THE LABYRINTH AS A MODEL OF COMPLEXITY: THE SEMIOTICS OF HYPERMEDIA

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ABSTRACT

In this paper, we intend to approach two specific hypermedia aspects; the structure that organizes the hypertextual information, as well as the route of reading that the user creates when advancing the links of a net. Our hypothesis is that the labyrinth is present in hypermedia systems in two ways: the first, more evident, is in the own organization at the moment of the project development. The second, subtler, but not less profound, is the labyrinth that the reader is to construct when operating his choices in between the hypermedia chains. In this sense, our research will be oriented as of two principles, or two labyrinths: the potential labyrinth, present as a modular document with access "doors", "hyperlinks" to other documents; and the lived labyrinth, that which is experimented by the user at the moment of his navigation by "hyperspace". We will start our research from a revision of the theory of hypertext, to later outline parallels with the labyrinth.

General Terms

Hypermedia, Metaphor, Intertextuality

Keywords

Hypermedia, hyperspace, links, interactivity, authorship, reader, complexity, organization, metaphor

1. INTRODUCTION

Recent advents such as the expansion of the personal computer, the multimedia, CD-ROM, and Internet are raising a series of problems to be discussed in different areas of the human thought. The acquisition of a new intellectual technology makes changes in the several human activities possible, that is, its reflection is spread to different fields and implies new analogies and classifications, new practical, social, and cognitive worlds.

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2. A BRIEF INTRODUCTION TO HYPERMEDIA

2.1 Historical Antecedents

The Hypertext is a digital document in the form of a text with the specific characteristic of that different blocks of information can be consulted in an interactive and almost simultaneous manner. In general, the information contained in the hyperdocument is modular and highly indexed, tied by connections named “hyperlinks”, which allow the user to advance in his reading as he pleases. The Hypertext reader may advance the several chapters according to his interests, and even, using the resource “search”, track an entire and extensive volume of information in a matter of seconds.

Ted Nelson is considered the inventor of the term Hypertext as well as of important concepts such as the “stretch text”, which expands and contracts according to the request for further information. It was back in 1970 that Nelson developed the Xanadu System, a kind of Universal Library that allowed the sharing of ideas among people. Author of several works about Hypertext systems, among others the book “Literary Machines” [1], Nelson is, no shadow of a doubt, an enthusiast of the permutation possibilities that these systems offer.

However, several years before, in 1945, Vannevar Bush, one of the first computational scientists, was to present the main concepts of the future Hypertext in his legendary article "As we may think" [3]. According to him, the traditional information exchange systems were not efficient at all. His project “Memex”, a machine previous to the microcomputer, mixture of microfilm and photoelectric cell, was a powerful device to store data of different kinds, and already allowed links between documents. In this sense, consultation could be performed from the associative links, that is, one item could lead to another item, and so on, allowing the user to construct a trail of reading according to his interest.

As of the end of the 80’s, the term Multimedia started to become popular, in that it was seen in the most varied places. However, this term may acquire several meanings according to the context it is used. We will use the term Multimedia in its usual meaning, that is, the incorporation of several sources of information, such

as sound, texts, images, video, etc., in a same technology, the computer. Hypermedia, in turn, adds resources of interactivity to the Multimedia technology, allowing the user to navigate by several parts of an application as he pleases. As the objective of this research is to study the structure that supports the construction in Hypermedia, we will not make any distinction between the terms Hypermedia and Hypertext as, within this perspective, it is irrelevant whether an application counts with different kinds of media or not.

2.2 Theoretical Discussion on Hypermedia

The object of our research, Hypermedia, is a quite new technology; however, many of the concepts that are related to it have already been explored in other areas of the human thought. Landow, in his excellent work on hypertext, points out some relationships between the topics of literary criticism and the main characteristics of Hypermedia [6]. Themes as intertextuality, open piece, decentralization, and multivocality, all quite pertinent in regard to this new technology, have already been highly discussed and approached by authors such as Derrida, Barthes, Eco etc. It seems that Hypermedia came to bring technological meaning, that is, material and technical conditions for the making of certain poetic projects.

The character that distinguishes Hypermedia lies in the possibility of establishing connections between several media and between documents or nodes of a Net. With this, the links between documents provide a nonlinear, multifaceted thought. The Hypermedia reader is an active reader, who is all the time establishing his own relations among the several ways that the hypertext links allow him to move. As a Labyrinth to be visited, Hypermedia gives us promises of surprise, unknown tracks...

Besides, it is necessary that we make a remark in relation to the Hypertext specificity, that regarding speed. It is completely different to have access to another book, image or reference only from a click. Such tasks used to take much longer. With the infoways, today we can communicate with people who are geographically distant, consult a book in about 2000 libraries, 24 hours a day.

2.2.1 The Differentiating Characteristic:Interactivity

It would be interesting to start this part by reminding the reader that the concept of interactivity is quite old and, theoretically, every good piece of art carries this interactive potential at a metaphorical level. However, we have, with the advent of new technologies, a greater emphasis for a certain kind of interactivity. In the specific case of Hypermedia, we can point out that the work, in itself, only becomes a piece of art from the moment it is enjoyed by the reader.

Thus, the act of reading becomes the constitutive element of the work. David Rokeby, when commenting on his work "Transforming Mirrors: Interaction as a mode of artistic expression", puts this in a quite interesting way when working with the mirror image. According to him, interactivity is defined at the moment the piece of art reflects the consequences of our action and decisions back to us. We have then the possibility of contacting our "self", which was processed and transformed by the contact with the interactive technology. In this fashion, the most important concept in interactive art comes from the exploration of meaning that emerges from the tension between the interacting part (or reader) and the reflection of his own self. The piece of art returns to him from the experience [13].

Other authors, as Frank Popper, have already pointed out the importance of the interactive character in relation to graphic computation, providing a distinctive perfume to it. We can take this punctuation to hypermedia as it embodies the interface between the nodes of the net and the choices of the reader [11]. This, however, leads us to a new question we will look at next.

2.2.2 The Question of Authorship

Authorship, in turn, is a rather complicated concept when talking about Hypermedia. It is necessary to remember that large teams usually work in the making of a CD-ROM application. However, in the most vivid Hypermedia, performed in nets such as WWW, we have an example in which the term authorship becomes totally unfit, since in each knot of the net we are connected with a point developed by a team, and we may, the next minute, be in a different point developed by another team, and so on. Some thinkers already state that Hypermedia represents the end of the authorship era. Landow, for example, talks about the author reconfiguration, which now suffers a "self erosion" with the transfer of the authorship right to the reader, who have at his disposal a series of options of choice ahead [6].

Even the way of presenting ideas must be thought over. For instance, the author of a work in hypermedia no longer needs to present a line of argumentation. The statement, that is, the researcher thesis, only appears in the establishment of limits of inclusion and/or exclusion.

2.2.3 The Active Reader

The concept of flexible text requires and creates an active reader. "New forms of mental navigation will be necessary to reencounter oneself in the informational labyrinths in constant regeneration" [12]. In the hypertextual systems, every reader is also the author of what he is reading.

We talk about active readers, regular authors, works in permanent mutation. We may, more than ever, review the question of the classic dichotomy subject-object.

Pierre Levy dissolved this Manicheanism division in a very interesting way when he sketched the program of Cognitive Ecology. If we consider the intelligence, or cognition, as the result of complex nets in which a great number of actors interact (human, biological, and technical), the scenario of interactions allows more complex reading. The hypermedia systems allow us to builds a paradigm of theoretical possibilities.

3. THE ORGANISATION OF COMPLEXITY

The hypermedia systems represent an excellent example on the complexity paradigm. We will use the term complexity as described by Morin, that is, as something, which is woven as a whole [9]. What defines the weave of the "complexus" cloth is that it is formed by a circular game in which the binomials order/disorder, chance/determination, interaction/retroaction are conjugated in an infinite and simultaneous way.

Thus, in the concept of complexity, one cannot exclude the "simple". This is one of the most interesting paradoxes to be observed in the hypermedia systems. Each knot of the net, each "home page", each CD-ROM page must be conceived from the principles of clearness, coherence, strictness, order, and precision. In this sense, simplicity and clearness are constitutive elements, passage bridges to a greater complexity.

A hypermedia system presents as reality the articulation and organization of complexity.

We may say Hypermedia is only accomplished when there is interaction between the conjugated pairs.

That is:

- The complex order in the hypermedia systems only exists if the connection between order and disorder exists.
- The complexity, if there is simplicity;
- The random choices of the interacting part only work if the system is previously programmed, determining possible connections to specific points.
- Non-sequential search and research are only possible because there was a previous work, necessarily sequential.
- This is also true for the free, creative and fluid route. Strictness, accuracy and obedience to standards were necessary.
- The elasticity of the hypertextual systems, its capacity of expansion and retraction, is directly connected to a construction in synthetic, firm, and solid blocks.
- And finally, a quite obvious characteristic: the user can only exert his virtual mobility by the several sites if there is an immobility of sitting in front of a machine.

Thus, it is in the organizational complement between (order-disorder), (simple-complex), (random-determinism), (sequential-nonsequential), (strictness-freedom), (solidity-elasticity), (mobility-immobility), that we can view the dimension of the complexity hypermedia performs.

One of the most important methodological cares we must have when working with systems is the danger of trying to analyze them. Systems must be understood as a whole that articulates and only exists as such. In this fashion, reducing it to its most simple parts, decompose it, is like stopping conceiving it as a system.

Another concept that was very important in our investigation was organization.

Organization is intrinsically related to the idea of system. Each connection, each hypermedia link, at the same time connects, transforms, transports...

Once more, we are dealing with an extremely dense concept. In its density, we can view order and disorder. Organization, when interacting order and disorder in itself becomes more and more complex. This phenomenon can be easily observed in the paths of hypertextual reading. Suppose a quite active reader, who describes rather complex movement when moving from one link in the net to another. In spite of the path disorder, of the complicated route, a hidden order is present. This order can be found through the command "history", which redoes the complete route.

We will try, in this way, to conceive the notions of organization and complexity of the systems as a circular route ad-infinitum.

3.1 Centered, A-Centered, and Polycentric Organizations

In order the complexity of Hypermedia systems is operational and lived, the system must be conceived as an organization. When we talk about hypermedia, we are in the field of inter-relations, and it will be the organization that will make these relations possible to occur.

Organization will make possible:

- System opening and closing.
- Sequential and non-sequential coordination.
- Random and predetermined connections.
- The recording of the route and its restoring.

The organization of Hypermedia Systems is characterized for being a polycentric organization. Let us analyze, for example, Hypermedia in the WWW: each site in itself represents a center. Once more, it is the system complexity in its totality that will establish the node order and regulation. However, besides that, one may say that, in Internet, the center is everywhere and nowhere, what leads us to the definition of an a-centered system.

In the case of CD-ROM applications, we can find a variety of categories. We may say there are polycentric and acentric titles and that, in most of the cases in which there was an electronic transposition of a material, which already existed, in printed form, the centered and linear character is still predominant.

Going back to the nets, the fact that the center is everywhere and nowhere makes that the acentric and polycentric characters are conjugated simultaneously. As all acentric organization is regulated from answer from certain computing places, we have there a polycentric system. In the radicalization of this though we may conclude that every acentric system is also polycentric and vice versa.

A very interesting case to be seen concerns our own brain. For a long time, the neuron cerebral device was considered the regulating and commanding center in the vertebrate living organisms. It was believed that in these animals the organization would take place from a hierarchical system of the pyramidal type. For representing an exception in the living universe, in which organizations in the acentered and polycentric form are the majority, the centered scheme was seen as a form of evolution. However, we know today that, in fact, we are dealing with an even greater complexity and that, behind this apparent centrism there are, simultaneously, acentrisms and policentrisms. Our brain is then seen as a center, and one of the centers of a larger polycentric system, which, in turn, in its complexity is often a-centric.

With this, we are trying to conclude that centrism-acentrism-policentrism are elements which are articulated in an increasing complexity. This complexity does not exclude one characteristic

or other, but allows, through a system of exchange and dialogue with the local centers, a coherence in the system as a whole.

4. HYPERMEDIA AND THE LABYRINTH

> *"The Labyrinth invites to exegeses, and the weaving of crossroads and ramified corridors irresistibly attracts the interpreter to a thousand and one routes."*
>
> *Marcel Detienne [4]*

4.1 The Labyrinth and the Minotaur: The Revisited Myth

Labyrinth, from the Greek *Labyrinthos*, was an extremely complex structure in Crete. The word origin is probably Caria or Lydia, and comes from *Labrys*, a double cut ax. We can make two relations: the double cut ax has a religious connotation, in that it is found in stone engravings and pillars in ruins of the Minoic period. The ax that cuts in two different places is also related to the paths that are divided in the Labyrinth.

According to the Greek mythology, Minos receives from Poseidon a wonderful ox as a present. However, the God of Seas requires this animal be offered to him. The greedy Minos denies returning it. As a punishment, Aphrodite intercedes, making the queen Pasífae to terribly fall in love with the oxen. From this union, a terrible monster will come out, the Minotaur, half man, half oxen. To hide that which was the shame of Minos, the craftsman Dedalus creates the Labyrinth[1].

Artifice legendary Athenian, son of Metión, and descendent of Hefesto, God of fire and a blacksmith, Dedalus was so skillful that it was said his sculptures could move. Still in Athens, Dedalus will commit a crime because of envy. His nephew, Talos, had invented the saw and the potter's wheel. Fearful that his success would overcome him, Dedalus throws Talos off a rock. He then escapes to Crete. His attitudes are always paradoxical, because it was because of his invent that Pasífae could carry out her love with the oxen. Builder of the labyrinth, Dedalus will however teach Ariadne a way for Teseu to find his way out. As a punishment, Dedalus will be stuck in the Labyrinth with his son Icaro.

4.2 A Labyrinth Typology

Labyrinths are images that have persisted in the history of humanity since millenniums. This long, continuous and mutant permanence unveils to us deep questions of human thought. More than the common sense is used to define; the labyrinths are signs of complexity. The greatest allure of labyrinths may reside in the fact that they are paradoxical and propose, each one in its own way, opposite and varied logics.

When one speaks about labyrinths, it is good to remember that besides human constructions, there are also natural labyrinths. Among them, the caverns and the caves that, with their narrow passages, propose us trace difficulties. The shells, exemplar image of the spiral theme, are other fecund source of daydream and reverie. The flowers, and their mandalic constructions, the leaves, the roots and the rhizomes are also natural labyrinths. Labyrinth is present in our own body, in many of our organs such as the brain, the inner ear, and even at the fingerprint, unique sign of our identity.

The labyrinthine imaginary is present in several periods of mankind. One of the oldest graphical representations dated from the neoliptic age and is found in the cave of Valcamonia, Italy. Among antiquity's labyrinths, there are the Egyptian (totally destroyed, whose original plan was reconstructed by the English archeologist Flindres Petrie, in 1888) and the Cretan (immortalized by the mythical narratives of Theseus, Ariadne and Minotaur).

The sense of labyrinth has been transformed throughout time. In the Egyptian case, we have a magnificent and majestic construction, as space dedicated to the protection of the sacred. The Egyptian labyrinth was, at the same time, sanctuary and monumental representation of the power of pharaoh and sacerdotal class.

On the other hand, the Cretan labyrinth is a prison and a shelter for the monstrous. We find this thematic in nightmares producing dark and tortuous corridors, facing a double challenge: to find the right path and kill the beast.

The labyrinths built in gardens' spaces however propose another question, and another logic. In the case of Versailles' labyrinth, for example, the idea was not to question, to puzzle or to confuse visitors. The propelling purpose, that led the architect to plan garden alleys, was to provide people with fun. To emphasize this character of delight, he placed among the flowerbeds many sculptures featuring scenes of Aesop's fables.

It is therefore impossible to think of a general concept that would define the labyrinth in a single word. The classic definition of a labyrinth being such a difficult and intricate construction that the walker often loses his sense of direction and meet difficulties to reach the center, corresponds to one type of labyrinth only, and reduces the complexity involved in this theme.

Let's examine a case where the pilgrim does not have to face any doubts or question which path he should take: the labyrinths built on the ground of medieval churches, such as Chartres and Amiens cathedrals. We can say that these labyrinths do not present any problem about decision taking, as they offer one-option paths only, without any branches. Different from problematizing mazes, this kind of drawing does not present any division throughout its course. Therefore, one-course labyrinths do not offer the visitor any free choice. As there is no path to be chosen, there is no possibility to get lost, and the visitor only has to follow the circumvolutions, in and out, as they have been conceived by the architect. However, these beautiful diagrams had a deep spiritual meaning to the faithful. There were more than mere ornamental drawings: the novice who walked through these labyrinths while he was praying, tried to reach a supreme state of mental concentration. To walk through these labyrinths was a quest for a sacred space, a substitution to a pilgrimage to Holy Land.

[1] Dedalus: from the Greek Dáidalos, "smart workman".

According to our proposition of elaborating a labyrinthine typology, this kind of labyrinth would be the first: without any forks, also called one-course labyrinth.

The second type of labyrinth, maybe the most frequent in stories and legends, corresponds to a labyrinth with crossroads. I will not spend much time on this type, as the latter has been the object of thorough research in my previous book. We will however examine some points of interest for our current discussion. In labyrinths with crossroads, the use of schemes to pave the path, such as Hop o' my thumb's pebbles or a leading thread (Ariadne's thread), are extremely useful to whom does not want to become lost. However, we have to remember that many artistic works in hypermedia consider the art of getting lost as a poetic stimulus (see web art works of Jodi and Landsbeyond).

Cyberspace labyrinth belongs to another class, another typology. It maintains characteristics of the first kind as well as of the second kind, but it goes beyond. We are here facing a rhizome-type labyrinth. A rhizome can be connected in different directions and from each of its points - so does WWW. A rhizome does not have one center only, we have got a center in all its points. Some authors refer to the very mind as an example of rhizome-type labyrinth.

4.3 The Metaphoric Issue: Theoretical Fundaments

The metaphoric discussion has long been restricted to the poetic investigation. However, as of a few years ago, this issue started to be discussed again with quite enthusiasm, especially due to the researches on Artificial Intelligence. Several authors will work the Metaphor, in that they will have opposite opinions quite frequently.

The pioneer, no shadow of a doubt, as Max Black with his famous book "Models and Metaphors" [2] in which he speaks in favor of its cognitive capacities[2].

Metaphors provide the approximation of two worlds of heterogeneous domains.

According to Ricouer states in his book *The Rule of Metaphor-Multidisciplinary Studies of the Creation of Meaning in Language,* metaphor is a model that makes a redescription of a certain subject feasible.

Among the greatest polemics, we can find divergence between Ricouer e Derrida, in that the first understands the metaphor as a meaning carrier and philosophy as a choice and development of a live and metaphysic metaphor. Derrida, in turn, describes the deceitful function of a dead metaphor. Another opposition to Ricouer, D. Davidson, denies that metaphors mean anything besides their literal meaning[3].

However, in our paper, we will be based on the following suppositions:

- The metaphor provides the possibility of having a creative and unexpected view of a certain subject.
- The metaphoric relation is frequently circular, that is, from B we have a new knowledge of A, but also what we know about B is changed by the process.
- From the metaphoric relation between A and B, it is possible to extract C, knowledge that is structured from this interrelation.

Recent studies on Cognitive Sciences go back to the issue of metaphor as the focus in the discussions on mental representations and in the construction of the Web Culture.

Holyoak and Thagard, in their book "Mental Leaps- Analogy in Creative Thought" [5] will talk about the importance of metaphoric identification. According to the authors, the metaphor provides the interaction between A "source" e B "target" This interaction is such that after the metaphoric bond, our understating is changed in relation to both A and B. The metaphor, as it forms analog schemes, is not interested in similarity or comparisons. Its basic characteristic is to conceive a category, which encompasses the two fields of knowledge. In order to exemplify such strength and comprehension, the authors show us two sentences, one metaphoric and the other comparative. To state "my job is a prison" is much stronger than saying "my job is like a prison". Besides, they will point out that the metaphor works as a factor of indirect communication and cultural agglutination.

4.4 Hypermedia as Labyrinth

Our hypothesis is that the Labyrinth offers name and image for the reflection of a technology, hypermedia. For that, we will have to assume the transdisciplinary character of our work from the start.

In our specific case, when we chose the Labyrinth to be the metaphor of Hypermedia, we intended to open paths to the understanding of this new technology from the confrontation with an extremely old and universal theme. The Labyrinth is always seen as a challenge to be faced and, many times, image of a high complexity. Fruit of logic, rational construction, the "Labyrinth is human" [15].

The Labyrinth, which is formed in the nets such as WWW, with its several paths and deviations, may be seen as a result of the expression of user's desires. Interests that are raised by a subtle curiosity, in the Labyrinth of the nets one needs, more than ever, powerful "Search" tools, as well as a program that records his steps, leaves traces. One can prudently follow the "Theorem of

[2] Out of curiosity, in our researches on the Labyrinth, we found another book by the same author, about languages, where the Labyrinth image is used as an argumentation pretext. In The Labyrinth of Languages, Black talks about the language Babel, the ineffectiveness of artificial language, such as "Esperanto" propagation. To conclude, Black states the Language Labyrinth does not have Ariadne´s thread.

[3] For a panorama of several discussions on Metaphor, see S. Sacks [16]; which corresponds to the minutes of the congress "Metaphor: The Conceptual Leap", University of Chicago, 1978.

Wise Ariadne" and try to return to his own steps. One can also assume the "Theorem of Mad Ariadne", and try to know the greatest number of ways [7].

5. CONCLUSION

> *"An extremely confusing area, a net of streets, that for years I had avoided, became to me, in one strike, reachable in a view of the whole, when, one day, my beloved moved there. It was as if, by her window, a projector were installed and decomposed the area with beams of light."*
>
> *Walter Benjamin*

An entire vast field for the acquisition and articulation of knowledge is open with the hypermedia technology. Because of the non-linear architecture of its memories, the computer makes the reading of texts that are in different parts of a document, as well as in a different address, possible.

In this sense, the research work counts now with the friendly interaction that the information support of hypertext provides us. The iconic representation of the information structure and its commands, (which would correspond to the establishment of the international convertible writing Benjamin talks about), as well as the possibility of a non-linear search open new cognitive media. This possibility of concentration, focus on our interest points provides, no shadow of a doubt, light to confusing roads.

We can, more than ever, promote dialogs between several subjects, travel by foreign countries, navigate into unknown seas... In this contact with distinctive media and documents, in this interfacing, as Levy would put it, connections and reinterpretations may be lived. The transdisciplinary thought Edgar Morin talks about has a fertile soil to be developed:

"I am not interested in synthesis, but in a transdisciplinary thought, a thought that is not broken by the frontiers between disciplines. I am interested in the multidimensional phenomenon, and not the discipline that cuts out a dimension of this phenomenon. Everything which is human is, at the same time, psychic, sociological, economic, historical, demographic. It is important that these aspects are not separated, but rather concur to a poliocular vision." [9, p.35]

Not forgetting that an intellectual technology must always be studied with a connected multiplicity, as a net of interfaces open to connections and transmutations, hypermedia systems are, to us, a guide to the Labyrinths of the nets, the Ariadne´s thread that helps us to find what we wished, our Minotaur, as well as unexpected crossroads...

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