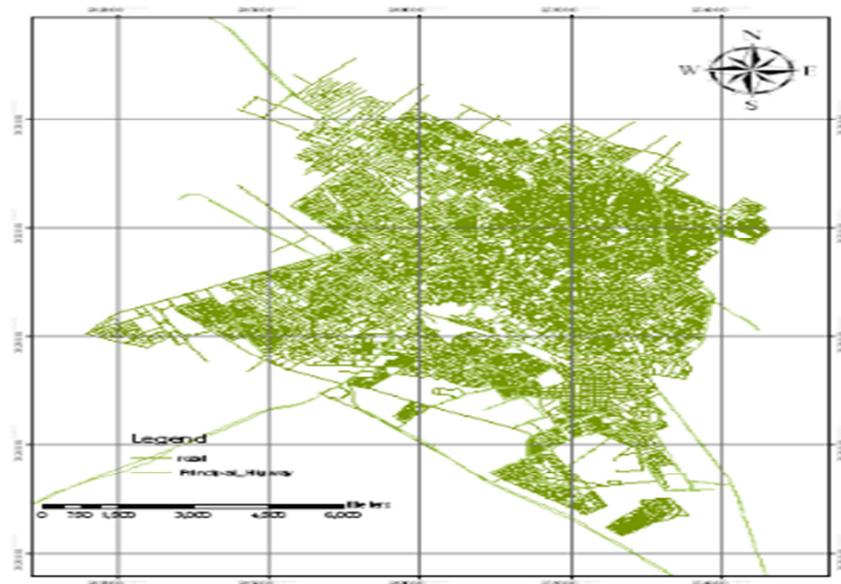


Fig.13 Location of Paths in Yazd city

REFERENCES

- [1] Baes M., 2001. Course brochure of satellite geodesy, mapping group of University of Tehran.
- [2] Comprehensive site of mapping
- [3] Ghaderi N., 2009. Familiarity with global positioning system, geography organization of armed forces publication.
- [4] Guochang Xu., 2010 Sciences of Geodesy: Advances and Future Directions, ISBN 978-3-642-11740-4 , published by Springer.
- [5] Kaplan E., 2006. Understanding GPS, Principles and Applications, ISBN 1-58053-894-0, Published by Artech House.

- [6] Mir Gasem M., 2007. Localization methods, vocational textbook, mapping field, textbook publishing company of Iran.
- [7] Marc Piéplu J., 2009. GPS et Galileo, Systèmes de navigation par satellites, published by EYROLLES.
- [8] N. R. C., 1995. GPS POSITIONING GUIDE, ISBN 0-660-15917-1, Published by authority of Natural Resources Canada.
- [9] Rabbany A., 2002. Introduction to GPS: The Global Positioning System, ISBN: 1-58053-183-0, Published by Artech House.
- [10] Raeisi R., 2010. Course textbook of GPS, education center of Shahid Mohajer of Isfahan.
- [11] Raeisi R., 2013. Gps user, satellite publication, Tehran.
- [12] Smith J., 2002. Understanding basic concepts without complex mathematics: Geodesy, translation and codification by A.A. Saleh Abadi, Geographical organization publications.
- [13] Seeber G., 2003. Satellite Geodesy , 2nd completely revised and extended edition , ISBN 3-11-017549-5 , published by Die Deutsche Bibliothek
- [14] Shahkar M., 2003. Satellite Geodesy (GPS), Tabriz Forouzesheh publication.
- [15] Sarpoulaki M, Shamei B.
- [16] Wikipedia.