

MAPPING RIO DE JANEIRO – THE WAYS FROM THE PAPER TO THE DIGITAL WORLDS

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SUMMARY

The objective of this work is to introduce ways for the apprenticeship of space by means of maps, by digital means, through the convergence of mass communication means. The utilization of well known software resources applied to the maps of the School Atlas of the City of Rio de Janeiro in printed material and games suitable for users of different ages in CD-ROM amplifies and complements the use of the map as a valuable didactic resource. The path of printed material to the digital system does not flow in a one way direction but in round trip directions where a didactic resource or a media feeds the other in the information systems interactive nucleus for teachers and students of the municipal teaching net.

I - INTRODUCTION

The city of Rio de Janeiro, Brazil has an area of 1 255,28 Km², with 5.850.544 inhabitants according to the 2000 census research. And thus, for being a metropolis, Rio de Janeiro possesses a space dynamic in constant movement therefore demanding frequent updates in the thematic maps data. As a result of these constant changes, the project team is elaborating a material with several sources of information including graphics data bases as well as alphanumeric data bases.

Although Atlases and CD-ROMS containing maps already exist in the market, the city of Rio de Janeiro has never had a didactic material containing updated information suitable for the use of maps in the classroom. Therefore in order to meet the immediate needs of the Rio de Janeiro municipal teaching net, we initiated in 1998 the elaboration work and printing of this first School Atlas on behalf of the Rio de Janeiro municipality. The first phase of the project was concluded with the publication of 100 thousand copies of the City Atlas in the month of November, 2000 and at in February, 2001 at the beginning of the school year it had already been part of the patrimony of the libraries of the 1029 schools thus allowing that two classes simultaneously work with the Atlas. With the publication of the Atlas, this material faced another challenge where the city is object of analysis by students of several ages and in the different cycles of teaching (2nd to 4th cycle) in the secondary grade, by university students at the beginning of their researches as well as by the population in general, due to the this Atlas update and data

reliability. At this second phase of the project, our objective is the utilization by information systems means thus allowing the reading and comprehension of maps by means of other media resources.

II - METHODOLOGY

In order to assist and allow the access of the technological resources by means of didactic material to the biggest net of municipal schools of Latin America, including approximately 700 thousand students, the execution of the Digital Atlas is of utmost importance for all students today. This Atlas will complement the paper map allowing different approaches and a variation in the use of the detailing scale during the work with maps.

The evaluations and suggestions made by one hundred and one teachers of the municipal teaching net about the printed Atlas regarding the graphic and or technical limitation that could not be contemplated in the paper Atlas are being incorporated in this multimedia. We strongly believe that the convergence of media will facilitate a cartographic initiation at other level, adequate to the use of maps for students that initiate their studies at the basic school at the beginning of this XXI century, making use of resources of a computerized cartography and another type of interactivity.

The digital Atlas usage viability at schools will be possible by means of workshops with the atlas CD-ROM to be initially implemented in the information systems pole rooms where both teachers and students will be able to utilize the CD-ROM. This material can be worked individually in alternate schedules by teachers and students.. The remaining schools that do not have information system rooms available would also receive the CD-ROM that would be part of the patrimony to be loaned to the schools.

III - DIGITAL ATLAS

The main limitations of the paper Atlas remain in the visualization scale (1:200 000) and in the Data Base information. With computing resources it is possible to present each map with more details and, as a result, a greater number of information.

The cartography base of the municipality of Rio de Janeiro utilized was the 1999 flight and digitalized at the 1:10 000 scale, thus allowing to generate 65 colored orthophotos in this same scale, where it was adopted a systematic mapping adopting the UTM projection and the reference surface for horizontal and vertical control of points (flat coordinates) was adopted the SAD69.

The Data Bases derived from several organs or secretariats have the necessary reliability since they are generated and updated by a primary source of information.

Software extensions will be utilized for data availability.

- coverage (archive used in ArcInfo)
- shape (archive in ArcView)
- DWG (Autocad archive)
- GIF (lighter archive to be quickly visualized).





The presentation form observed at the CD-ROM Atlas will be the cartographic mapping with several levels such as streets, topography, hydrographic (rivers and lagoons), administrative division (Districts, Administrative Regions and Planning Areas), usage of the soil (residential, commercial, vegetation), schools, hospitals, medical emergencies and tourist points. Other forms can be visualized on the screen such as the colored orthophotos at the 1: 10 000 scale or satellite images that will serve as background. All the levels can be seen in different graphic scales.

Our concern on the paper atlas was to utilize pairs of thematic maps so that at the first moment the pieces of information were worked so that comparative analyses could be performed besides the individual study of each map. At the School Atlas of the City of Rio de Janeiro (Prefeitura, 2000) on pages 18 and 19, for instance, it was utilized a comparison of the Hypsometric Map with the Morphologic Views. In this example we have the relief of the city seen at the frontal view and the planimetric view of the contour curves.

In order to prevent this analysis from getting lost at the CD-ROM Atlas we have chosen the classification of the set of maps by themes. The maps would always show up in pairs at the initial screen what will permit the same exercise of the paper Atlas with an additional resource of studying each one of the maps separately and in full details. The possible resources with the multimedia usage such as sound, animation, photos, films, drawings, cartoons, graphics, tables, dictionary of data, explanatory text about different subjects permits to accurately study the city in its entirety.

One of the advantages of the CD-ROM Atlas over the paper Atlas is the usage of the Tool-Tip that permits the user to activate information such as name, district and other related data that were previously selected, games with questions and answers, puzzles and memory games that will be taught in a very interesting and appealing manner.

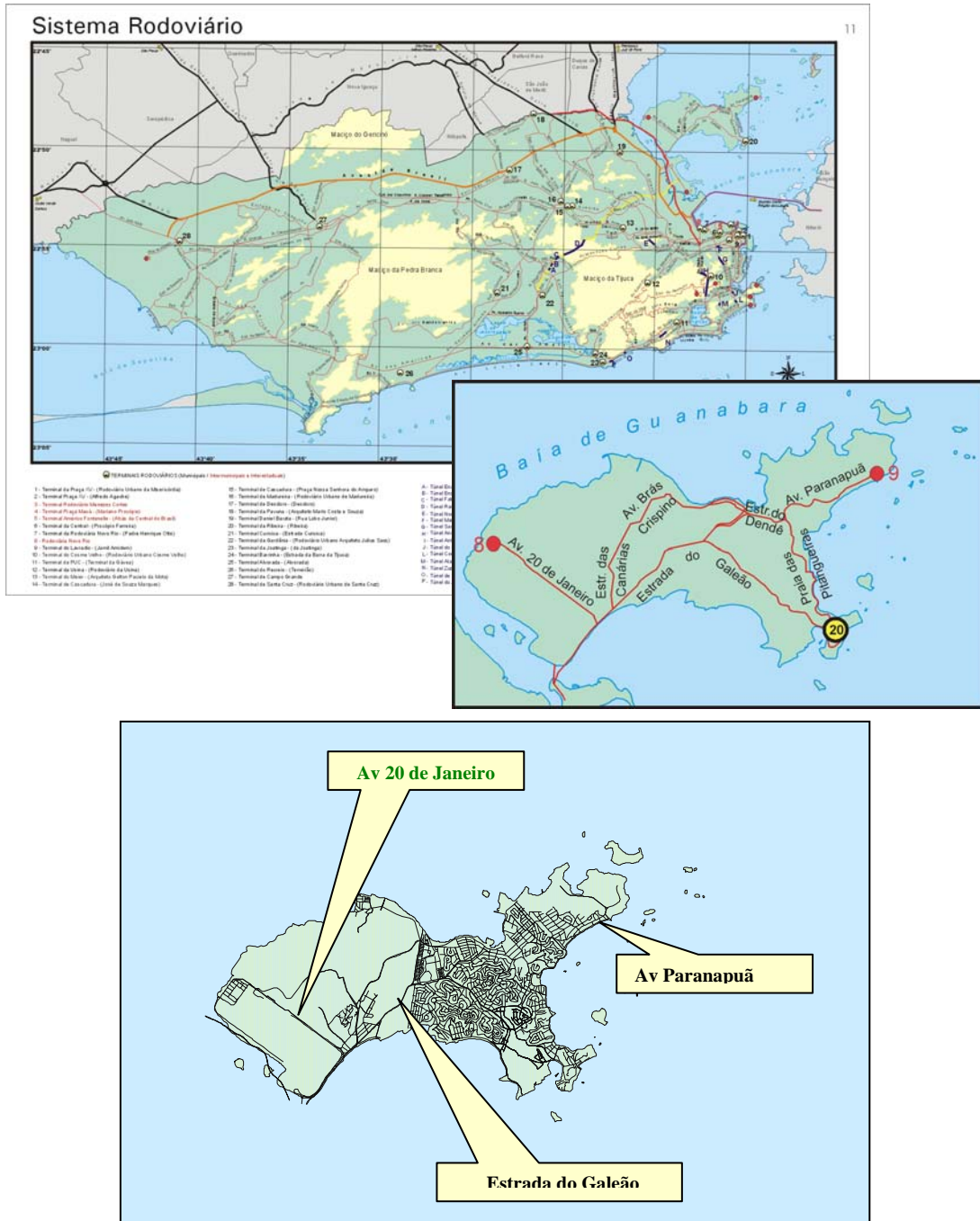
Another advantage is the insertion on the computer screen of icons representing already known objects in order to facilitate the usage and make it user friendly.

-  - Magnifying glass or binoculars to increase or decrease the visualization.
-  - Airplane to make an air trip over the municipality
-  - Photo camera to see the photos of Rio de Janeiro
-  - Video camera to show the natural resources of the municipality such as animals, plants, etc.

Examples maps:

- Map of the Urban Evolution of the city of Rio de Janeiro to visualize the transformation of the urban network in several periods (morphism technique).
Transformation of old photos of a specific area into a current image. (morphism technique).
- Relief Map: visualization of volume of massifs in third dimension (3rdD)
Use of Digital Terrain Model (DTM) techniques.
View of massifs in third dimension (3rd D) as of the observer point of view.
- Hydrographic Map: visualization of the hydrographic net – the rivers and their main streams with all relevant information such as extension, volume, water spring.

- Road Map: visualization of the main roads, all the streets of the city of the municipality of Rio de Janeiro (around 22000 streets), their extensions, district they belong to, bus lines that flow by the selected route.



IV - ACTIVITIES WITH THE ATLAS:

For the maps presentation sequence in the paper Atlas, it was considered the school criteria of gradual apprenticeship of initial cartographic notions to be utilized or applied in the first maps by means of notions of locations, direction, distance, coordinates, reading and interpretations of symbols by means of captions, utilization of cardinal and collateral directions and of a graphic scale.

The activities for the digital Atlas are ruled by another criteria, since some pieces of information will be provided by the utilization of the mouse itself over a screen and a menu will permit to select the activities that will appear on the screen.

The space operations of topological, projective and Euclidean relations demonstrated by Piaget (1972, 2 edition) served as a basis for the digital activities with the utilization of current available resources.

The environment in which the games will take place may be individual or collective, either led by the teacher or freely chosen by the students, thus allowing a greater interaction between students of different ages, knowledge sharing and developing the skills of more advanced students who have demonstrated their understanding of the issues addressed, and at the same time, closely monitoring other students at the information systems classes. The discovery of knowledge and skills unknown by the students themselves and not developed by the teacher will permit to create a rich, inventive and creative environment of several forms for the use of the paper Atlas as well as the CD-ROM.

The games were subdivided according to the types of space relationships.

a). Action games and topologic operations:

Objectives:

- To activate the elementary topology notions by means of known or unknown nearby spaces.

To activate the space visual memory of form and position of territories.

- **to compose all the parts:** puzzle starting from greater units such as administrative regions and planning areas to the districts of the municipality by shifting the pieces on the screen.
- **Neighborhood matrix** between borderline and non borderline districts, states, countries making use of different colors introducing the notion of borders at the territory and mutual and reversible actions.
- **Combination of colors of districts:** Choice of non repeated colors between neighbor districts.
- **Linear order and qualitative and quantitative distance:** linear trajectories between the points, establishing a non conventional chosen standard measurement (span of the hand) or conventional (centimeter – cm.) between two reference points.
- **Inside/outside in scale levels:** inclusion of smaller or bigger areas, the street at the district, district in the regions, regions at the municipalities, municipalities in the States. States of Brazil, Brazil in the World, at the direct and reversed order taking as an example the school or residencial street.

- **The continuity and the discontinuity.** This notion as of the space point of view will be activated as of the aerial photography and the natural and conventional limits between districts and municipalities, between the continuity and discontinuity of the earth and water in the lagoons, at sea and ocean.
- **Distortion of the form and distances / conservation of the relations on a map** - To distort a surface containing two or three districts (outlines and references) horizontally or vertically, identify the permanence of the topologic relations.

b) – Action games and projective operations

Objectives:

- to activate point of view notions, reference point utilizing right/left notions, front/back, up/down and collateral and cardinal directions.
- Sketch of an elevation of a point of view.
 - **Right and left round trip on a street.** Notion of direction, way taken,, identification of street references (photographs or sketches of main references)
 - **Sugar Loaf and Urca.** Identification among photographs, the view of four distinct points in some districts.
 - **Corcovado without the Christ’s Statue.** – corresponding districts at the right and left side, in front of and behind the Christ.
 - **Corcovado with Christ’s Statue** correspondence between the Christ’s arms, right-left, front of and behind, position of the sun (the East and sun setting), north-south, east-west directions.
 - **Corcovado with Christ’s Statue** correspondence between the Christ’s arms and the collateral directions.
 - **Corcovado with Christ Statue (in curves of level) at the plan of the city of Rio de Janeiro,** Christ’s view from four points selected at the map and at elevation form.
 - **Sketch on the screen of an elevation from a point of view.**
 - **Cartographic projections and images and territories distortions.**

c) – Action games and Euclidean operations.

- to activate notions of linear distances, rectangular (cartesian coordinates), notions of degree and space projection.
 - **Blocks to walk.** Linear distance from downtown to points at the North, South, East and West on a line and vertical and horizontal line
 - **SOS 1,**To locate ships in hazardous situations by means of rectangular coordinates.
 - **SOS 2,** calculating linear distances and angles of direction.
 - A turn around the world: latitudes and longitudes of places. To choose some cities around the world or prepare a table with these data and the students choose the cities. Distance matrix between the cities (kilometers). Hours of flight (anticipated speed).

- A trip around the globe or soccer games in the world: the time zones and time in Rio.

V- FINAL CONSIDERATIONS

The work with maps is admittedly stimulated and has been a theme of reflection of several researchers. The adequate utilization of maps at schools denies the old concept that the role of cartography is as a mere presentation of finished and ready to manipulate maps. "What matters is to develop the reading ability and the oral and written communication by photos, drawings, plans, small rough models and maps and therefore make the student perceive and control the space" (Simielli, 1999).

The work with maps by means of the atlas at schools must be fostered among several age bands divulging the cartographic language. "Young children can learn to work with maps in a meaningful way if challenged in an interesting, interactive manner (Anderson, 1998). Therefore, in order to make these changes happen we simply need to present them maps in an interesting and interactive way. "Learning about maps therefore involves not only attempting to understand cartographic concepts but also undergoing a process of socialization by which individuals are introduced to a cartographic culture by its more skilled members." (Wiegand, 1997). We believe that the multimedia utilization can help in this task by complementing the study in an interactive way specially outside the classroom where the student acquires the dimension of the outer space in order to expand his/her knowledge.

The importance of working with maps for and with children allow us to summarize the phenomenon that occurs on a determined area by means of different pieces of information and by different ways to represent such data. Simielli (1999).

The simultaneous work of the paper atlas with the CD-ROM atlas and in the near future with the internet atlas, allow us to divulge the usage of cartography in our classrooms and make it even easier and much more interactive the reading of such data for both students and teachers.

It is our task as educators to facilitate the learning process by means of several mass communication means and state-of-the art technologies.

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