From the Digital Dimension to the Virtual Geographic Dimension

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Abstract

A Web site for the publishing of geographic information was developed within the scope of the Trás-os-Montes Digital project, in north-eastern Portugal. This Web site presents maps with information about the region. This paper describes features of this Web site, and comments on the motivation that should drive the development of such Web sites. Finally, some conclusions and future directions are presented.

I. Introduction

In the absence of a concrete definition for the concepts of Digital City and Digital Region, the practice demonstrates that a common set of goals exist, underlying most initiatives fitting within this denomination [Xavier, Gouveia & Gouveia, 2003].

The Digital cities and regions are, in most cases, projects grouping different entities with the common goal of bringing the information society to the citizens of the city/region.

The basic process of "digitalisation" of an institution deals, on a first level, with the transformation of information media from physical into Digital. Most of the data is stored in Digital format, replacing the paper archives. At a higher level, one has to deal with the automation of the services provided by the institution, thus converting to Digital form all tasks needed to provide a service.

A second level of automation addresses the publishing on the World Wide Web of general information about the institution (i.e., so-called "static" information). Offering services through the World Wide Web is the next step in the process of digitalisation. At this stage, the information and services related to all institutions (partnering in the Digital region) are made available to all citizens, regardless of time, date or geographic location.

From this moment on, the Digital project reaches a new dimension, thus becoming a cyberspace region. The Digital project should ensure the integration of all information in a single space of interaction: a regional Web site.

The Trás-os-Montes Digital project (a.k.a. SCETAD – Serviço Cooperativo de Extensão em Trás-os-Montes e Alto Douro) [Morgado, Ramos & Bulas-Cruz, 2003], [Morgado et al., 2003] developed a Web site for the Digital region, called "Espigueiro" [Espigueiro, 2003], aimed at promoting all information and services

provided by the institutions that integrate the project. The role of this initiative became even more preponderant when we started supplying technical support to the institutions that did not had the critical mass to reach an adequate level of digitalisation.

The Web site provides information and services, grouped in a thematic hierarchy, with a high level of usability and interaction by interest topic. However, we verified that this information fails due to the absence of geographic location data, supplying the proximity and neighbourhood relationships – major features on any region. The maps are a powerful tool for this kind of regional characterization, and geographic information systems are the technology that matches this level of digital media.

The Trás-os-Montes Digital project thus decided to develop a geographic information Web site, called GeoEspigueiro [GeoEspigueiro, 2003], in order to integrate, as WWW maps, the information and services supplied by the partner institutions of the project.

II. The Role of GIS in Municipalities

i. The Current Situation

In the past, the Government promoted municipality-level digitalisation of geographic data, using governmental programs like ProSIG [Mourão & Condessa, 2001]. However, only a small set of municipalities acquired or increased know-how in this area. Nowadays, given the inexistence of geographic information, most projects integrated in Portugal Digital program have included this component in its main goals.

The Trás-os-Montes Digital project believes that the role of geographic information can be increased if, along with information itself, Web sites also supply services through the World Wide Web.

The geographic information about the Trás-os-Montes Digital project is published in the Word Wide Web in the GeoEspigueiro Web site. The approach we followed is similar to that of other well-known projects worldwide, such as Digital Kyoto [Ishida et al., 1999]. The main goal of the GeoEspigueiro Web site is to divulge and promote the region, presenting (in map form), the locations of cultural heritage, education and health services, entertainment, local government, and all other relevant regional information.

ii. The Future

The Trás-os-Montes Digital project believes that the role played by geographic information systems could be valued beyond the mere role of geographic data banks, by providing access to services in the Word Wide Web.

This is also the next development phase of the GeoEspigueiro Web site: to provide access to services available in the virtual offices of the tras-os-montes.net Web site.

Upon completion of this development phase, the region of Trás-os-Montes will have available, from a single Web site, all contextual and geographic information, and also access to regional services.

III. GeoEspigueiro: an hands-on example

i. Introduction

Considering geographic information as an important asset for the implementation of Digital regions, by providing the link between people and the land, this project supported the creation of a Web site, called Geoespigueiro, for displaying geographic information about the region of Trás-os-Montes e Alto Douro.

To accomplish this goal, we developed a geographic information system (GIS) for the region and also an interactive geographic Web site.

ii. The Geographic Information System

A GIS containing several socio-cultural themes was developed for the region of Trás-os-Montes e Alto Douro. The GIS cartographic base includes local government administrative divisions ("concelho"/county and "freguesia"/sub-county) and the road network. Other themes in the database address educational institutions (from preschools to universities), healthcare institutions (such as hospitals, healthcare centres and pharmacies), cultural heritage points and exhibitions, tourist accommodation and amusement centres, and also industrial parks.

iii. GeoEspigueiro Web site

Geoespigueiro can be accessed using a web browser on a computer connected to the Internet, like any other Web site.

To access the GIS and produce the different maps selected by the user, we used Geomedia Webmap 4.0 [Intergraph Corporation, 2003]. This software produces maps in ActiveCGM format [Corel Corporation, 2003] that are embedded in the web pages and thus can be displayed by any web browser, requiring only the installation of a plug-in.

The user interface (Figure 1) was designed to display four different functional areas.

figura1.tif

1. GeoEspigueiro user interface

On the top section of the page, the heading presents name of the Web site and some links to other project Web sites; it also contains an area for advertising project events.

The selection area, located on the left-hand side, allows the user to choose the information that he intends to see in the map. A menu shows the different subject areas available for selection. By performing a selection, a new area opens, providing a choice of sub-classes under the same theme. It is still possible to search just one institution for this subject, from a list of names.

The centre of the interface is occupied with the visualization area, where geographic information is published under the form of maps. The map allows some interaction, through the generation of tooltips showing the name of the represented geographic element. After selecting a graphical symbol, all additional alphanumeric information associated with that element is presented as a table (Figure 2).

Figura2.tif

2. Properties table

The navigation bar (Figure 3), above the visualization area, allows the user to interact with the map, modifying the scale, zooming, panning and printing.

Figura3.tif

3. Navigation bar

iv. The Back-office

The maintenance of the geographic information provided by a Web site is relevant for its credibility before the citizen. The costs associated are high, and in order for this task to be sustainable, it is necessary to make accountable the proper institutions in this process.

With this goal in mind, a back-office was developed (Figure 4) allowing authorized users to update the alphanumeric data of their institutions.

After authentication, the user is presented with a list of the geographic elements for which he has editing permissions. After choosing an element, a form is displayed for editing the associated alphanumeric data.

Figura4.tif

4. GeoEspigueiro's back-office

v. Publishing Municipal Master Plans

The Municipal Master Plan (MMP) is a valuable instrument for regional planning. For this reason, its publication in a form easily accessible to citizens is, in many municipalities, a priority. To support this goal, the publication in the World Wide Web of MMPs of the region of Trás-os-Montes and Alto Douro was integrated in the

GeoEspigueiro Web site. The MMPs are presented in map format, allowing the selection of the information to visualize, and benefiting from all navigational features.

vi. Ongoing work and future directions

Although extensive, the available information in the geographic Web site is permanently being expanded, either by updating existing information, or by adding new data as it is provided by partner institutions.

New functionalities are being developed, such as the presentation of thematic maps characterizing the available information, planning of optimal routes over the road network, and publishing of recommended tourist and cultural routes.

Other features under development are the use of three-dimensional virtual models to replace maps; and location-based mobile services, providing information from the geographic website to mobile platforms such as mobile phones or pocket computers.

IV.   Conclusions

The development of the GeoEspigueiro Web site has clearly shown the advantages of this technology, regarding Web site integration within the scope of a Digital city/region project, by providing a Virtual geographic space to present information on the region of Trás-os-Montes e Alto Douro. Information available in databases can be associated with geographical features and be presented at the same time, in a virtual 2-D space (i.e., a virtual map).

The region of Trás-os-Montes e Alto Douro lacks proper access routes, and the GeoEspigueiro Web site can help diminish this barrier. By presenting cities and villages in the same map, one can visually realize the access routes, which aren't always the best. These are the routes that a citizen must cross, from his/her town to the places where public government institutions are available, including health and educational services.

By publishing thematic maps, citizens can better notice asymmetries within the region, and act upon them.

The GeoEspigueiro Web site can also be used to search for general information, such as location the nearest open pharmacy.

Geographic Information Web sites are, in conclusion, a major contribution to fulfillment of the goals of Digital projects, in the path to becoming true Digital regions, by providing a geospatial dimension, which is a core feature of a Region.

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