OPEN GIS INTEGRATED TO GOOGLE MAPS USED IN DESTINATION MARKETING

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ABSTRACT
The opportunity of creating a web portal for tourist destination marketing in Cluj Napoca is analyzed, by building an experimental website: http://ro.around-cluj.info. Using an OpenGIS backserver and the Google Maps API web front-end for navigation, the website offers a street map of Cluj Napoca and more than 100 historical features of interest.

Keywords: GIS, Open GIS, Google Maps, Destination Marketing, Web GIS

1. INTRODUCTION

The purpose of the work is to analyze the opportunity and feasibility of creating a geodatabase accessible through an Internet website using the latest open source GIS software. The site (yet in experimental phase) aims to promote the city and surroundings of Cluj-Napoca as a tourist destination. Promoting is done through web marketing, based on data from multiple market studies and statistics. From the point of view of the hierarchy of the tourist destinations, Cluj-Napoca is the center of Transylvania, being an important cultural and historical city of Romania and Eastern Europe. As an universitary, multicultural and business center with significant potential for the leisure and medical tourism, Cluj-Napoca is the obvious preference of Transylvania's Internet visitors. Considering the existing offers (information platforms) and the visitors' profiles, the need of a web portal with the city map, bus map, tourist objectives and other points of interest such as bars and restaurants (Cosma 2006), was identified. Attempts to create digital, even 3D reality models of tourist destinations (Ilies 2006) exist but none has reached the actual stage of being functional and online.

Creation of such a platform requires a GIS server as the cornerstone of the informational edifice. The quasi prohibitive license costs for traditional GIS systems offering a Web interface (ArcGIS : ArcIMS costs $8000 per server) (ESRI 2008), even if there is large experience with these products locally (Zavate et al. 2006). The choice falls on the very efficient OpenGIS alternatives. Consequently, a multilanguage website (http://around-cluj.info) was developed, built around an interactive map with high-resolution satellite view (*Google Maps* integration), containing to date more than 100 (mainly) historical sites. Each objective in the website may be accessed by clicking it in the map or through a hierarchical categorized directory. The categories and subcategories were structured according to the city's profile and the target markets' needs, the main ones being: *Tourist (Hotels, Restaurants, Art, Tourist Objectives, Tourist Circuits and Routes),*

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Entertainment (Bar, Cinema, Fun, Museums, Shopping, Sport), Student (Universities, Education, Libraries, Student Organizations), as well as *Transportation (Bus), Business, Medical, Nature*. In view of the increasing competition between tourist destinations, and of the increasing use of new online promotion techniques, the website promotes the distinctive features of Cluj-Napoca and its surroundings; it underlines the city's image as the historical and cultural capital of Transylvania, with a pronounced academic character, as well as a stimulating business environment. Thus, the website appears as an attractive tool presenting relevant information that should determine some of its online visitors to come in Cluj-Napoca. Afterall, marketing is one of the three pillars that form a tourist destination offer (Goodall 1988).

2. THE RATIONALE

"A place becomes a *destination* only when there exists a *tourist* who sees in that place a target of his holiday, hence, there exists a *demand*" (Tamma 1995). The city of Cluj Napoca already is a tourist destination, but its potential is seriously underevaluated and poorly used. As a „melting pot" of students, international businessmen, traffic center, the potential tourists already are *in place*, just the *place* is not well defined.

A study performed in 2006 by Cosma S. and Coros M. on a smaple of 199 interviewed tourists, aimed at identifying the information media preferred by tourists in choosing a destination, generally, and Transylvania, particularly, reveals a 41% preference for the Internet, as shown in the graph below (Fig. 1):

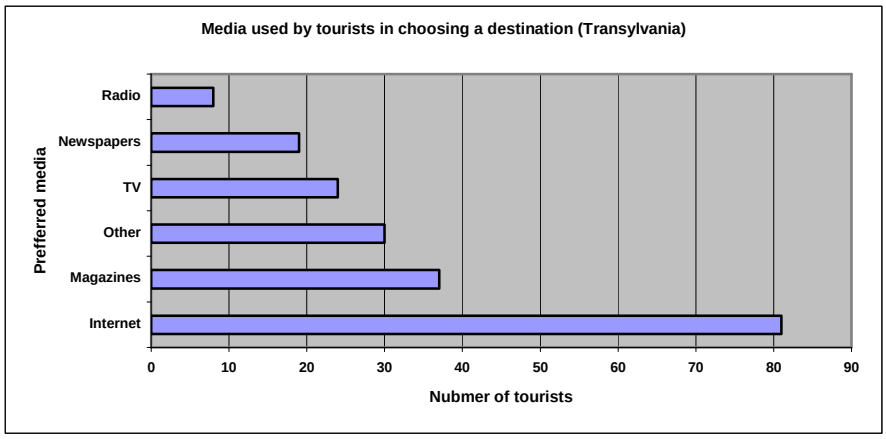

Fig. 1: *Media prefferred by tourists in choosing Transilvania as destination (Data source: Cosma, 2006)*

Nowadays tourist likes to *live the experiences as an actor*, like the most recent visions on the evolution of economy and society suggest (Pine, 2003). This tendency determines the tourist to get more and more involved in the process of finding the right holiday and even organizing it.

Knowing these, we deduce that providing all (or almost all) the possible pertinent information to the user (potential tourist) will enable him/her to assemble the most

attractive holiday package even from the „research" stage . In this context, the information and communication technologies play a crucial role, a decent website being compulsory nowadays for any decent destination (Martini, 2002). Moreover, the data availability is nonstop, while the staff in a tourist agency cannot effectively know everything about their entire offer, while through Internet this data can be easily found and accessed (Briggs 2001).

The market (Cosma, 2005) also shows that the most required information about Cluj as a tourist destination are: "city map, tourist attractions, bus lines map, cultural objectives, bars and clubs list".

Thus, choosing the Internet as the media promoting the Cluj-Napoca destination by creating a website with search and navigation capabilities seems fit.

Developing an integrated product and creating a brand is of the competence of an entity with high decision power at city level and this is a long term objective

3. THE OPENGIS ENGINE

OpenGIS is an open standard developed by the Open Geospatial Consortium, an „international industry consortium of 345 companies, government agencies and universities participating in a consensus process to develop publicly available interface specifications" (OGC 2008). OpenGIS Specifications support interoperable solutions that "geo-enable" the Web, wireless and location-based services, and mainstream IT (OGC 2008).

Many products follow the OpenGIS specifications, actually, almost every website is GIS-capable, because the worldwide-spread *MySQL* database implements the basic GIS functions and datatypes on the SQL commands layer. Better and more complex products such as *PostGIS* or *GeoServer* exist, the latter was preferred for this purpose for its good compatibility with the Google Maps API.

GeoServer supports WFS-T and WMS open protocols from the OGC to produce JPEG, PNG, SVG, KML/KMZ, GML, PDF, Shapefiles and more (GEOSERVER 2008). Adding existing data to a geo-enabled database is trivial as *GeoServer* has native ESRI SHP format support. Most of the data powering the website already existed in legacy SHP files, thus their direct integration in the geodatabase was a must.

GeoServer was used to produce the required maps in 256x256 pixels wide *tiles* (transparent PNG images), which compose themselves like a puzzle and are the input of the Google Maps API interface.

4. THE USER INTERFACE

Even if *GeoServer* is able to hold geo-enabled data and perform any GIS operation with it, its interface is barren and limited to administrative tasks. The ordinary internet visitor can not „experience" the power of GeoServer without a proper interface. The most widespread, rapid and efficient is the *Google Maps API.*

Google (R) offers the internet-connected world a free cartographic service: the *Google Maps* website and API. There is little difference in using a web-based GoogleMap or a „traditional" desktop product such as ArcView on the level of navigating a map (zoom, drag, drill etc.). Of course, layer overlaying has to be manually programmed in a Google Map enabled website; hence Google has provided the API which is now at the 2.6 version.

Because the Google Maps API is a JavaScript based program (executed locally in an interpreted language), the amount of resources (CPU time and RAM) increases dramatically as the number and complexity of features increases. Considering this, the objectives and features of interest are generated directly as transparent tile layers by GeoServer instead of being fetched vectorially to the GoogleMaps API running in the browser.

Google Maps enables thousands of websites nowadays and, along with the standalone 3D renderer Google Earth, it has developed its API more and more towards the GIS universe (layers of points at version 1.0, lines at 2.0, and polygons from version 2.4 on). GIS-powering the web with Google Maps seems the right choice for the future.

5. THE GEOGRAPHIC DATA

The data used is heterogeneous by nature but may be classified in two main categories:

5.1. *Raster satellite imagery* (provided by Google);

5.2. *Vector data* (used internally, presented as raster tiles).

Some of the vector data of interest is the street map of Cluj-Napoca, which comes from a geo-rectified existing *ShapeFile*, and the location data, which was manually digitized directly from the Google satellite imagery, using an internal tool (Fig. 2).

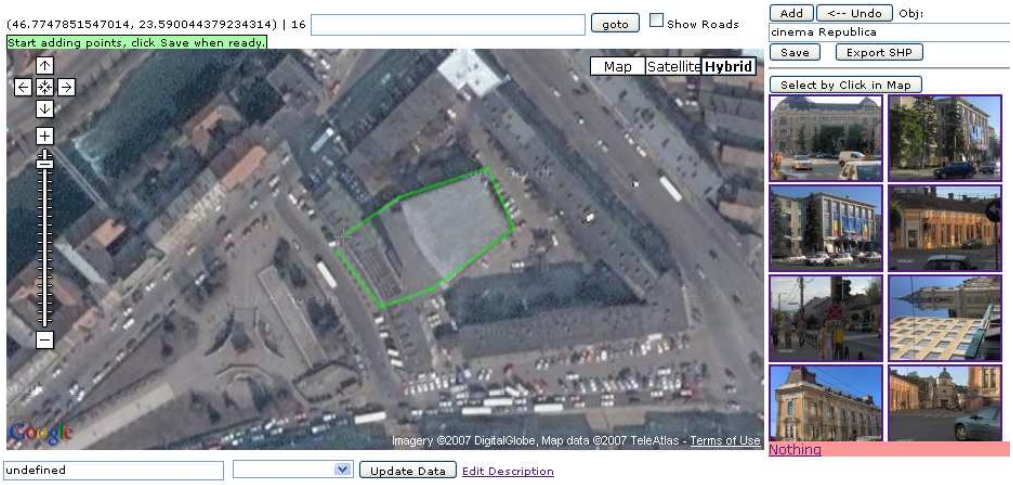

Figure 2. *The internal digitization tool used to create maps of tourist objectives in Cluj Napoca*

A number of 121 historical objectives were digitized and photographed, the data describing an objective being its location, imagery and textual description.

6. THE BIG PICTURE

In order to show the digitized maps (streets and objectives) the *GeoServer* system accesses the SHP-based geodatabase and generates a huge number of small tiles for all the

implemented zoom levels (1 to 16). To ensure the best user experience, hence a maximal speed in navigation, those tiles will be cached as PNG files on the web server, and regenerated by *GeoServer* only when a feature changes in the geodatabase. The whole system is schematically presented in Figure 3:

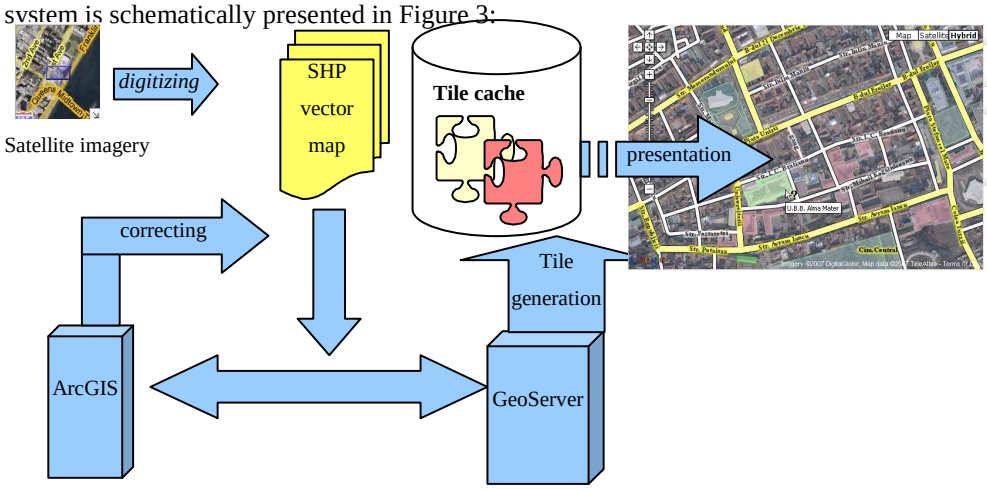

Figure 3. *The information flow in the system*

The information should be reachable on the website in three ways: from the map (operational), from a directory (operational), and through the search engine (in development).

7. THE WEBSITE STRUCTURE

The goal being to create a web portal with the main tourist attractions from Cluj-Napoca and it's hereabouts, a proximity-to-centre approach was taken in data availability. Information was structured on categories and subcategories, mainly in a structure similar to the well-known files/directory structure of a disc, directories being the categories and files being the webpages. Moreover, in this system, a webpage may belong to multiple categories (such as a file shortcut in the *disc structure* paradigm).

On each page, a map with high-resolution imagery (60cm/pixel), focused on the feature of interest appears, map navigation enabling the user to easily identify interesting objectives in the neighborhood and making the data presentation far more attractive.

7.1. THE PAGE STRUCTURE

The „Virtual Cluj" website has a simple and attractive interface (see it at http://ro.around-cluj.info).

To detail the basic elements, an explanation of items from the main page (Fig. 4) follows:

1. **The page address (separated)**: It is formed by a chain of categories and the name of the feature (if selected), Ex: Cluj > Tourism > Accomodation > Hotel > Hotel „Continental". Each separated element is a link to the corresponding page.

2. **Search field**. It has an internal search engine (in development).
3. **Multilanguage menu.** Any page may be seen in one of the languages implemented (Romanian, English, French, German, Italian).
4. **The directory**. The categories belonging to the page (*all*, for the main page) are shown in this area and are expanded where a better visibility is desired. This area enables the hierarchical navigation in the directory. The main categories are 'Tourism', 'Entertainment', 'Student' and 'Other', each having its subcategories.
5. **The content area**. For the features of interest, this area contains HTML: text and images about the objective; this area extends unspecifically under the map, fitting to the entire available space in the page. If a category/subcategory is selected, in this area also appears a list with all the subcategories and points of interest subordinated. At a latter date, this area will hold the search results.
6. **The navigation cursor**. Normally the mouse cursor is a crosshair (**+**) on the map, but when registered objectives are hovered, it morphs in an interrogation cursor (**?**), moreover labeled with the name of the objective under the cursor.
7. **The quick info bubble.** On clicking an objective in the map, a *bubble* window opens, containing brief information: title, a short description, a link to the objective. This enables geo-navigation (by proximity) through the website.

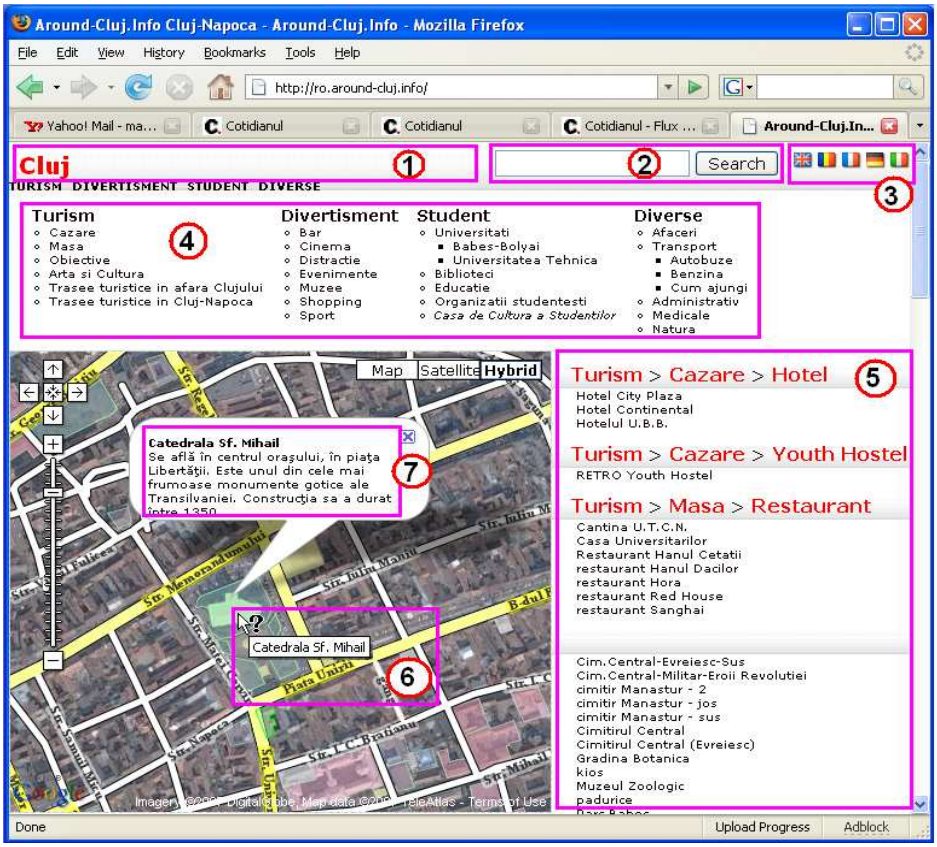

Figure 4. *The website's main page*

8. CONCLUSIONS

We assist at an increasing competition between tourist destinations. A tourist destination represents "*an amalgam of products, services, natural and manmade elements able to attire a certain number of visitors in a specific and well defined geographic place*" (Martini, 2002). This amalgam becomes an unitary touristic product through "*the tourist's experience of consuming the product*" (Martini, 2002). Thus, the tourist plays an important role in creating the touristic product, which, for this reason presents a virtual character (Tamma, 2002).

This virtual characteristic of the touristic product has made the investment in searching information about the place where the tourist would spend the holiday become more and more consistent, and in this context appears the importance of the internet as an informational and promotional mean for touristic products and destinations.

Thus, it results opportune creating a website for the promotion of the city of Cluj-Napoca as a tourist destination. By highlighting the objectives that determine its identity and notoriety and by integrating maps with navigation and search options, it seems to be a useful and necessary tool for all the visitors of the city.

Using the most modern available techniques: Google Maps for cartography and satellite images, multilanguage, hierarchical directory structure, internal search engine, tourist objectives profile, the portal has the possibility of reaching a utility, attractiveness and ease in use for its potential virtual and hopefully real visitors of the city.

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