

Communicating the “Virtual”

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"As our age translates itself back into the oral and auditory modes...we become sharply aware of the uncritical acceptance of visual metaphors and models by many past centuries."

Marshall McLuhan, *The Gutenberg Galaxy*

Abstract

The revolution of the digital technologies in the past has focused attention mainly on the technical power and not on the semantic level of the informative and communicational aspects. In the field of the virtual heritage the risk was/is to enhance the amazing esthetic features despite the informative/narrative feedback and cognition within the virtual worlds. How much information can I get from a virtual system ? How does it communicate ? How can we process this kind of interactive information ? The importance of the virtual reality systems in the applications of cultural heritage should be oriented towards the capacity to change ways and approaches of learning. The Virtual communicates, the user learns and creates new information. Typically we define a linear learning, tools and actions, such as books, audio guides, catalogues and so on (in this case the communication is a linear sequence), and reticular learning VR systems where the user is immersed within reticules of information and visual data.

Psychological and cognitive learning in the museum cultural exhibition can be interpreted as the principle of communicating vases: the communicative flow of information crosses the museum's territory and the user's territory. The relations between Virtual and psychological reactions (action/reaction) are the basis of any cognitive processing: a good impact corresponds to a good memory, a good memory very probably will be a good tale. In a museum exhibition, for instance, in order to interpret an object, we compare old mental “maps” with our newer “maps”: this mutual interaction can create an aesthetics of the fruition, a new context.

In this presentation we embrace the philosophy of ecological thinking for the Virtual reality applications, interpreting virtual worlds such ecosystems. According to this cybernetic approach, we will consider these basic concepts in virtual reality: feedback or retroaction, circularity, redundancy of information, difference, hierarchical levels of information, map, connectivity, metaphors, context, narrative visuality, aesthetic of the fruition. "Complex systems are those that include large numbers of components interacting in nonlinear ways, often leading to unexpected behavior. Complexity sciences explore how parts are related to wholes, describing the interactions between environment, system, and observer. In common language one is reminded of the saying that 'the whole is greater than the sum of its parts.' Understanding art as a language, the historical development of art, and the creative process itself are all key areas in which art and complex systems have a common ground." (Ellen K. Levy and Philip Galanter, New York, 2002).

Keywords: Virtual, ecology, map, territory, museum, information, ecosystem.

Introduction

Most part of the world seems to be interested mainly towards technological and digital aspects of the Virtual, we consider this direction over-technological without a correct evaluation of the relations between mind and environment. We imagine the Virtual like a 3D cyberspace in which artificial organisms and humans interact, move, grow on the basis of rules of artificial societies and of relations of ecosystems; the realm of the Virtual, in a technical sense, includes all the 3D worlds where the action/reaction/retroaction is free and in real time. In particular we are interested in DVR, that is screen based and aimed to allow the user to interact with a responsive “game space”. Three key words describe VR: inclusive, interactive, interactive in real time.

In the field of the Virtual Reality the concept and significance of the Virtual is smoothed, undefined, misunderstood, misinterpreted. The big mistake in common sense is to consider the Virtual as an ontology-technology, that is the Virtual would communicate only through a technology; it is not true, the Virtual communicate through information, feedback, inter-relations [1], the Virtual is mainly an Ecosystem, an Environment, so its rules are the rules of a theory of the systems. This is the reason why we discuss the importance of an Epistemology of the Virtual in ecological terms: without environmental interactions there is no information.

Virtualization is movement opposite to *Actualization*, so the Virtual is not the opposite of the Real but of the actual, it constitutes entities [2]. The interaction between humans and computers depends on the dialectic of the virtual and of the actual. In general it seems that the digital revolution of the Virtual is close to an end but, on the contrary, it must still start in my opinion.

It is important to distinguish technological questions and epistemological questions: what technology for the Virtual ? What Virtual for the technology ? The first question is not so important because the answer depends on the progressive development of the Digital; the second question is fundamental because it embraces a key point of the matter: the content, the context, the map of the Virtual, that is, how does it communicate, how and what do we learn in a virtual way.

My view is that an important epistemological cybernetic discussion about the Virtual must be started in order to identify its communicational aspect and content. The question is not related with a general and barren epistemological and philosophical discussion on the concept of Virtual but towards the correct means, methods and instances for projecting the Virtual, for planning, for communicating the Virtual for cultural heritage. The issue is fundamental because the Virtual is the “map of the territory”, the map of the reality. The next challenge of the Virtual will be the study of relations with the neuro-sciences, that is the cognitive impact of the Virtual in terms of neuronal aspects of the brain. In short, it is possible to embrace all the questions in a new field we define anthropology of cyber culture or cyber anthropology.

This paper wants to discuss the properties of communication, learning, and knowledge of the Virtual according the cybernetic theories of the ecological thinking of the Bateson’s school in relation with cultural heritage fruition and “consumption”. The study of the process of learning through VR systems and applications is a key point for analyzing *in toto* the cognitive processes of the mind and for understanding the exchange and value of information technologies.

In order to promote a discussion on this matter I have constructed the paper with keywords-key concepts: each comment follows a keyword (the words of Bateson are in italic). In the following parts of the text I will comment the key concepts in relation with the theory of communication of the Virtual.

First of all the Virtual is an environment; in terms of epistemology of the Virtual there are important relationships between cybernetics, theory of the systems (biology) and cognitive sciences. According the issues of the ecological thinking the living being is to be understood in the whole system of relations and not only by the nervous system; so the living being is defined as autopoietic organization because it self-produced, self-organized. In short we can define VR as an autopoietic system because it reflects processes of mutual interactions [3].

In autopoietic theory, cognition is a consequence of circularity and complexity in the form of any system whose behavior includes maintenance of that selfsame form. This shifts the focus from discernment of active agencies and replicable actions through which a given process ('cognition') is conducted (the viewpoint of cognitive science) to the discernment of those features of an organism's form which determine its engagement with its milieu.

An ecological approach takes as a starting point the condition of the whole organism-person inseparably mind and body. These states are called descriptions in autopoietic theory, and an organism operating within the realm of its descriptions is an *observer*. Relations between organisms and environment dominate all the knowledge of the real and of the virtual and they constitute the central item of the biological research. According to Maturana and Varela the Observer is the system itself: the interactions with the environment are instructive, they are part of the definition of the organization of the system and they lead to the course of the transformation [4].

1. **Cybernetics.** *The delimitation of an individual mind must always depend upon what phenomena we wish to understand or explain. [...] The elementary cybernetic system with its messages in circuit is, in fact, the simplest unit of mind; and the transform of a difference traveling in a circuit is the elementary idea. [...] The unit which*

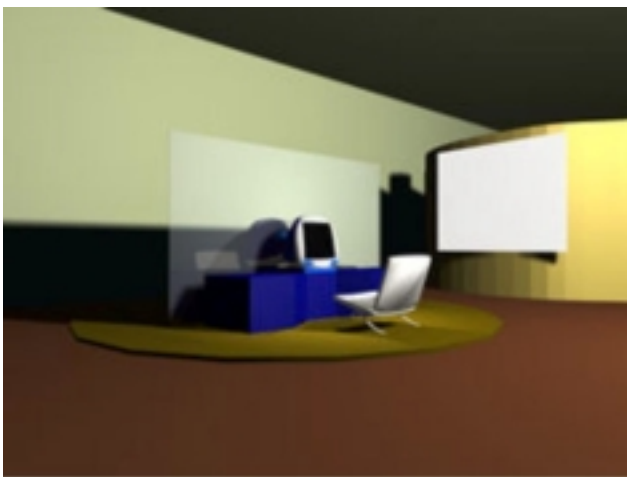


Fig.1. Project of the ipermedia room of the Scrovegni Chapel (Padua)

shows the characteristic of trial and error will be legitimately called a mental system. [...] After all, the simplest cybernetic circuit can be said to have memory of a dynamic kind – not based upon static storage but upon the travel of information around the circuit. [...] We get a picture, then, of mind as synonymous with cybernetic system – the relevant total information-processing, trial-and-error completing unit. And we know that within Mind in the widest sense there will be a hierarchy of subsystems, any one of which we can call an individual mind [5].

2. **Map and territory.** The map is not the territory. “The map is not the land” is a principle made famous by Alfred Korzybski (1941) according to which “...when there is thought or perception or communication of perception there is a transformation, a codification, between what is communicated, the Ding an sich, and its communication”. According to Bateson the map is “a sort of effect which sums up the differences, which organises the information about the territory’s differences”. “The differentiation, for example, between map and territory, which the semanticists insist that scientists shall respect in their writings must, in cybernetics, be watched for in the

very phenomena about which the scientist writes. Expectably, communicating organisms and badly programmed computers will mistake map for territory; and the language of the scientist must be able to cope with such anomalies. In the relation between map and territory, presuming the Virtual the map, and the territory an item (object) of knowledge (“musealised” areas, archaeological sites or museums), the transfer of information from the map to the territory and vice versa can be in the in a circular relation of interaction “map-territory”, between coded information and uncoded information. Knowledge and learning of the environment “map” will produce as effect a new knowledge of the territory and, in consequence of this, a new knowledge of the territory will produce a newer knowledge of the map. This reversive circularity of the information catalyzes different forms of learning of type reticular-circular. According to Bateson the difference between map and territory, must, in cybernetics, be watched for in the very phenomena about which the scientist writes. Expectably, communicating organisms and badly programmed computers will mistake map for territory; and the language of the scientist must be able to cope with such anomalies. In the case of museums or cultural exhibitions many problems of bad orienting, misunderstanding, low level of learning depend on the confusion and overlay between map and territory, between context and content. In the realm of the Reality the map is not the territory, in the realm of the Virtuality the map is the territory. The museum or the “musealized areas” are the meta-territories because they “de-territorialize” cultural finds or objects from the original contexts for creating new grammars; so they are not completely territories and not completely maps (they have lost the original maps) . *The original statement for which Korzybski is most famous, the statement that the map is not the territory. [...] What is it in the territory that gets onto the map ? We know the territory does not get onto the map. [...] Now, if the territory were uniform, nothing would get onto the map except its boundaries, which are the points at which it ceases to be uniform against some larger matrix. What gets onto the map, in fact, is difference, be it a difference in altitude, a difference in vegetation, a difference in population structure, difference in surface, or whatever. Difference are the things that get onto the map. [...] But what is the territory ? Operationally, somebody went out with a retina or a measuring stick and made representations which were then put upon paper. What is on the paper map is a representation of what was in the retinal representation of the man who made the map; and as you push the question back, what you find is an infinite regress, an infinite series of maps. The territory never gets in at all. The territory is Ding an sich and you can't do anything with it. Always the process of representation will filter it out so that the mental world is only maps of maps of maps, ad infinitum. All “phenomena” are literally “appearances”.*

3. **Reticular spatial learning.** Without learning there couldn't be transmission of representations between generations, and therefore there couldn't be culture. This interaction and learning in VR is of reticular type (information spatially connected within a 3D cyber-net) because the use is immersed within reticules of information and visual data. Each interaction is carried out from its own system of virtual learning; a new “alphabet” can suggest a different and fast perception of the visual and interactive space; in this way advanced directions of digital learning can be promoted so that the audience can receive in a very short time a relevant quantity of information [6]. This mental re-composition is a new map. We have defined this process of digital cultural learning through virtual exhibitions “musealising” the Virtual”: the use of VR tools and applications will increase a reticular cultural learning (despite the traditional “linear” learning), catalyzing new uses of virtual heritage. Therefore, in a very short time, the users should learn and acquire much more information using VR than using “linear” tools and actions, such as books, audio guides, catalogues and so on. This interaction and learning in VR is of reticular type [27] (information spatially connected within a 3D cyber-net) because the use is immersed within reticules of information and visual data [8].

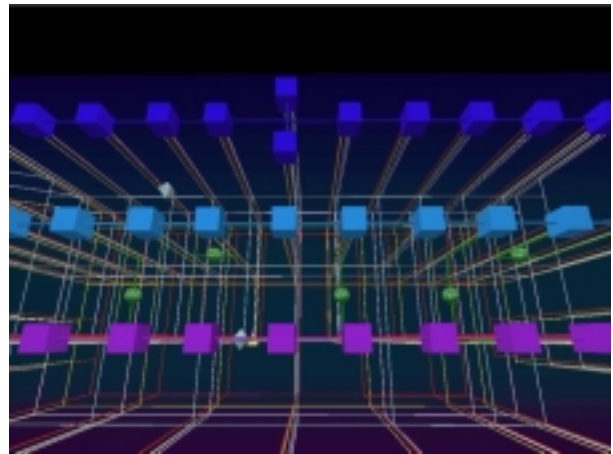


Fig.2. Cybermap of the VR system of the Scrovegni Chapel (Padua)

4. **Behaviors.** We define a behavior a real-time interaction in the 3D space (3D hot areas, 3D movements and visualizations, 3D simulations, etc.). Each interaction is carried out from its own system of virtual alphabetization; a new “alphabet” can suggest a different and fast perception of the visual and interactive space; in this way advanced directions of digital learning will be promoted so that the audience can receive in a very short time a relevant quantity of information [9]. This mental re-composition is a new map. For example in the nineties most virtual reality projects in the cultural heritage were involving 10-20 behaviors (interactions) for each application, while in our application we have 500 links and behaviors “*The subject matter of cybernetics is not events and objects but the information “carried” by events and objects but the information carried by events and objects. We consider the objects or events only as proposing facts, propositions, messages, percepts, and the like. The subject matter being propositional, it is expectable that explanation would simulate the logical. The hierarchy of contexts within contexts is universal for the*

communicational (or “emic”) aspect of phenomena and drives the scientist always to seek for explanation in the ever larger units [...]. Without context there is no communication.



Fig.3. 3D Inclusive interaction within the virtual model of the Scrovegni Chapel

of the knowledge is fit to explain the mechanisms of processing information: data are neutral objects, the knowledge of a spatial system is for interaction (difference) between the components or for the simulation of connected events. The more difference increases in the virtual interaction, the more learning increases. Difference. *A difference is an abstract matter. In the hard sciences, effects are, in general, caused by rather concrete conditions or events-impacts, forces, and so forth. But when you enter the world of communication, organization, etc., you leave behind that whole world in which effects are brought about by forces and impacts and energy exchange. You enter a world in which “effects” are brought about by differences. That is, they are brought about by the sort of “thing” that gets onto the map from the territory. This is the difference. [...]. And within the piece of chalk, there is for every molecule an infinite number of differences between its location and the locations in which it might have been. Of this infinitude, we select a very limited number, which become information. In fact, what we mean by information, the elementary unit of information, is a difference which makes a difference, and it is able to make a difference because the neural pathways along which it travels and is continually transformed are themselves provided with energy.*

5. **Feedback.** Feedback or retroaction, the property to learn and to know the ecosystem/digital environment through actions, inter-actions and re-actions (answers). Perceptive phenomena provides an interaction level, or better an “exchange” or absence of behavior between the actor and receiver; in this field we can identify multiple levels of interaction in real time [10] *When the phenomena of the universe are seen as linked together by cause-and-effect and energy transfer, the resulting picture is of complexly branching and interconnecting chains of causation.*

6. **Difference.** According to the cybernetics of G. Bateson, learning is “through difference”, the perception acts only on the difference. Receiving, grabbing information means always and necessarily to receive news of difference, and perception of the difference is always limited from a threshold. Differences too slight or presented too slowly are not perceptible: they don’t feed the perception. The Bateson’s theory

7. **Circularity, redundancy of information.** Thanks to the alternation of real and virtual phases, learning develops through redundancy and spatial contextualization of the information; the user-visitor moves through informative itineraries, adding progressively new learning levels. This digital *anakyclosis* (from the Greek term meaning circularity of the events) ends when one is able to identify already acquired information (already seen, already known, already memorized) with the faculty of elaborating it again. Therefore, starting from the redundancy dealing the same subject, it is possible to create a cognitive cartography, increasing the ability of learning and stabilizing the memorization. The virtual reality project is aimed not to substitute the real visit, but to prepare it, to integrate it, to re-contextualize it, alphabetizing in real time the visitors with new and immersive visual grammars and with all the interactions in 3D and in real time. The sequence should be circular: before the visit (virtual alphabetization) – during the visit (real alphabetization) – after the visit (virtual re- alphabetization); the great challenge of the project is to increase and to accelerate the cognitive impact of the cultural learning. Informative echo, circularity. The relation between real and virtual is circular, even if they are contextually different. Anyone who observes and interacts with an application of virtual reality exchanges the information coming from the real environment (physical and intellectual) with the virtual environment and vice versa; so a circular environment is created. In the case of the virtual reality project of the Scrovegni Chapel, the topographic position of the monument (the virtual system is located beside of the Chapel) is similar to a picture of the Escher's Print Gallery [11]: a boy looks at the picture that gradually and imperceptibly is transformed into the town where the gallery of the observed picture is located. In a similar way, in the case of the cultural context of Ename, a user can observe the site by a display equipped in the archaeological area and showing the same archaeological area reconstructed. In this recursive circular sequence it is apparently difficult to identify the starting point, the real ? The imaginary-virtual ? Ideally we could put the start phase in the phase of cognitive reversion, that is in the point and the time in which our mind has processed a sufficient amount of information for involving a comparative-mnemonic and visual analysis between virtual and real environment (before this moment the two environments are practically two objects hypothetically unknown and not comparable for the users). In this circular exchange of information and contexts between real-virtual-real again, we have a cognitive increment even if, for completing this simulation, we

should input an avatar instead of us (the “observer” according the autopoietic theories of the ecological thought, [12] in the virtual environment, able to explore and to describe the environment from inside the virtual space. In the work of Maturana and Varela the inextricability between action and experience is recognized, so any knowledge is action and any action is knowledge; a perception without action or, better, inter-action doesn’t exist. The human

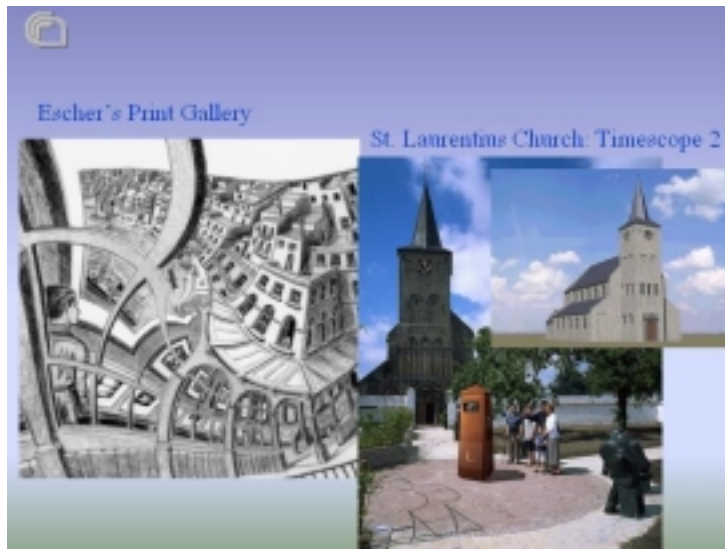


Fig.4. Comparison between the Escher’s Print Gallery and the display system Timescope 2 (Ename, St.Laurentius Church).

mind make possible the “thing” emerging from the description. *The concept of redundancy is usually derived by considering first the maximum of information which might be carried by the given item and then considering how this total might be reduced by knowledge of the surrounding patterns of which the given item is a component part. [...] To guess, in essence, is to face a cut or slash what item might be on the other side. [...] A pattern, in fact, is definable as an aggregate of events or objects which will permit in some degree such guesses when the entire aggregate is not available for inspection. The message material is said to contain “redundancy” if, when the sequence is received with some items missing, the receiver is able to guess at the missing items with better than random success.*

8. **Hierarchical levels of information.** *The hierarchy of contexts within contexts is universal for the communicational aspect of phenomena and drives the scientist always to seek for explanation in the ever larger units... without context, there is no communication [13].* The hierarchical virtual space must be contextualised and hierarchically restructured in order to allow for the identification of the logical units of information in the geometry of the models¹⁴. “In the general semantics’ system, live experience can fall within a number of terms: Territory, silent level, non-verbal level, “facts”, “unnameable level”, object-level. Even at a cognitive level, ‘seeing’ an object means creating an image of it, an inside map which is not the external object. To communicate, we use signs that *belong* to something else; they are abstractions, ‘pretences’. The ‘facts’, the ‘phenomena’, are thus ‘appearances’, since they are cognitive elaborations that, during communication, are elaborated still further” [15].
9. **Perception, Visuality and Cognition.** The way in which we perceive depends on the way we move, or in the Real or in the Virtual. As “cognitive”, we call all the mental actions (procedures, operations) involved in the processing of receiving, archiving and elaborating information [16]: sensorial perception, memory, thinking, learning; to perceive visually means to think visually, but the vision is selective: we scan the target. Then we interpret. Therefore without a selected interest we don’t have experience [17]. We can consider an observed object really perceived when it corresponds to some organized configuration, a pattern [18]. In fact, when we project a virtual reality application, we plan different patterns of information accessible by real time interaction. In the case of a picture (work of art) an observer starts from a single point or area of the work and he tries to orientate on the main structure of the painting, he searches the enhancements, he experiments a possible grid possibly fit to the whole content, and so on.



Fig.5. Ename Center. A collection of pictures and objects belonging to the local community.

In considering perception, we shall not say, for example, “I see a tree”, because the tree is not within our explanatory system [...]. I make the image, under various restraints, some of which are imposed by my neural circuits, while others are imposed by the external tree.

10. **Connectivity.** In VR all the information must be interconnected in a 3D space; an ontology of connectivity entails mutual causality: actor and environment modify each other creating new information.
11. **Narrative.** The possibility to calculate cultural learning on the basis of a museum visit, for instance, depends mainly on the faculty to tell what we have seen, what we have elaborated, observed...they let traces, mnemonic traces .The more we learn, the more we can tell; but also the objects, the places, the

sites, tell. The new challenge in virtual environments is to develop advanced narrative mechanisms. The experience is the very new way of storytelling. As we see the high speed of development in the game industry, the need for new forms of storytelling is apparent. Virtual Storytelling will be one of the important progresses in virtual reality. We have to develop interfaces and tools for them that enable them to work on virtual sceneries. These tools should include the narrative as well as the technical and creative issues, for example camera tracking, lightmoods, and so on. Digital Heritage Exchange scenarios are a relevant opportunity to implement new virtual storytelling concepts to create vivid environments for sharing cultural and ecological content, worldwide, in an attractive way.

12. **Space and place.** The place is the map Although spatial metaphors are the prevailing ones to support interaction, it is actually a notion of place that frames interactive behavior. According to Steve Harrison and Paul Dourish [19], in contrast to space, place is the desired notion, as a set of common and shared cultural understanding about behavior and action. A place is a social space. On the basis of these concepts that a territory called museum must become a place. How is cyberspace being used to reconnect community members in a geographic space ?

Territory - Space - real

Map – place - museum

Map - virtual

Musealized area – Meta-territory (meta-territory)

13. **Mindscape** (the landscape thought). I have created this neologism (composed by the words mind and landscape) in order to explain the process of perception, cognition and interpretation of cultural and archaeological landscapes. As “cognitive”, we call all the mental actions involved in the processing of receiving, archiving and elaborating information (Arnheim,): sensorial perception, memory, thinking, learning. A visual perception is a visual thought, but the vision is selective: we scan the target (eg. a painting) according hierarchical levels of information, then we interpret. Therefore without a selected interest we don't have experience (William James, 1950). We can consider an observed object really perceived when it corresponds to some organized configuration, a pattern (Arnheim).



Fig.6. DVR Pompei Project. Virtual representation of spatial layers in 3D.

14. **Mixed and tangible realities.** The fruition-interaction with virtual environments keep a relevant distance or separation between users and virtual spaces, so for canceling these distances we must create hybrid installations, partially physical and partially virtual. Hybrid spaces where there is the possibility to create transparent boundaries between the physical and the virtual [20] (Reynard, Brown and Koleva, 1998). For example such a construction of a transparent physical-synthetic boundary is based on a combination of projecting graphics into the physical space and texturing video into the virtual space.

The future: conclusions and perspectives

In conclusion, re-contextualizing these discussions on the title of the conference “Heritage, new Technologies and local development”, so what it happens when computer and virtual realities impact on popular culture (Escobar,), on popular “glocal” collective imaginary ? In the popular environments the technological imaginary increases the development of symbolic contents substantially different from those planned by scientists. We contend the importance, in VR applications, of the superimposition of Art, Science and Technology: this approach will help us to understand a vision of the cultures of tomorrow: dynamic phenomena, processes rather than static definitions, basic elements in cultural heritage, namely, individuals (Who?), objects (What?), concepts and their relations (What?), space (Where?), time (When?), and narratives (How? Why?).

This will make possible a global interoperability of contents, which reflects adequately the complexities of cultural and historical knowledge [21].



Fig.7. Mindscape. Semi-immersive navigation through the archaeological landscape of Aksum (Ethiopia)

Virtual realities open doors previously closed to the popular alphabetization. In the near future we expect to project virtual environments using neural networks and artificial intelligence; in that situation avatars and artificial organisms will learn interacting by the environments and they will be able to interact with us, observers, and to describe their environment; so these new artificial lives will create artificial societies. These new behaviors will be not completely predictable because they will represent the Difference (in the terms described by Bateson) in the activity of learning an environment.

Therefore, in late modernity, bodies, organisms and communities must be re-theorised because composed by elements born in three different domains with permeable boundaries: the organic, the technical and the textual-cultural (memory) [22]. In this way we will have power interactions between humans, nature and machines. An environment can be recognized in relation with an organism of which it is an environment; the VR is an ontology by virtue on the relations that are created with the actor/observer of the system. The significance (information) is not the form that the mind imposes through acquired or innate schemes but it is generated in the relational contexts of the surrounding world.



Fig.8. Digital metaphor of VR project of the Scrovegni Chapel: the user walks over the sky painted under the floor (on the vault of the crypt).

Finally, a political consideration: until today we, the world, have created a lot of Digital, digital heritage, virtual heritage. What about all these data, archives, memories, images, and so on ? Can we have access to all of them ? Have we created a large amount of digital cyber communities sharing e-cultures ? Unfortunately no; most part of this digital heritage is not shared, is not visible and not interactive. So, given this situation, in terms of political directions, I think we should add a new item to the general discussion, the creation of a newer field of CRM (cultural resource management), named DCRM,

the Digital Culture Resource Management, a shared virtual heritage of increased cyber-information. Given this premise, the increment of the DVR applications of digital heritage will bring new needs, new fruition (museums, musealized areas, archaeological sites) and

new cultural consumes thanks to a re-contextualized transfer of information/interactions. It is also very important to stress that the portability and the migration of VR applications on PCs and personal workstations (low cost platforms) open new scenarios on the domestic high level fruition of digital cultural heritage in real time systems.

The cultural and economical development of the “Glocal” communities, in terms of heritage, depends also on the relations with virtual spaces and mnemonic landscapes; in this context the anthropology of the cyberspace explores the territories of the reality, crosses the virtual maps of the future: again, the map is not the territory.

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