

HOW TO VISUALIZE THE PROCESS AND THE COMPLEXITY OF ROCK ART INVESTIGATIONS?

International Museum of Rock Art Research – Beta Version

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Abstract: This project arises as answer to an initiative of the *Group of Investigation of Indigenous Rock Art* (GIPRI-Colombia), which decides to elaborate a museum of rock art in digital media with the purpose of offering a tool of international popularization to the public specialized in this topic. This museum looks for to concentrate on oneself system, diverse data relating to the history of the investigation, to the archaeological discoveries, the aesthetic and the ethnohistoric studies. In this way, a great database is built, these data could be fused and visualized in screen, then it allows the user to make thematic connections, specialized searches, relate space, and possibly, to determine conservation plans for each zone with rock art. The technological development has been concentrated on two big areas: visualization of data and graphic synthesis. A programming atmosphere *Open Source* called *Processing* was used, with which specialized software was developed which visualizes the information stored in charts XML, in a graph 3D way with which one can interacts in real time through Internet. The graphic plan recovered part of the outlines and conventions elaborated previously by GIPRI (1970-2006), and new elements were created that simplify the appearance in screen of each item, searching a purely geometric atmosphere that makes more efficient its reading.

1. INTRODUCTION

Since its early beginning in 1970, the research group of indigenous rock art (GIPRI) has been restless by the incongruence and errors of the previous researchers (Corographic Commission 1850; Triana 1924; Cabrera-Ortiz 1970) which made up the history of the rock art in Colombia. These oversights had promoted some level of judgment, a very particular internal effort inside the group to conceive rigorous studies and high detailed descriptions of each one of the murals previously found.

During 36 years, the model of representation that had ruled the research was the mathematician approach proposed by Descartes, according to him each one of the objects of study is supposed to be incorporated in the X-Y axes system, allowing the research to have a mathematician base implicit in the registering processes; the draw on paper will take this tool to represent the lines of each motive located at the same time in the same pictograph mural (Figure 1). During this period each one of the picture

murals of the rock are included in the register, at the same time, they must be understood as one single system of language; each motive, the inclination, its scale relations, the distribution into the group, the intensity of the pigment, all of this characteristics are supposed to be registered with detail and placed in a grid determined by numbers and letters. In contrast to the transcriptions made by the previous researchers, there isn't a singular interest for showing the indigenous, but a profound search to generate optimums documents that were really accurate to the original deposits. In every fieldwork was evident the magnitude of the murals that has not been registered yet, even when some of them were located just a few meters from the ones that were already denounced (Municipalities of Soacha and Bosa). After a few years the demographic explosion of Bogotá generated in those faraway zones with rock art -conserved after hundreds of years at the mercy of elements- brought the urbanization causing the destruction of a great percentage of rocks registered in the first phase. It was central for the

history of the investigation that the materials conserved since its time (draws, schemes, pictures, and maps) are supported on a mathematician model because today it helps to include those registers in the formats of the new technologies, rebuilding almost in a 100% the original murals.

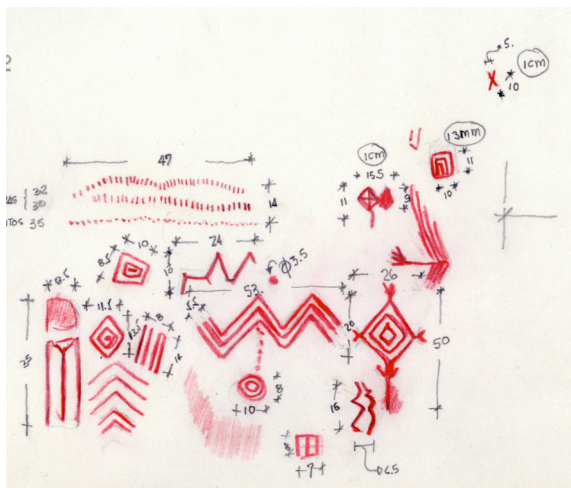


Figure 1: Detail of a draw from 1984, that shows the scale and proportion of each motives located in a indigenous pictograph mural.

The Cartesian model will constitute the base for a very long process of techniques and technologies implemented in the posterior phases, even when the backups of the register were progressively becoming more precise, from the pencil and the paper to the high-definition color film; with the use of high technology tools (computer systems, high resolution scanners, GPS) there were found new data in each fieldwork, whose accumulation reached a disproportionate level. Such is the case, to mention the most recent work, of the municipality of El Colegio, Cundinamarca, where after 6 years of continuous research there were found nearly 2000 rocks with indigenous art, with only a 60% of the total territory analyzed (Muñoz, 2004). The information gathered of each deposit was included in the files of rock and zone, after that, they were incorporated in a system of geographic information (GIS) which allows to make an assessment of the great quantity of data and eventually to go through the totality in detail, just in a single geographic view.

After almost 4 decades of investigation, the totality of the produced material was revised with the purpose of elaborate a museum of Colombian rock art in digital media, finding hundreds of pictures, schemes, draws audio and video cassettes, maps, GPS points; the general balance make visible

the need to think in the design of a digital structure that allows to have access simultaneously to the totality of the data and in detail, interconnecting the various documents not only on a geographical space but mostly on a historic level, permitting to make space and temporal links between the deposits, authors, and documents as a museum where each one of the shades involucrate in the process are revealed, including the gaps and questions still existents.

This previous period of analysis of the information gave the basis to think in a project structured with local data and at the same time to contemplate universal concepts derived from the processes of the investigation, this is made with the objective of offering a tool for international use to the specialized public on the area. What has had been searching on is a significant change of perception in the way that the object has been presented traditionally in the museographic spaces.

Furthermore, the focus of attention has been centred almost exclusively on the reflections generated by researchers and also on the materials produced during the investigation. From this we found that the relevant point is not the thing itself, but the object, in other words; there's nothing useful in the silent rocks in the middle of a landscape, there's nothing that the petroglyphs can tell us as they are still confused within their natural context, as long as the language doesn't builds a world of ideas which charge with sense the rocks, the researcher will be the one who build the existence of the object, not as the opposite. It is for this reason that the accent is placed upon the theoretical advances and the discussions generated by each phase of the research.

The next step consisted in elaborating different sketches of all the structure where each one of the elements that in some way surrounds the subject of indigenous rock art were contemplated; the classification and hierarchization of the information was indispensable even when at the bottom this goes against to the idea of the continuity of the process that was meant to show. Three different levels were established to give order to the structure: geographic, historic and documental. Each one of them has as a common point the rock and the related data, allowing to make links between these different levels, is this process the one responsible to charge with sense the rocks (object of study). By this way each rock on the historic level (Figure 2) has received values of information since the very moment when they were shown into the written texts of the colony up to our days. It also includes some of the elements derived from the oral tradition which probably proceed from the first indigenous communities, the origins, until the present time.

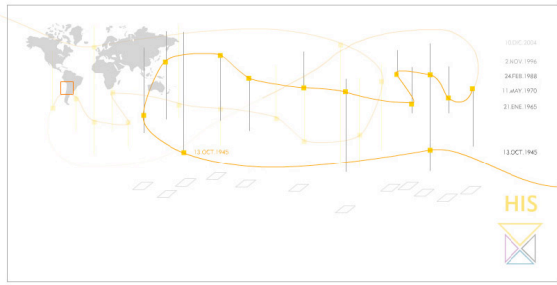


Figure 2: First digital sketch thinking about the structure for the historical level.

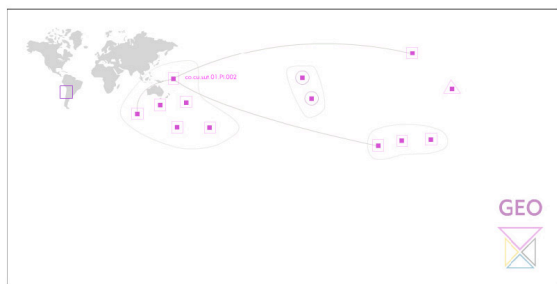


Figure 3: First digital sketch thinking about the structure for the geographical level.

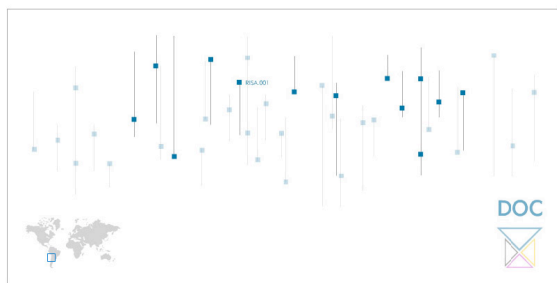


Figure 4: First digital sketch thinking about the structure for the documental level.

Geographically the rocks are localized in accordance to standards derivates from systems of geographical localization (GPS) and by the flat coordinates included in the modern cartography; the local information barely describes something about their geospatial relationship within the prehispanic world, according to that the present geographical limits, the ways to access (except for the royal paths “caminos reales”), the nature represented in its fauna and flora give us nothing but a little help to rebuild

the aesthetic universe that is represented on the rocks (figure 2).

Figure 5: Index card of historical monitoring of the deposit's register.

The documental level (Figure 3) shows the process of documentation that has been done with the *Methodological Model for Documentation and Registration of the Rock Art* (Muñoz, 1995) in each rock, in this level the information gathered by GIPRI is consigned on the index card: zone, rock register, state of conservation¹, digital laboratory, historic register of the deposits (figura 5), oral tradition, between others; by this way a continuous historic chain is spread from each of the rocks, this contains in first place the most recent documentations in a consecutive way up to the most old. For the rocks with a low rate of conservation and a higher risk, a continuous process of monitoring is realized following closely the causes of its deterioration, in such cases the chain is longer and it gives the possibility of looking carefully for the obtained materials in each phase. For some cases there is only one single visit for the rock so the documentation chain will have just one node.

¹ The Conservation Index Card was highlighted by IFRAO, compared the french model as a pioneer, because it has a high

range of symbols derivate of the implementation of colors in the different areas of each rock. (Bednarick, 2001)

2. THE PROCESS AND THE COMPLEXITY

The simultaneity of the information, the multiplicity of values contained on each node, and the fast access to the information made possible to think only within the frame of the virtual world. After some programs to visualize information were checked, as systems of data base with statistic boards or systems of geographical information, the decision was to build our own software with our own criteria and variables. Even when the developing costs of the system as it was planned upon a commercial platform (language) were practically unsustainable we were decided to work with a non-commercial platform. By the middle of 2004 the technology department of the MIT had recently presented a beta version of what will be a programming ambient with open source called Processing upon which the project was decided to develop. "Processing is an open source programming language and environment for people who want to program images, animation, and sound. It is used by students, artists, designers, architects, researchers, and hobbyists for learning, prototyping, and production. It is created to teach fundamentals of computer programming within a visual context and to serve as a software sketchbook and professional production tool. Processing is developed by artists and designers as an alternative to proprietary software tools in the same domain" (extracted from processing.org).

During the first period of sketching three different XML boards were adapted and restructured, as i have said before they correspond to three different levels of data: geographical, historical and documental. Even when the total compendium of the information derivate from the history of the investigation were not used we made a selection; for the geographic area 150 model rocks placed in the department of Cundinamarca were chosen and classified according to the modality of the rock art manifestation: picture (with pigment), petroglyph (by percussion), geoglyph (huge dimensions), furniture objects with rock art tradition (ceramics, goldsmithery) and associated manifestations (workshop artefacts, archaeology); for the historic level the most referenced documents during the research were choose and they were agruping in 5 groups according to the type of document: graphic (JPG, BMP, PSD, PDF), texts (DOC, PDF, TXT),

links (HTML, XML, PHP, ASP), audio (WAV, MP3, WMA) and video (AVI, MPEG, SWF); for the documental level the formats used were the ones derivate from the *Methodological Model for Documentation and Registration of the Rock Art* (Muñoz, 1995), they were classified by types of index card: conservation, rocks, fieldwork, zone and associated events. In this period different visual models were made upon the paper and some interactive schemes in screen, according to that a three-dimensional structure were designed including three systems of simultaneous representation with different visual characteristics for each board, assigning for each of the fields a location X-Y-Z within the new system; since the fist sketches the assignation of values relates to the size, percentages of transparency and color shades were presented to determine the way each data will be visualized and differentiated in the final interface on the screen.

Once the first structures were programming in processing, the data contained in this three boards makes possible to visualize processes, connect phases, perceive the density of the rocks in the geographic level, and also the concentration of documents at the historic level (Figure 6), there is no doubt also that it was possible to find some gaps on the research. This initiative was called *International Museum of Rock Art Research* (Albadán, 2005), and to the period between from its plan until the final on-line current version as Version Beta (IMRAR-beta).

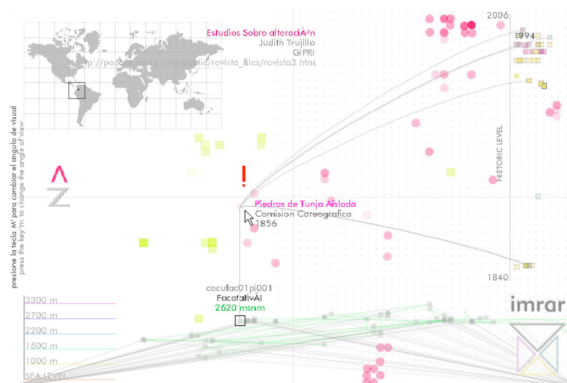


Figure 6: Screen capture of the online version of IMRAR, it shows the selection of a rock (red circle in the center) localized on the geographical level with 4 references on the historic level.

The museographic parameters and the architectonic constraints of the physical museums are transformed here for new concepts, not merely on the organization and presentation of the data but also on the final offered tools for the user so he or she can actually interact with the information, by

this way a visual structure is presented, and a new concept of museum is proposed where intertwined simultaneous temporalities, individuals creating dynamic spaces and investigation networks on real time.

2.1 Simultaneously temporalities

IMRAR is build from a 3D Cartesian model where there are as many systems of information as existent data on the environment. It is the user who consciously take into account of this endless possible relations in the measure that his mind make visual associations and temporal-space interconnections with the different type of information showed: the way this hundreds of data are visualized asks for an specialized public, for a progressive understanding of the graphic language that is presented there, the assimilation of the complexity requires that (Figure 7).



Figure 7: Visualization of the total amount of data contents by IMRAR_beta. Screen apture.

In the measure that this type of language is acquired, the user begins to build a particular world immerse on the information: the points, lines, maps and texts which appears in the first moment seems to be disperse, now, in conjunction they are interpreted as landscapes, mountains, possible paths, density of population, fertile lands, dessert, historic gaps on the investigation, politic processes, commercial interests, anomalies and aesthetics similarities, processes of deterioration and preservation of the deposits, the spirit of each time is inscribed into his own temporality fused and intertwined with other temporalities, the researcher is for the first time ever on the capacity to visualize the totality of the data and simultaneously is delighted with the detail.

2.2 Individuals creating dynamic spaces

The geometrical structure is determined by the type and the volume of the data, its form is directly associated with the values of its content which are rebuild and transformed along the unlimited history. As it is a dynamic structure the content of each zone will always generate a particular form, if the data is aggregated or modified it will be automatically transformed on the general structure.

Here the design does not consists in a static frame of lineal reading, on the opposite the design makes a mosaic of multiform data who contemplates all the possibilities, connectors, contrasts, and the associations that the mathematics could generate by making the function of the structure on the side of the user. We could speak about a space that has never been navigated before, and even when the static museum is never the same one, because the subject is in a constant *dinamis*, by giving to the structure of representation the character of dynamism the design of an interactive space becomes an agent who makes possible the creation of worlds.

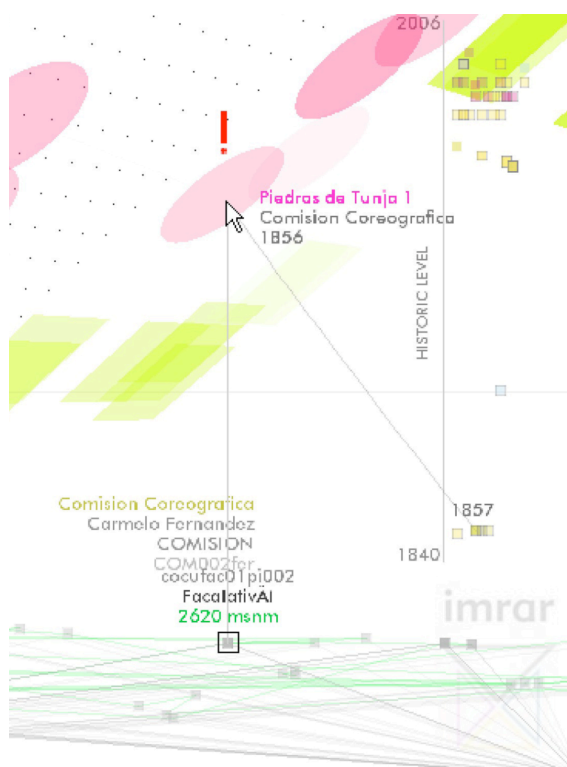


Figure 8: Detail of a screen capture of the online version of IMRAR.

The researcher determines his search in a constant take of choices, moving on from one interrogation to another, choosing and storing information while its perception of the conjunct is transformed.

2.3 Research network on real time

The possibilities of visualization and interaction contemplated by IMRAR become even more complex when the structure is placed in a global network of information. The data will not necessarily be storage in boards and update periodically, besides that it will have the faculty of being modified in real time by the researcher from virtually any place in the world, even during the work fields. Its capacity to storing and visualize great quantities of information in a global scale will be evaluated in the measure that the researchers published their materials in the museum and denounce new zones.

Part of the discussion that derivates from this subject surrounding the post of the material is related to the levels of access to the information and the require security, so the access to the museum most identified the academic-scientific condition of the user to assign the permission required in three levels as it follows: specialized user, associated researcher, and member of the museum. The existence of those levels is not a merely bureaucratic or administrative issue; it makes an important part of the argumentation related to the care of the deposits. The information must be classified and only the researchers that have pointed out their particular interest in some subjects will be able to interact with the data based stored.

CONCLUSIONS:

What is produced directly from this exercise is a new way to relate events previously non-related. IMRAR allows watching and thinking diverse interactions, and also systems of representation for the complexity, not only of the object of the study, but also of the possibilities of the math and technology at the service of the national culture. This subject of academic and university interest, will be able to generate different develops and incentives interdisciplinary processes of investigation.

A visual structure is presented graphically permitting to reveal the mathematic structure behind: during the building process of this kind of

links it was indispensable that the graphic process make an active part of the design of the data base, assimilating the possibilities of working with an open source and including a reflection over the geographical, theoretical, historical and political problems who were implicit on the process of the investigation so this way it was possible to planned and finally produce in a more precise way a optimum visual solution.

On the other hand, and facing the increasingly crisis of the identities in the country as a result of the advance of the globalization, the subject of the indigenous rock art in Colombia asks for more attention from the academic environment and the cultural institutions of the state. The subject of patrimony will stay in force only if it is profitable and lucrative for the entities on charged of its promotion. The new politics and measurements of the Ministerio de Cultura for decentralize the control and handling of the patrimony, and deliver it to each one of the regions has flowed into a series of unfortunate events, making zones with archaeological material in tourism zones with public access.

In this sense IMRAR tries to denounce an isolated subject, excluded intentionally from the national history. We think that by showing it with this method the international community could have an approximate idea of the magnitude of the zones with rock art, the gaps on research for rock art investigations and also for national archaeology and anthropology. Towards the discussion about ¿what is patrimony? The museum evidences that patrimony are the reflections and the materials derivate from the research around the object, and not the object itself.

REFERENCES

- Albadán, M., 2005. *Aproximaciones para la Construcción de un Museo Internacional de Arte Rupestre* Best thesis selection Faculty of Arts, Universidad Nacional de Colombia. Bogotá, Colombia.
- Bednarick, R., 2001. *ROCK ART SCIENCE: the scientific study of palaeoart* - Geology and Rock Art Recording.
- Muñoz, G., 1995. *Modelo Metodológico para Rescatar y Documentar el Patrimonio Rupestre Inmueble Colombiano*. Colcultura Award. Bogotá, Colombia.
- Muñoz, G., 2004. *Estudios Regionales Sistemáticos*. International Congress La Habana, CUBA.