

Urban Information Visualization

The Salvador project

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Before popularity of GIS a map is a tool with two basic functions - storage of spatial data and presentation of spatial information. Now, a digital database store spatial data and cartographic visualization is how spatial information usually is presented. Recent technological development applied to visualization area can increase analyse and interpretation capacity of professionals concern with urban planning, design and management. In other hand, many professionals and students involved with urban studies are not familiar with GIS software and this can limit casual users to access urban databases. One solution is to build software that allows direct visualization of spatial information based in users needs and knowledge. The project discussed in this paper introduces a computer application structured like a hypermedia atlas using concepts from cartographic modelling. The city of Salvador is represented by a model based in a combination of maps, and others images. User composes visualization.

Keywords: Visualization; hypermedia; GIS; urban information; digital atlas.

Introduction

Geographic urban information has been for centuries visualized mainly in a cartographic way, in other words, like maps. Map is a tool that was been used for store and present spatial information. This kind of presentation was in accord with technological, cultural and social context and in these days a map user did not have control of what it was presented.

An urban map is of course a representation of the city and it reflects mapmaker view and selection of reality.

Until some years ago what could it be the limitation of a more frequent use of maps was the time and cost to produce this documents and the limitations of the media to represent space and spatial trends in static images.

After GIS, maps can be made with a speed unprecedented and thematic cartography gain new power using computer graphics and multimedia

technologies. Before rising of GIS a map is a tools with two basic functions - storage of spatial data and presentation of spatial information. Now, a digital database store spatial data and cartographic visualization is how spatial information usually is presented.

Recent technological development applied to visualization area amplify analyse and interpretation capacity of professionals. The word visualization used here, is related with the use of computers for data exploration in a visual form. It is a process of transformation of raw data in images, information and visual communication. Visualization is a method and a product integrating computer graphics and human vision to provide insights and understanding. Visualization is a tool that can aid understanding of phenomenon, process and spatial structures. This issue it has been investigated by this author and others (Pereira, 1999; Langendorf, 1992; Parsons, 1995).

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Another important function is communication, in urban applications case, between planners, technicians, managers, researchers and citizens.

With the increase of computer power now available for urban planners and new technologies of data collection like high-resolution images from remote sense, GPS, digital photogrammetric, very large databases can be stored and manipulated and this it is opening new perspectives for urban studies.

Use of digital spatial data it will now requires interactive and direct interfaces and in this process map can perform a key role as a spatial index. Large spatial digital databases, multimedia systems and 2D and 3D visualization techniques can push cartography to a new step that now begins to be explored.

Hypermedia, Visualization and Urban Planning

In urban planning visualization is very important in initial phase as a spatial analyze tool making easy detection of: lacks (infra-structure, educational and health equipments); population density; site limitations; urban developments; spatial trends, and so on. In urban management decision about public policies or investments were based in spatial information.

In any case information in planning, landscape design or related areas come from data that were originate by various ways of collection and it role is to reduce uncertain of our understanding about the environment we live. We select information to this purpose, which it is based in a conceptual model of our environment perception.

Digital data are the key for the plain utilization of potential already available with GIS and Computer Graphics technologies. Information that interest urban designers and planners came from several sources with diverse media and formats. Information technologies beside integration and manipulation permit visual analysis of spatial data in varied aspects. Multimedia systems became an obvious alternative for integrate and present this kind of data.

For easy understanding of spatial pattern revealed by geographical data it must be visualized, or, in other words, data must be transformed in visual information.

Through visualization user can reach his goal that can be: to compare; to apart; to relate; to point trends; to represent values, or locate spatial structures. GIS can integrate data from diverse sources and produce new information processing this data.

Nowadays we have individual access to very large geographic databases and in this context architects, geographers and urban planners can select the data they need to transform it in information they want.

Today cities are very huge and complex objects. Visualization techniques using available data can be used to aid people to understand urban environments, and even to communicate urban information between professionals concern with urban planning or design and citizens.

Unfortunately many professional associated with urban studies may have not the skills to manipulate digital databases using GIS software. This situation limits the access to digital data already available for many casual users.

One possible solution to that question is to develop computer applications that permit users to direct visualize spatial information without the need to learn how to perform a SQL query. Such applications must have a direct interface and integrate data form different medias with great interactivity. Interface must allow visualization and combination of spatial information in a very easy way, based in users needs and knowledge.

The project we present intend to build an urban digital database from Salvador and provide architects, geographers and urban planners a tool to visualize inner urban information in an easy way.

Bahia is one of the most important states in Brazil and the most important city of Bahia is Salvador, which it is also one of the oldest towns in Brazil and it first capital, a city founded in 1549.

Several stage of project includes database design, data conversion, thematic cartographic production

Figure 1. Information planes.



using GIS and interface design for visual urban information presentation (Pereira, 1999).

Salvador Project: Urban information visualization

The design of this tool was based in the idea of an organization of information in features themes that can be select by user and present in a main visualization window.

Interface design start with a classification of spatial information in themes, and presentation in information planes. This concept is illustrated in figure 1. Information is also organized in general and specific themes. General themes are for instance; population, topographic information, streets, and others, and compose the base map. Specific themes like socio-economic information, land use, habitation, infrastructure, etc. are presented like thematic cartography.

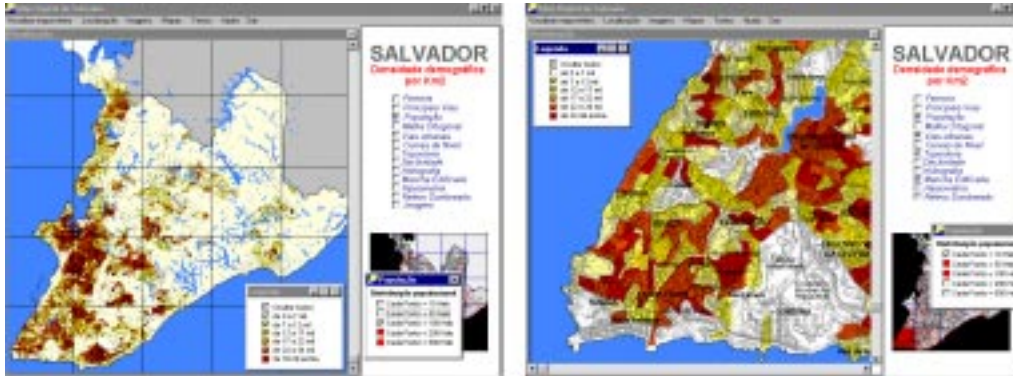


Figure 2. Visualization window – selection of themes and classes.



Figure 3. Atlas workspace

Interface allow users to define what themes he wants to visualize, what classes in a thematic map, in some cases also what kind of cartographic techniques will be used and if it will be visualized alone or concurrent with others themes. When you cross more than one theme you may obtain another information by comparing intersections, coincidences and proximities. Figure 2 shows two examples of possible visualizations.

This analysis methodology it was first presented by American architect Ian McHarg (1969) in his

classical book *Design With Nature*. More recently with GIS development this methodology was adapted for computers and Tomlin (1990) propose the term cartographical modelling to this process.

The application is structured like a hypermedia atlas using concepts from cartographic modelling. The city of Salvador is represented by a model based in a combination of maps, and others images (animations, remote sensing images, photos).

Other media like aerial photos can be spatially indexed in base map. Scale of visualization can be

various. All themes can be visualized in the main window, but alternative information like photos, images and animations are visualized in separated windows as it is illustrated in figure 3. This is adequate for some themes like variation of space occupation in time, or spatial disparity of patterns, that it can be presented with animations instead of static images (fig 3).

Secondary windows are used also to control how themes are presented and what classes will be displayed so user can select themes, classes of themes, scale and cartographic technique of presentation that it will be used by him to compose his particular visualization.

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