Design, Heuristics And Digital Media
An Experimental Pedagogic Approach to the Cultural Integration of Media

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Globalization is a multidimensional process which impregnates all the facts and events of our present culture and, as a by-product of this situation, there is a set of complex relationships where "intuitive behavior plus knowledge and information technology" are central issues of the new pedagogic procedures of our times.

In this paper we assume by "knowledge" the data obtained from a set of relationships oriented towards the "heuristic approach" from the point of view of "qualitative analysis" concepts (Muhr 91).

Our main "provisional hypothesis" is to use this methodology to control the analysis-synthesis process as a continuous procedure during the design stages.

One particular aspect of this view is going through the "informatic culture phenomena" which is the base of the present "turning point" of design procedures in most architectural and design schools around the world.

This paper discusses how "media" is affecting the "design process" regarding three aspects: the conceptual, the instrumental and the representational one.

These aspects are also affecting the cultural models and creating new paradigms in the way new design methodologies combine "heuristics procedures" with the growing set of computer graphics parameters.
Introduction

In the last five years we had the opportunity to check different "design methods" using digital procedures in our Architectural Studio at the CAD Center in the Faculty of Architecture of the University of Buenos Aires. We also conducted the research in other educational institutions as the CEAC, the Faculty of Architecture of the University of Mar del Plata, both state universities of Argentina.

We will show an applied design experiment performed to test the provisional hypothesis mentioned in the abstract, and to emphasize the use of several CAD techniques integrated with the design process using a "heuristic approach".

The heuristic approach

The "heuristic approach" consists of a combination of analog and digital procedures in an iterative mode, and we wanted to stimulate participants to use the computer not only as a drafting tool (Herbert '95), but to generate a "creative environment" where they could be motivated avoiding the usual references to CAD systems (Bermudez '97).

Another input that we wanted to experiment was the influence of other art expressions such as painting and sculpture (Neumann '93), which could contribute to operate new design ideas, as well as the influence of certain films regarding spatial organization, sequences and characters. (Goldman '95, (Hemanson '97)

We are also experimenting for the first time the use of "computer aided qualitative data analysis software" (CAQDAS) to assemble the vast amount of digital information which has been produced during the exercise, because it allows us to extract a set of relationships that contribute to the understanding of the final results of the design alternatives.

Qualitative analysis. The ATLAS/i/ti software

"Qualitative analysis" is mostly used in sociology, anthropology, psychology and pedagogy but also in architecture and urbanism because the existing software (ATLAS/i/ti, Muhr '98) enables us to take advantage of the written and graphic discourse by means of digital media.

"ATLAS/i/ti" is a powerful workbench for the qualitative analysis of large bodies of graphical, textual and audio data. It offers a variety of tools for accomplishing the tasks associated with any systematic approach to "soft" data, e.g., material which cannot be analyzed by formal, statistical approaches in meaningful ways.

The ATLAS/i/ti system was developed by the German psychiatrist Thomas Muhr based on sociological theories by Renate Tesch ('94), Anselm Strauss ('96) and Matthew Miles ('96).

The main principles of the "Atlas/i/ti" methodology can be termed VISE: Visualization, Integration, Serendipity and Exploration.

Visualization

"Tools are offered to visualize complex properties and relations between objects which accumulate during the process of eliciting meaning and structure from the analyzed data."

The object-oriented design of ATLAS/i/ti tries to keep the necessary operations close to the data they are to be applied.

The visual approach of the interface keeps you focused on the data and quite often, the function we need is just a few clicks away". (Muhr '98)

Comments:

The facility of using graphic procedures allows the selection of fragments of the design by means of "windows", in the same manner as in most CAD systems. The system is able to import JPG files and each window is linked to a code which enables to declare a series of "notes" related to "qualities" of the image selected. These windows can be observed in Figures 1 to 5. (Please see the end of the paper.)

Integration

"Not to lose the feeling for the whole when working on details - this is another fundamental design aspect of this software". Given the often
analytical operations needed, especially in early stages of an interpretation, synthetic operations keep and bring the pieces together. The main -container- object integrating all the other entities is the -Hermeneutic Unit-. Resuming work on a complex project with hundreds, or thousands of files is only a matter of loading one file". (Muhr 98)

Comments:

One of the fundamental laws of the Gestalt theory (Kohler 47) was "the whole is more than the mere addition of components" and, applying this to ATLAS/II, it is possible to infer that we can operate with the segmented components and with the global view simultaneously.

Taking a creative approach into the design process (analog and/or digital procedures) we work simultaneously with the whole and with segmented images for validating a certain idea.

Through ATLAS/II we can assign a set of logical relationships to these images to link codes, as shown in the networks included in Figures 6-7.

Serendipity

"According to Webster's Dictionary we define -serendipity- as a seeming gift for making fortunate discoveries accidentally. In the context of information systems we can add: to find something without looking for it. The term serendipity also stands for an intuitive approach to data. A common operation making use of the serendipity effect is -browsing-". (Muhr 98)

Comments:

The exhibition -Cybernetic Serendipity was organized by the Institute of Contemporary Arts in London (1968).

This pioneer exhibition was organized by Jasia Reichardt, an art critic, who in 1971 published -Cybernetic Art and Ideas- a compilation of papers related to -computer and the arts-. It is interesting to mention subjects such as: computer graphics, computer animated films, computer composed and music played by Iannis Xenakis, and Gordon Pask's cybernetic machines -collaqui of mobiles-.

We suppose that there is a correlation between -Heuristics and Serendipity- because during the design process in architecture and design, many of the intermediate pre-forms or partial solutions are made of a combination of creativity-invention [heuristics], chance and morphological laws of different qualities.

Exploration

"Through an exploratory yet systematic approach to your data as opposed to a more -bureaucratic- handling of data, The whole conception of the program, including getting acquainted with its own idiosyncrasies, is aimed towards an exploratory, discovered-oriented approach". (Muhr 98)

Comments:

The Design Methods approach of the sixties (Jones 63). (Broadbent 63) taught us about -exploration- as a typical stage during the design process in architecture and design.

Again, ATLAS/II allows us to "explore dynamically" a "mental territory" between the analysis and the synthesis of the design process.

This territory can be adjusted permanently taking into consideration the two types of networks generated by the system; the first type is generated automatically based on the selection of a set of quotations (windows) and their codes as shown in Figure 6.

The second one is built up by the designer using a set of "logical operators" in order to reflect the "qualitative" characteristics of the whole design. See Figure 7.

"Networks are the main ingredients for constructing theoretical models with ATLAS/II. The system uses networks to help explore conceptual structures and to make them transparent. The networks add a heuristic "light brain" approach to qualitative analysis". (Muhr 98)
Main hypothesis

- The first hypothesis is that "media" could give us the possibility to systematically fragment the "chaotic amount of information" existing nowadays in the architectural world. "Qualitative analysis" could be the tool to set up, also systematically, a strategy to deal with "soft data", as the different lines of architectural theories existing nowadays can be interpreted.

- "Qualitative data analysis" methodology gives us the possibility to research the "mental territory" existing between the analysis-synthesis procedure in a dynamic approach by using digital media.

Design methods applied part I (brief)

The design experiment was performed during 1998 at the Faculty of Architecture of the University of Mar del Plata.

The design problem for the students (postgraduate level) was to develop an "art area" around three urban blocks which enables to integrate an existing residential area with a set of art exhibitions, music and theater performances." (Figure 1)

In these three urban blocks there are three villas which belong to the historical heritage of the city, one of them "Villa Victoria" is the focus point where the design experiment was applied since that villa is currently used as place for the above mentioned performances, at present.

There were four groups of participants and we selected just one group, "the metallic trees group" to describe the design experiment phase.

The proposal of this group consists of the development of a pedestrian path along the diagonal of the three selected urban blocks covered with a "folding metallic tree" module, inscribed in a "high tech" expression in terms of architectural domain.

This group has purposely assumed a "contradictory" operation regarding the dominant environment of the area. When the path reaches the proximity of Villa Victoria there is an open space to perform music, dance and theater activities. There is also a semi-basement space covered with a semi-transparent roof where the art exhibitions will take place (Figure 4).

Design methods applied part II (analysis)

The VISE four principles (Visualization, Integration, Serendipity, and Exploration) were taken into consideration during the analysis-synthesis phase of the design experiment.

It is possible to establish some analogy to process data and to fulfill the three concepts mentioned before: conceptual (written and analog drawing discourse), representational (2D and 3D discourse) and instrumental (operational discourse). Each one of these discourses is able, firstly, to be integrated to a graphic and alphanumeric database by means of the "qualitative analysis" methodology using the software mentioned before, and secondly to be interrelated through "media procedures".

Design methods applied part III (handling data)

Firstly the area, the villa buildings and the environment were surveyed by means of manual sketches, digital photos and with video cameras. Some of the analogue information was then digitized through scanning and manual schemes; video digitalization completed the work.

A digital catalogue was created of architectural elements and components of the site and context (mainly plans, facades, materials and vegetation) together with those from some other local or international scenarios as semantic references.

Design methods applied part IV (operational procedures)

Once the initial instances of unconditional acceptance or rejection of computer graphics were overcome, in many cases intermediate positions of superficial adjustment have developed, such as the digitalization of projects generated manually or only using the possibility of 3D modeling. In such circumstances, it would be convenient to formulate theories, criteria and
practices aimed at researching into the complementation, contamination, enhancement and mutual processes and their graphic expression in architecture and design, to analyze the relationship between the analogue and digital media involved.

The suggested mechanism intended to overcome CAD limitations so as not to make the design work rigid by proposing the interactive use of different programs. Only for instances of the project formalization in the final stages of the design process the Autocad 14 system was used. The suggested programs were: for animation and modelling 3-D Studio, True Space Caligari, for image treatment Adobe Photoshop and Corel Draw; for script structuring, Adobe Premiere and for creation of web pages Front Page.

At first, work was carried out with simple volumetric models of the site and villas resulting from analogue models created by students using common materials and CAD digital models.

Each group presented several alternative schematic proposals free from restrictions and prejudices, defining the possible relations and migrations between analogue media (sketches, manual outlines) and digital media (CAD systems - solid modeling - animation - rendering - visualization - image treatment - scanning - video animation - photographs - digital sound).

Project processes of exploratory and fragmentary nature were generated. These proposals were structured around four project parameters which each group had to select and to prioritize: architectural domain, shape grammar, environmental context and building technology.

The outline or sketches, were always produced manually as well as certain cases of reformulation of proposals or particular decisions, thus recognizing the versatility and smoothness of the analogue for realizing and expressing first design approaches.

It proved difficult to limit the overestimation of digital images and effects facing the possibilities of creation, transformation and testing through computer use and to consider their translation to future architectural realities. But at the same time, experimentation allowed to reflect on the creation and validation of unknown spaces and aesthetics resulting from virtuality.

The formal features of the communication stage were the particular choices of each group, all presentations adopting CD support with the use of script structure - story boards and hypermedia links considering national and international evaluation of the exercise via Internet.

Finally, Figures 1 to 5 show the results of the evolution of the design process from the brief to the final scheme.

Along these processes, it was possible to test not only the possibilities of this type of design experiment, but the great possibility to check in a continuous "on line process" a new methodology of analysis-synthesis of architectural solutions.

**Design methods applied part V (ATLAS/ti applications)**

Figures 1 to 7 are the result of the ATLAS/ti software application to the analysis and interpreting work during the design process. The primary data material (primary documents) and all the by-products and results of our conceptual work on these documents are maintained in containers called "Hermeneutic Units".

The Hermeneutic Unit can be considered as an organizational data structure. It is composed by:

- primary text: a text, an image, or audio file that has been assigned to a H.U. E.g. Figures 1 to 5 are primary texts.

- Quotations in the course of image analysis, the images are segmented into regions called "quotations", most commonly connected to keywords and/or memos at the time of creation. A quotation is a continuous piece of graphical region within a primary document marked with the mouse as a window frame. Figures 1 to 5 show the different windows selected for the
analysis procedure.

• Codes: is a usually short piece of text attached to quotations in the process of coding. Codes may also refer to other codes, resulting in conceptual networks. E.g., Figure 6.

• Networks: is another grouping device which is used for conceptual theory building work. Networks are created using a graphical editor. The nodes in these networks are usually codes that may be linked with selectable relations to form semantic networks which allow greater freedom to express more complex relations between the entities. Therefore networks in ATLAS/ii can be considered as devices to support the creative process (mind mapping) in general, E.g., Figure 7.

• Relations: are used to create links between codes or between quotations (conceptual and hypertext networks). Examples for code-code relations are: ISA (is a subclass of...), IS PART OF, IS CAUSE OF, IS ASSOCIATED WITH, etc. Additional relations may be defined by the user, E.g., Figure 7.

Conclusions

We are showing here just a small fragment of the potential possibilities of the ATLAS/ii software, related to the use of digital media associated with architectural design and procedures.

During the design process, students produced a great variety of digital and analogue images. The application of this software lets us to build up a design theory based on the whole corpus of images. Each image was considered as a primary document in term of Atlas/ii environment. We selected only five of them in order to illustrate the paper.

The four groups of participants used the proposed software in order to build up a design solution: the theory emerges from a series of networks as a consequence of the selection of several quotations, although each group, obviously, proposed a different network according each design project.

We believe that there is a new tool for conceptual and operational procedures in the field of architectural theory and design.

We are also aware of the present situation of architectural models based on ‘authors’ rather than on an entire body of theoretical implications.

This could lead to a chaotic situation without any valid parameter in terms of pedagogic strategies; this is why we want to contribute to clarify the possible use of these new tools.

When experimenting with new analysis and synthesis tools during design process, we run the risk of getting involved into an unsuitable simulation of reality, just a tautology.

Through this design experiment we discovered that the ATLAS/ii software could provide us with appropriate tools to deal with graphics entities and to operate a series of additional logical procedures such as: ‘network vs. network view, relation vs. link, nodes, layout and topological sort’.

These tools are opening a new ‘mental territory’ of research into the logical procedures of design assisted by digital media. We hope these interests will be successfully exploited.

Notes


References


research: grounded theory procedures and techniques." London: Sage


Home page ATLAS/ti software
http://www.atlasti.de


<table>
<thead>
<tr>
<th>Quotation window No.</th>
<th>Codes</th>
<th>Comments</th>
</tr>
</thead>
</table>
| 1                   | Landscape domain  
Urban-geophysical domain  
Urban identity  
Urban image  
Urban integration | Residential area of Mar del Plata |
| 2                   | Building system  
Cultural activities  
Cultural axis | Area of cultural activities and museums on a pedestrian axis |
| 3                   | Focus point | Villa Victoria |
| 4                   | Functional dimension  
Morphological dimension  
Spatial dimension | Villa Victoria digital model |
| 5                   | Architectural domain  
Historical heritage  
Landscape domain  
Pictorial architecture | Villa Victoria-Museum of Art  
Villa Sivina-Mar del Plata  
Foundation  
Villa Mitre-Museum of History |

Figure 1 - Proposal for the design of a cultural area of the city of Mar del Plata - Argentina  
(set of 5 windows selected for the analysis-synthesis design process)
Table 2 - Codes for the primary document corresponding Figure 2

<table>
<thead>
<tr>
<th>Quotation window No.</th>
<th>Codes</th>
<th>Comments</th>
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<tbody>
<tr>
<td>1</td>
<td>Building system</td>
<td>Digital model of an oak tree</td>
</tr>
<tr>
<td></td>
<td>Articulated metallic umbrella</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Urban-architectonic domain</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Analogic tree structure</td>
<td>Model of an analog oak tree</td>
</tr>
<tr>
<td>3</td>
<td>Closed metallic umbrella</td>
<td>Phase 1 of the articulated metallic umbrella</td>
</tr>
<tr>
<td>4</td>
<td>Partially spread umbrella</td>
<td>Phase 2: idem</td>
</tr>
<tr>
<td>5</td>
<td>Partially spread umbrella</td>
<td>Phase 3: idem</td>
</tr>
<tr>
<td>6</td>
<td>Totally spread umbrella</td>
<td>Phase 4: idem</td>
</tr>
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</table>

Figure 2 - The different phases of the articulated metallic tree. (analogous vs. digital model)
<table>
<thead>
<tr>
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<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Architectural domain</td>
<td>Digital model of the set of metallic trees. Space for music-dance-theater.</td>
</tr>
<tr>
<td></td>
<td>Cultural activities</td>
<td>Villa Victoria is a wooden house made with a balloon-frame system.</td>
</tr>
<tr>
<td></td>
<td>Focus point</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Historical heritage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Landscape domain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Picturesque architecture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Totally spread umbrella</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Urban-architectonic domain</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Antique stone benches</td>
<td>Existing stone benches. Proposal for wooden and plaster benches.</td>
</tr>
<tr>
<td></td>
<td>Future furniture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Urban equipment</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Architectural components</td>
<td>Enclosed balcony</td>
</tr>
<tr>
<td>4</td>
<td>Set of meshes</td>
<td>Proposal for the design of panels and tapestry based on Villa Victoria architecture</td>
</tr>
</tbody>
</table>

Table 3 - Codes for the primary document corresponding Figure 3

Figure 3 - Focus point. Relationship between the open space for cultural activities covered by the metallic trees and the main entrance of the Villa Victoria.
window scheme 4

<table>
<thead>
<tr>
<th>Quotation window No.</th>
<th>Codes</th>
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<tbody>
<tr>
<td>1</td>
<td>Architectural domain</td>
<td></td>
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<td></td>
<td>Digital model</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Reality and virtuality</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Audio data</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Cultural activities</td>
<td>Aerial view of the exhibition of modern art</td>
</tr>
</tbody>
</table>

Table 4 - Codes for the primary document corresponding Figure 4

Figure 4 - Focus point. Digital model of the nocturnal view
Table 5 - Codes for the primary document corresponding Figure 5

<table>
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<th>Quotation window No.</th>
<th>Codes</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Architectural domain</td>
<td>Villa Victoria facade digital model</td>
</tr>
<tr>
<td></td>
<td>Design domain</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Graphic and textile design</td>
<td>Shape grammar based on Villa Victoria architectural components</td>
</tr>
</tbody>
</table>

Figure 5 - Proposal for the design of papers and tapestry based on Villa Victoria architecture
Figure 6 - Automatic generation of network focused on quotations (windows).

The two numbers separated by a dash enclosed by curly parentheses and appended to the code’s name by the system make reference to: Groundedness (or grounded theory), because of its emphasis on the generation of theory and the data in which that theory is grounded. The first number displays the number of quotations (windows) already coded with this code. The larger this number is, the more participation that code has within the data.

Density. The number following the dash is the number of other codes linked with this code. Codes with large numbers can be interpreted as having a high degree of theoretical density. This latter characteristic belongs to the networking procedures shown in figure 7.

Type of relations

: is a

\[\]

: is part of

\[\]

: is cause of

\[\]

\[\]

This network is a ubiquitous and powerful tool that serves to represent complex information by intuitively accessible graphic means.

"This means that the designer is able to modify the structure of this network in order to adjust the design of theoretical models and also exploit the structural properties of code-networks to enhance the retrieval of quotations". (Muhr 98)
Figure 7 - Code-code relations. Semantic network.