A Geospatial Website for Consulting Geographical Information in Casablanca City

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Key words: website, geospatial, Casablanca, geographic information.

SUMMARY

Every day we manipulate a great quantity of information such as an address, an image, a map, etc. Thus we can notice that the majority of the data handled can be geographically localized. Using the traditional tools we can share this geographical information only with a very reduced number of users. Therefore, It is necessary to set up modern means to facilitate the diffusion of this knowledge to a large public.
The use of Internet as data carrier is regarded today as being an essential tool for any field and in particular for the geographical information systems, taking into account the great number of its users.

The present research paper aims to create a geospatial website for consulting geographic information concerning certain services located in Casablanca City such as: administrative services, shopping services and some public and private services as well.

Our research focuses on presenting the general concepts of the deployment of geographic information via Internet. After that, we design a geospatial website that will allow consulting geographical information over the web using the ArcIMS software after it has been prepared and restructured in ArcGIS Desktop.

The developed application is able to meet several public needs such as:
- Consultation and localization of various public and private services (administrations, points of interests, hotels, cultural centers,… etc.) within the city of Casablanca,
- localization by postal address, or by name,
- making spatial queries,
- printing outlines.

The result of this work reveals that using Internet as a GIS platform represents a suitable tool to deploy Geographical Data and make it accessible to large public of the community.

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1. INTRODUCTION

Every day we manipulate different kind of information such as addresses, images, maps, etc. Thus we can notice that the majority of the data handled can be geographically localized. Using the traditional tools we can share this geographical information only with a very reduced number of users. Therefore, it is necessary to set up modern means to facilitate the diffusion of this knowledge to a large public.

The use of Internet as data carrier is regarded today as being an essential tool for any field and in particular for the geographical information systems, taking into account the great number of its users.

Diffusion of geographic information via internet allows several services for different categories of users, even those with little cartographic knowledge could consult GIS services through internet. They could copy parts of maps and download several kind of GIS data.

In this paper we will develop the process of designing and creating a geospatial website for consulting geographic information concerning certain services located in Casablanca City

2. GENERAL CONCEPTS ON DESIGNING A WEBSITE

Several strategies can be used to add GIS functionalities to the WEB (Foote and Kirvan, 1998; Peng, 1997): server strategies, customer strategies and hybrid strategies. In our study we choose to use the ArcIMS software to develop the proposed website.

ArcIMS is a technological solution developed by ESRI which makes it possible to add geographical dimension and the capacities of analysis that conveys with many applications such as the electronic trade, the resource requirements planning, the management of data, and the localization of services (ESRI France, 2003).

ArcIMS assures the diffusion of geographical information via Internet/Intranet. It also helps managing data using tools for visualizing, analyzing and making decision as well (ESRI, 2002 (c)).

ArcIMS can combine data from different sources and even when localised on distant sites. Data can be of different formats: raster or vector files, and ArcSDE themes. In addition to many possibilities of analysis, queries, measurement and visualization, ArcIMS allows the user to propose necessary modifications (ESRI, 2002 (d)).

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3. DATA PREPARATION AND PROCESSING FOR THE WEBSITE

The geographic data available for Casablanca city was supplied to this research by the company Geomatic. Data are in different formats: shapefiles, ArcInfo coverages, text files and data concerning the geocoding.

These data require updating some details, an extraction and a classification in a suitable group of services, and the polygonal elements should be converted into point elements. We also need to design a library of cartographic symbols to represent the services that do not have any standard symbol. These data will be used as follows:

The Plan of the city of Casablanca, the counties, the blocks of streets will constitute a base layer for the other topics. The road Network will be used to assign the names to the streets, avenues and the objects which have a relationship to the roadway network. The geocoding network will be used to carry out research by address.

The themes describing the majority of points of interests and services of Casablanca city will be restructured in order to extract information concerning different services.

It is important to notice that the structure of the data varies from one theme to another and that the zones covered by these data are not complete, therefore we proceed to the reorganisation of these data in order to guarantee precise and complete information.

3.1 Data Reorganization

In order to make data useful we proceed to some reorganizing, in practice we used the following procedure:

– Convert the shapefiles into coverages using the conversion command defined in ArcToolBox of ArcInfo. This procedure creates polygon topology for the shapefiles, this topology generates three topological structures: Arc, Tic, and Label.
– Isolate the label structure which contains information on the polygon's centre and save this structure as a coverage in ArcMap.
– Using ArcCatalog, make a copy of this coverage as a shapefile (shp).
– Finally open this new file using ArcMAP, this operation creates the complementary files (shx) and (prj).
– Delete useless fields from the table of attributes of the new file.

4. LIBRARY OF CARTOGRAPHIC SYMBOLS

In order to facilitate the interpretation of any type of service to the user of the website, we have assigned a suitable cartographic symbol to each service. Unfortunately, certain services do not have standard symbols, therefore new cartographic symbols were created using simple graphic symbols understood by the public, the table summarises the library of the new created cartographic symbols:

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Service	Symbol	Service	Symbol
Super Market		Cinema	
Rapid restoration		Centres of leisure	
Sports grounds		Embassy	
Pharmacy		Administration	
Education			

5. ESTABLISHMENT OF AN ACCESS DATABASE

Geographical data on ArcIMS are organized as dBASEII files (dbf). However this type of data base is not recognized automatically on Internet. Therefore, in order to interact with such a data base from a web page, it is necessary to create a data base recognized by Internet. In our study we chose to use Access database that is quite compatible with internet specifications. For that purpose, we proceed as follows:

- open the attribute tables using Excel software, make the necessary changes and save these tables as Excel files
- correct spellings errors due to the nonconformity of regional parameters because of using Arcview and Excel softwares
- create a new Access data base and import the Excel files, specify the name of the fields (Name, address, etc.) and finally save the new Access data base.

This procedure insures that the data base would contain tables in consistency with the original attribute tables of dBASEII which permits avoiding mistakes during the treatment stage.

6. DESIGN AND DEVELOPMENT OF THE WEBSITE

The following tools and softwares were used for the development of the web geospatial site: ArcGIS was used for designing and structuring the data to be implemented, ArcIMS was used to create the services of maps and JavaScript and HTML languages were used for the definition and the personalization of the web pages.

Once geographical data are prepared and restructured we proceed to the development of the interface of the website as explained in the following stages(figure 1):

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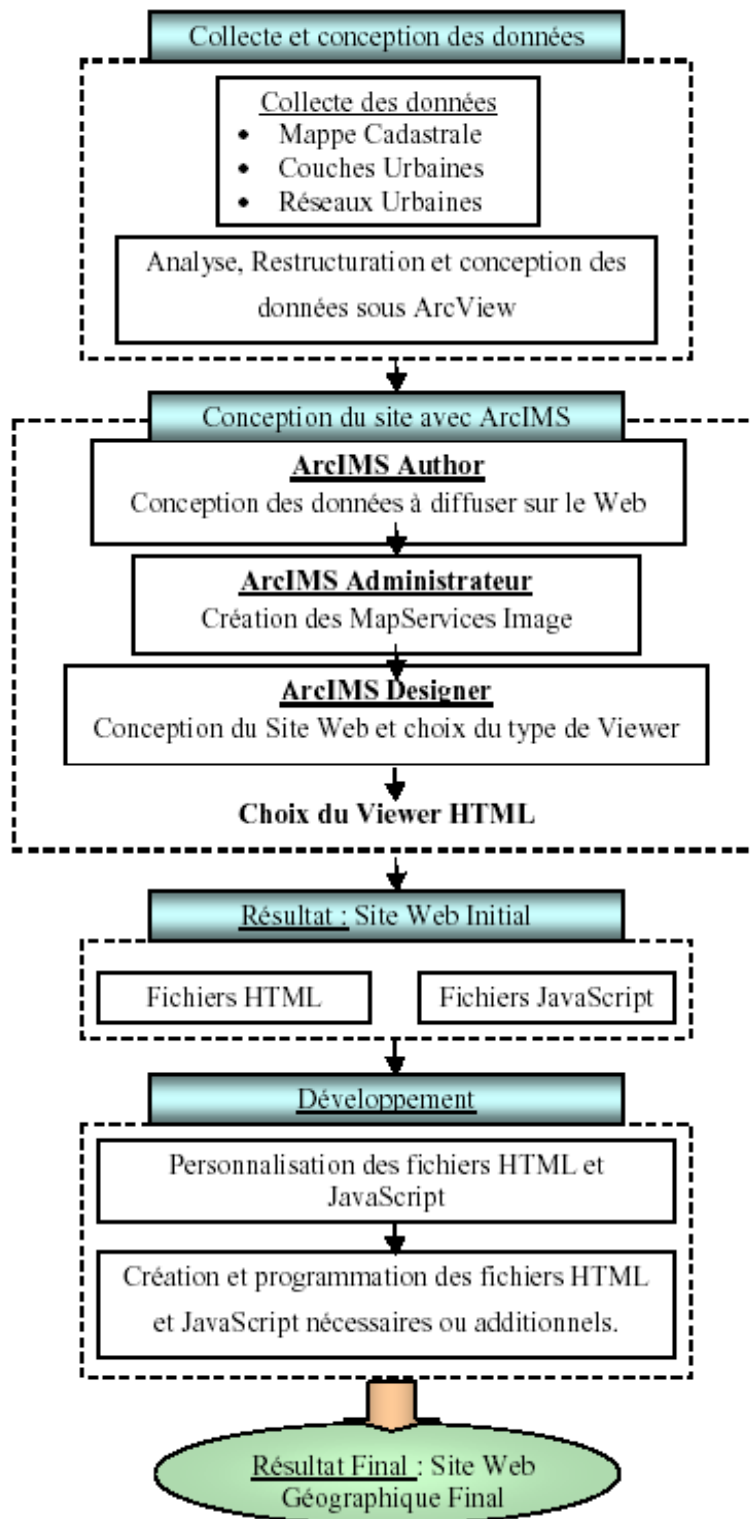
Figure 1: Website development process (Bazzi, 2003)

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6.1 Map Definition in ArcIMS Author

ArcIMS Author allows defining the contents of the map to publish on the website. Among its functionalities, the user can define the themes to use for the site, identify data, order the layers and define their displaying order. Once the module is loaded, the themes to publish and the affectation of the cartographic symbols are undertaken.

The geocoding of the addresses is a process that permits localizing a point based on a given address and calculate its coordinates from a layer of data containing some information about street's and boulevard's indexes.

ArcIMS Author gives the user the opportunity for setting addresses' associations. From the button of gecoding we choose a style of address that is closer to the one adopted in Morocco, where the address is defined as a succession of *number* and *Avenue* or *street's name*. After this choice, we can establish the link between the fields and the corresponding attributes of the style.

The result of this stage is the addition of new beacons (CGFIELD and CGSTYLE) in the map's configuration file (.axl) as well as new index files (gci) and (xrf).

ArcIMS Designer creates the necessary files to represent the web page of the geospatial site that is composed of HTML and JavaScript files. The JavaScript files allow to define the behaviour of the site responding the user's events (click on a button, data entry etc.). While the HTML files constitute the different pages and settings of the frame of the website.

6.2 Design of Menus

A good design of a diagram of disposition of the settings would facilitate the communication to the user and gives the site excellent visibility and fine aesthetics.

At this stage, we create a dynamic navigation menu for all public services of the same category, in order to facilitate the navigation for the customer without affecting the performances of the spatial server. For that purpose, we create "gif" images that are going to represent different categories of services. The four categories created are described in the following paragraph.

6.3 Creating Categories of Services

6.3.1 Creation of the first category: Points of reference

This category contains the key points of the city such as: movies, cultural centers, education establishments, hospitals, mosques, cults, sport centers, parks, etc.

6.3.2 Creation of the second category: Services

This category contains the Public services of the city like: travel agencies, banks, some well known stations, road stations, hotels, restaurants and snacks etc.

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6.3.3 Creation of third category: Shopping

This category contains the commercial services of the city such as: supermarkets, the shopping centers, pharmacies, etc.

6.3.4 Creation of the fourth category: Administrative

This category contains the administrative services of the city like: administrations, consulates, states, counties etc

6.4 Displaying the Names of the Services

This page displays the set of names of the available services, it is charged dynamically from the data base and is saved in a rolling list. When a user clicks on a given name, then spatial data as well as descriptive data of the service are displayed.

6.5 Developing the Address Research Page

This page would initialize the process of geocoding in ArcIMS, and stars a simple address research. Indeed, the address style used in the process of geocoding is an American style like: *21 Aboubaker street*. This style of address is different from that used in Morocco. In Moroccan style the name of the street comes after the type (i.e. Boulevard, street,..etc), that is the address is expressed like *21 rue Aboubaker*.
To improve and facilitate the research of address we create a function that permutes the name and the type. The customer will have a choice of specifying a type for the road network or ignore it.

7. FUNCTIONALITIES OF THE APPLICATION

The geospatial website offers the possibility of consulting and localizing different services of the city of Casablanca, researching and finding addresses on a map and permits also printing an extent of the desired map (figure3).

7.1 Consultation and Localization of Services

The consultation of services is a very rapid research that takes few seconds; in addition, some auxiliary information could be found like the period of night pharmacy services.
The localization of a service on a map gives precisely the site position and permits navigating using some offered tools (like zoom, displacement etc.).

7.2 Research and localization of addresses

The research of addresses is a very useful tool for several delivery societies, sanitary services, and others. Once the address introduced by keyboard, it is automatically displayed on the map shown on the screen (figure 2).

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7.3 Printing Extent

To print the contents of a map extent with one click on the *Print* button, a new page appears asking to introduce the title of the map to create, then a new page containing the chosen extent with a legend of different themes within the view. Such operation would be very useful to create a plan on a visit cards.
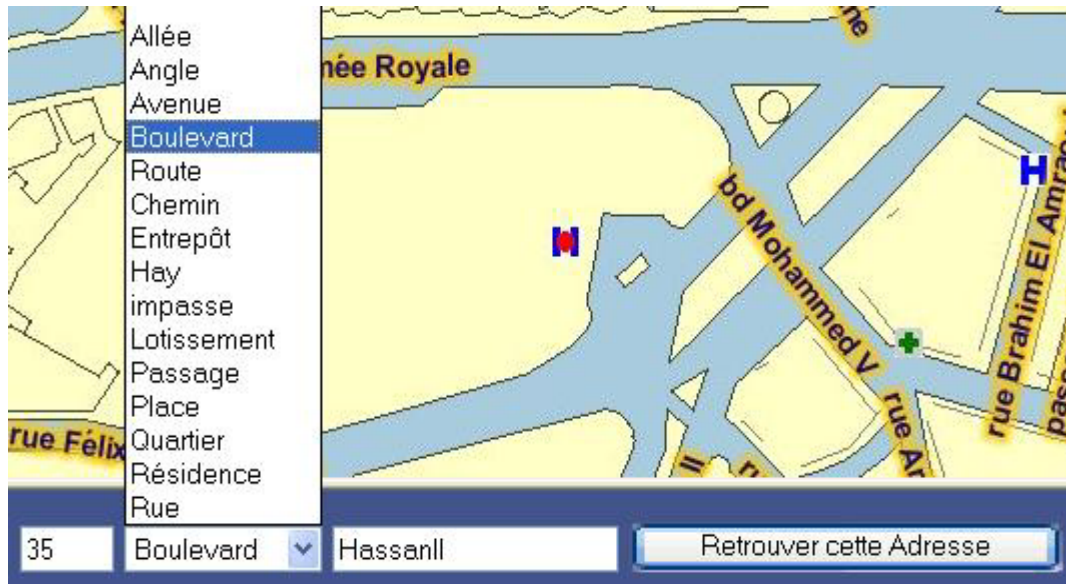

Figure 2: Localization of an address (Bazzi, 2003)

8. CONCLUSION

The website designed in this paper, allows visitors to consult some services of the city of Casablanca, search some useful addresses, as well as doing some spatial analysis tasks like zooming, identifying and printing small maps. The interactive graphic interface is simple to exploit even by non experimented users.
The website application developed, reduces the actions of the users to few simple operations, the research of addresses is improved in order to get the best results. The interface presents retrieved information in a very fashion manner and the aesthetic is fine. Thus, the response time is reduced because the request of information is established using a direct process.

This application contains several menus that allow searching, editing and printing information . This application has the advantage of minimizing the user's intervention by the use of simple and well organized menus with the best performances.

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Figure 3: The geospatial website (Bazzi, 2003)

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BIOGRAPHICAL NOTES

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1979: Diploma of engineer in surveying from IAV Hassan II, Rabat, Morocco
1986: Master of Science from Ohio State University, Columbus, USA
1999: Doctorate of Sciences from the University of Liege, Belgium.
Principal areas of interest are : GIS, geodesy and surveying.
Publications: data base design, errorr propagation in GIS, parcel redistribustion methodology, GIS in land consolidation, cadastral systems, GPS, GIS for urban planning.

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