

RESEARCH 360 - Environment Interaction in Virtual Reality: Analysis of Interaction Patterns and Functional Prototyping Methodology

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Abstract

This document discusses creation environments of virtual reality, understood as temporal and spatial constructions that assemble objects, sounds, and images mediated by digital technology, in a habitable environment interaction. In general terms, relates the formal and functional structures between the perceptual, sensory, and cognitive with the object, space, and body, these being the new field of digital interfaces. In summary, the research explores how the use of technology platforms enables the ownership and development of fields of interaction and interface design, the development of different virtual reality environments was planed, so it allowed a glimpse of how the analysis for formal and digital structure today is not only happening by the ratio of feedback, but by the interface, gesture and control supported in virtual media spaces. 360 poses the evolution into a new type of environments, of synesthetic character, to examine these hypotheses in the research there were a series of prototypes that corroborate and rethink some of the ideas these parameters were developed under functional prototyping methodology which is described briefly at the end of the document.

Basic Concepts

In analyzing the relationships found when designing interactive systems, we find the problem, for other appellant, which is the point of view from which this analysis is done, i.e. which of the many possible ways of analysis and relationships are traversed when starting analytical work, which is why this paper begins by specifying the point of view from which is generated by this analysis and research "360 - interaction environment of semi-immersive virtual reality" which is reported in this paper. It is therefore necessary to place ourselves on two concepts: The Interaction Design and User Centered Design. We understand the first as the field trying to create user experiences to improve and expand the way we work, communicate and interact, Winograd (2001) describes it as "the design of spaces for human communication and interaction." In this sense it is to find ways to support people. This contrasts with, for example, software engineering that focuses mainly on the production of software solutions for specific applications. And the second is addressed from the perspective of Donald Norman confining itself to the design based on user needs, let alone what he considers secondary issues like aesthetics, user-centered design involves "the simplification of the structure tasks, making visible only the important things" Norman (2007), this is a mental model, inherited from cognitive psychology, used in systems development processes of interaction with the user. By clarifying these concepts in the research process, appeared two questions that were the founding germ of the proposed research.

- 1) When designing new media, as well as the user and interaction, what other processes are involved, and what is the location of these concepts in the design process?
- 2) While the concepts of Interaction Design and User Centered Design arise from the emergence of so-called new media, what are these so-called new media and how are these from their advances and developments influencing the design itself?

In attempting to answer these questions different ones appear in a couple of concepts that help understand the problem of the evolution of design in the areas related to the digital. The metaphor understood as a "conceptual model has been developed to be similar in some aspects to a physic entity (or entities), but also has its own behavior and properties" (Preece, 2002, p.55) and the technologies embedded in the interactive processes.

Proposals, Prototypes & ANALYSIS

Thus, from the thematic and conceptual clarification, the research went to analyze, both in theory and in practice, how technology based communication systems evolve and the models that link human beings with devices designed for it, addressing areas and topics of study leading to rethinking and designing communication or knowledge systems that adjust to these developments, and the need for man to appropriate the new technologies that are the basis of new communicative structures. That is 360 proposes the construction of prototypes of semi-immersive and immersive nature, linking various virtual reality dynamics, because this type of environment allows us to analyze and design systems for communication or knowledge to fit these models and technologies enabling us to make a detailed observation of the use of these technologies in various fields, analyzing, and observing how it evolves. These prototypes are described below.



Fat Brush interactive installation

Space of immersive and interactive video and audio that allows visitors to edit images projected from the use of physical objects such as brushes and rollers. These objects can transform the shape and color of images, creating an enveloping space after a proposal audiovisual powered by a soundscape from the everyday sequences on different rhythmic structures. The project will seek to offer the visitor a visual and auditory response depending on their specific exploration, location, and interaction with different spaces and objects proposed. The prototype was intended to observe and analyze the intrinsic ability that each user gives to meet the different interactive communication system proposed.



Abstract Memories interactive installation

Abstract Memory is a work where visitors transform and feedback the digital memory and space only with their presence. The assembly of *Abstract Memories*, is based on the construction of images by reading the visitors neural impulses, the interactor puts on a neural impulses sensor and generates on-screen images that are stored and projected to the other visitors. This installation explores and analyzes the postWIMP interaction paradigms considering the concept of interference that occurs when the memory of a particular material is damaged by prior learning or a subsequent one. The interference effects occur when trying to recall previous learning, this generates a series of responses, which drive the control system of the installation generating a feedback-controlled model controlled but not structured by the visitor.



Urban Perspectives interactive installation

Urban Perspectives is an installation in which, through media such as tele-presence and virtual reality, we present a look of urban spaces from different perspectives to everyday. Thus, *Urban Perspectives* allows users to alter the visual routine in which they are involved because of the dynamic city. In this, activated areas within the city allowing knowledge or recognition, accessing the exploration of landscapes that are usually ignored, creating memories of these places, *Urban Perspectives* is articulated from three perspectives:

1. The transmission of video in real time.
2. Tele-presence.
3. The tele-control.

In this interactive installation naturally and synesthetic metaphors arise that address gesture and movement control elements, three-dimensional projection, and audio holophonic as system answers.



Facades interactive installation

Facades offers an immersive interactive video space where visitors explore Republican architecture facades from Manizales (Colombia) through the use of streaming technologies and natural interaction. The project gives a new look to spaces and places that for the everyday roam become invisible to our eyes, the installation creates a visual copy of the facades through the use of remote cameras, placed in this case, in the city of Manizales, images, initially static are revealing the events that occur at sites remote from the movement of the participants of the installation, as participants move through space the online video and audio capture is most evident not only allowing a better view in the details of the facade, but also the everyday passing around on the same, explores the gestural interfaces and proxemic because the specific movements (say painting a wall) allows the interaction system to control sound and visual responses.



Collage interactive installation

Collage is a project where two research are joint, NODES multimedia event of Collaborative Creation, and 360 Interaction Environment of Semi-Immersive Virtual Reality, carried out in Sensor Laboratory of the University of Caldas. This installation is an interactive and collaborative creation, where form an open call intended to visual artists (designers, artists, photographers, etc.). images and sounds of cultural coffee landscape are collected. The images must be captured so as to cover a 360 ° view of the place taken as reference, then Sensor laboratory turns them into panoramic images and makes them part of a database that is used in the installation, where attendees can control the display of pictures and sounds, through the application "collagepaisaje360" developed for Android, giving users the choice of images and audio control of the installation from a mobile device, with response to their interaction in a panoramic projection system and surround audio.

The analysis of interaction of the prototypes presented above is based on four aspects:

1. Technology: constant exploration of different possibilities in interactive technology applied to concrete achievements
2. Creation of digital communication systems: appropriation of information by the user through the conscious application of different types of metaphors and interactive tours.
3. Creation of algorithmic image and self referenced.
4. Proposing sound-spaces and surround sounds.

The system concept is also an important component in this project since the notion of immersive navigation and the proposed shift of the interface or even the disappearance of it, in the field of digital, powers the purposeful and explorative possibilities of the project. In addition, it raises the possibility to propose the installations as laboratories that analyze interaction and usability. Since the development, evaluation, and analysis of these prototypes is studied in how the use of technology platforms allow the ownership and development of fields of interaction design and new media, is how to develop different virtual reality environments, and evaluate them from the sampling and analysis of usability (a process that is part of the investigation but not described in this paper). We conclude that the analysis and formal structure of the digital is happening today not only by the ratio of feedback, but uses of the interface, gesture and space control supported by virtual mediation aided by analysis and interface design. This way of creating content generates an evolution in metaphors that have been transformed in terms of its structure

and communicative intent, these new structures have generated new grammars, where significant elements pass through our various senses (picture, sound, and haptic in a broad sense) expressions, intentions, emotions, and all flow of information reaching the brain via the sensory organs and experiences that generate new grammars that affect, ultimately, our knowledge.

The study of these communication models can be categorized into three areas that appear in every creation of this type, namely: interactivity, interface and code.

1. The possibility of interactivity and user involvement by responding to the actions and reactions in open space or made possible by digital technology.
2. The interface or set of grouped physical devices as an instrument for such interaction.
3. A code or set of rules that defines the behaviors and emergent events that occur during development in the life of a digital, interactive project.

Structure of Functional Prototyping

To achieve the development of specific applications based on the analysis and development of systems of interaction raised the functional prototyping methodology, which is structured from the recognition of new types of technologies and possibilities for action on these. Therefore new methods of design for construction of structures and digital environments appear. According to the interaction designer Bill Verplank, appears a structure within the interaction design that is based primarily on the question "How do you ...?" Spread on the triad of how it is, how you feel and how it's done (Verplank, 2003). This approach provides insight into the problem not from the GUI, but from the possibility of the complete system from the user and the creator. How would the problem be analyzed from what the system itself looks (is perceived)?

This reconfiguration of the problem is a reformulation of the interaction models proposed in the first instance as a system of parallel inputs and outputs in a continuous bygone of space-time, i.e. a representation of the analog world (continuous), but evolves into a representation of reality from the parties, their peculiarities, and the relationship that each party has with the whole. In this sense and support on the general methods of prototyping (Londoño 2006) where the prototype is understood as a simple concept recognized and used in engineering and other disciplines. Bernard Board has defined it as "a specific strategy of requirements definition, where users need to extract, display, and successively refine (through the iteration of the prototype), by building a working model of an end system in context. "That is, is a working model (methodology) easily buildable, expandable legible, and finally the primary aspects of a proposed system, which recognizes the project plan, analysis and fast design, prototype construction, prototype iteration, until acceptance, refinement and maintenance.

It is clear that the implementation of prototyping process is not linear but iterative (repetitive). Based on this methodology the functional prototyping arises the following stages:

User Study Scope	Device Control
Requirements model	Demo
Analysis of the information	Technical evaluation of the prototype
Collaborative	Field evaluation
Analysis of interactions	Prototype settings

Conclusions

By analyzing the changes that have occurred in how we interact in society, i.e. the transformation of communication models, we are faced with a change of paradigms generated by the actors in this model. With the emergence, evolution, and appropriation of new information technologies added to the model, condition for their understanding and subsequent development from different perspectives. Topics such as ubiquitous computing, for example, not only affects the field of technological development also affects the way we relate and communicate reconfiguring the analysis environment, the conceptual framework and the reality in which we are immersed. These changes are not beyond the discussion topics from disciplines such as design, on the contrary, give grounds to consider elements and structural alternatives.

The articulation of a vision based on the approaches of design based on the understanding of sensory and perceptual relationship, cognitive, and technological processes that occur in the transmission of data, information, or knowledge, as one of the pillars in the design study. This is how the knowledge of the sensory apparatus, technological devices, and how they influence our perception of the world, seems to be the way, in many research and development centers is considered the best for the study of new paradigms and design areas.

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