

MULTI-USER-BODY PERCEPTION IN BODY-MOVEMENT-INTERACTIVE DIGITAL 3DIMENSIONAL AUDIO/VISUAL INSTALLATIONS

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ABSTRACT

This PhD research thesis summary is based on arts-practice-led research exploring interactive digital environments, perception and consciousness. It brings attention to how technology is changing our mind/bodies and can affect the way we perceive, which informs the conceptual interactive designs that intervene with body perceptions. The installations explore human computer interaction (HCI), from an embodied psychological perspective. The interactive installations concentrate on aspects of the body in the way it enframes or moves to achieve perception, imagination and consciousness. It explores creative interactive experience within body-movement interactive-installations. The research combines 'creative interactive' with embodiment/disembodiment theory, as a way of rethinking the body and aesthetics in interactive installations. A series of interactive 3D audio-visual installations were designed to cause the experiencers to engage their body perception and consciousness that go beyond the human-computer interface and focuses on creative imagination, by extension of the body. It questions and explores body perception awareness in new media interactive environments. It importantly concerns "experiences that are integral to the development of virtualized body experiences. The research examines current theories of body perception, which informs new media interactive experimental practice and its effect on aesthetic experiences.

INTRODUCTION – AIMS – OBJECTIVES

The approach in this research examines the theories that surround human body perception, concerning the body as central to perception, in the context of body-movement-interactive-digital-audio/visual installations. This research broadens an understanding of body perception and consciousness in interactive art installations and how the body is being transformed by technologies which is 'naturalized' to certain kinds of interaction with digital technologies.

I am interested in how body-movement interacts with virtual technologies. Body-movement-interactive interfaces have been explored by the efficiency of human computer interaction (HCI), in science and sociology. Importantly in this research I am studying (HCI) from the psychology of body perception of visual and sound. The context is a series of interactive art installations in which the body continuously moves to interact with computer digitalized audio/visuals. By enhancing perception through digital means, of visual and sound displacements, the 'experiencers' have to re-engage their next body movements, which leads to exploring a changing and evolving embodied perception. It is conjectured that these interactive installation causes the participants body to move differently and to continuously preform, through a newly obtained body-memory attained from kinaesthetic memory 'proprioception,' which is continuously changing and evolving. So by doing this the installation is exploring body-movement perception, embodied

movement awareness and an aesthetic of behaviour. To see if the changes and adjustments made by the body of the experiencer caused by intervention of the interactive environment open a participants awareness and alters perception towards a more creative response from the individual and *virtualized body experience*. That goes beyond the cultural body inscriptions that inform our thought systems and also therefore by definition embodied perception.

The active realization of body-movement perception is an alternating or a parallel manifestation of reflective and immersive moments. Aesthetic distance or reflection is possible and is an essential counterpart for body self-reflection. Aesthetic experience of interactive art is especially shaped by the interplay between immersion and distance, for only in this way can one's own actions become available as an object of reflection, in the audio-visual world of the installation.

METHODOLOGY

This artist-led-research developed its inquiry through parallel experimental and conceptual frameworks. The development of this approach was informed by body perception philosophy & theory, HCI frameworks used in artists interactive installations and contemporary artist's interactive work that involves the body, as interactive. The experimental interactive installations were applied to explore the questions and hypothesis. The conceptual frameworks from theory have been examined to place my hypothesis in context and to show why this research is significantly new and important.

THEORETICAL FRAMEWORKS

I began in this research to formulate questions, surrounding *body-movement* interactive digital audio-visual installations, to form a concept and to find, how *body-movement-perception* can be utilized to enhance aesthetic imagination. A thorough reading of the philosophy of body perception, theories of body-sense, new media digital art and philosophy, human computer interaction, natural user interface (HCI) began to inform this arts research practice in body-movement-perception, in 3D audio-visual interactive environments.

I started by analyzing philosophy, new media theory, embodiment theory, Human Computer Interaction HCI, theories that were relevant to body perception and body-movement installations, to find if this was relevant to artists interactive installations and if a new aesthetic could be formed from such enquiry I also looked at science and neurophysiological evidence of body perception. The central framework was Mark B. N. Hanson's, 'New Media for New Philosophy,' (2004) and 'Bodies in Code' (2006), to develop my

theoretical, experimental and conceptual frameworks. [1], [2] My aim was to discover the relationship between body-movement and body sense perception and interactive digital audio visual installations, from the point of view, of the affects the interactive virtual material and materiality of body-movement could have on the subjects' imagination and creative cooperation in interactive art.

Currently the body is thought to be more central to perception in the digital environment. These theories have been explored to develop the interactive designs and to discover relationships between the perceptions of 3D moving image and surround sound, by exploring body perception and consciousness. Central to this research is a series of experimental interactive art installations in which the recipients body' interacts with computer digitalized audio/visuals in a 'live data' environment.

There has been little research in Human Computer Interaction (HCI) experimented in the area of interaction with virtual 3Dimensional objects with body-movement. Some research has been undertaken in Health and Science and in (NUI) experiments, in replacing the mouse. Very little experiments have been tested using all body joints for experiments using (NUI) for the manipulation of 3D objects. Most of the practical and theoretical studies in this research are relevant to Post-Human research. One of my thrusts was to explore an area in interactive art, to see if dysfunctional movement can be aesthetically meaningful in the realization art.

CONCEPTUAL AND EXPERIMENTAL ISSUES THE WORK EXPLORES

Body-movement interactive and 'computer vision'

Research in 3Dimensional interaction in the virtual environment has had very little input, is still relatively thin considering that the VR and games industries depend on such technologies. The computer mouse or game controller, has been most used. The ocular Rift and other new VR technologies, does not have the facility for an interface that can control 3D objects. Interface Design has been a concern in the design of the interactive environment.

The interactive body and virtual 3Dimensional Movement

Body-movement has been explored in relation to the virtual 3 dimensional space in several interactive design's, it is the actions and interaction with virtual 3D that have been the concern. The design of the digital environments has drawn body perception theory, from philosophy and new media theory & philosophy.

Reciprocal Action in Interactive Installations (visual and sound perception) Introducing the Problem

To intercept proprioception at the body status of 'aesthetic reflection' causes a reforming of body-movement and mind. By intercepting proprioception a remodelling of the bodies underlying

inscriptions can take place. The complex digital environment of virtual audio-visuals, adds to the reason for exploring body sense in these installations. The interactive designs incorporate time factors that intervene and flush the digital data and code, to commence a new interactive cycle.

PHILOSOPHY – BODY PERCEPTION THEORIES

This practice-led-research explores interactive design technologies to make 'experience able' new forms of human body perspective perception that capitalizes on perceptual flexibility and aesthetic behaviour. I will develop the discussion from the view that visual and auditory perception are no longer thought to be the only prime sources of perception but it is the body, which is now discussed to be more important in the digital environment and which has informed the research here. These are discussed in relation to the 'interactive digital 'live data' environment and the 'interactive designs' in created in this research. Some older philosophies and newer theories that have seemed relevant to developing the interactive environment are Henry Bergson, Merleau-Ponty, Mark Hansen, Brian Massumi, Lombard and Ditton. Gallagher and Cole.

Mark Hansen's research in 'New Philosophy for New Media' (2004) and extended into 'Bodies in Code' (2006), follows a line of theories and conjectures, that the body becomes a more active framework for the image in the digital environment. [1] Hansen argues that media convergence under digitalism places the body as centrality, as a framer of information, as media loses their material specificity. The body takes on a more prominent function as a selective processor in the creation of images. Hansen following the early phenomenology of Merleau-Ponty and defends Henry Bergson's philosophical theory, which emphasized the role of the 'affective, proprioceptive,' and tactile dimensions of experience in the constitution of space and by extension visual media. He distinguishes between the 'body-image' and the 'body-schema,' and in summary it is the 'body in motion that is important.' Drawing on Merleau-Ponty's concept of the body scheme (the action-oriented, environmentally based self-perception of the active body), Hansen coins the term "body in code" to denote a technical mediation of the 'body scheme,' which is accompanied by a dissolution of the boundaries between body, real space and data space.

'Body Schemas' are an important concern in this practice base research of artist's installations, aesthetics and human computer interaction (HCI) and I have demonstrated and shown how this is important to an understanding and developing of new aesthetics, in the interactive digital environment.

Hansen went on to maintain "that the body continues to be the 'active framer of the image,' in the digital realm," and draws upon new media artists who deploy technology in order to pursue this 'Bergonist imperative,' of the body 'enframing' the digital image. [1] Cognitive Scientists and philosophers Gallagher and Cole,

assert that the 'body-schema' is a system of 'motor and postural functions that operate below the level of self-referential intentionality.' It includes non-conscious, sensori-motor perceptions and actions, the parts of our bodies that we may or may not be aware of, which are activated when we move and interrelate in and with our surroundings. This is similar to Bergson's theory of 'proprioceptive' perception.

Theorists have argued for the importance of 'proprioceptive' as a kind of 'sixth sense,' which is more than enables, the body to orient itself through its habitual movement of space. Proprioception can be thought of as the recurrent patterns that form, as the body's sensory motors system generates microscopic transitions 'kinesthetic,' while negotiating time and space in the world. Choreographers and performance theorists and researchers often see dancers make mistakes based on such misrepresentations: "a dancer proprioceptive experience might experience his or her knee as perfectly straight, when it is in fact bent or a hand as directly above his or her head, when it is behind." However it is not only the *bodies* physically sense of *movement* in response to external stimuli; but bodies steer our emotional and intellectual reactions and they subtly mirror, embody and even abstract social, cultural and intellectual concepts.

Now that body sense is thought to be more of an 'active framer of perception,' it is especially relevant especially in the interactive digital environments. The body externalizes inside and internalizes space from outside via the body and its movements, in the digital virtual environment and therefore experiences 'self-visualization,' in a different way, which is a form of apprehending the next move.

Audio-perception theories have also influenced the research and are necessary to be aware of whilst designing the interactive installations. Sound in this research, is designed from a perspective of a dislocation of embodied meta-language. In combination with 3D movement which combines a sense of spatial dimension and extent. Verticality for example is commonly understood in the realms of pitch and harmony; i.e. high notes and low notes. There are rhythms, upbeats and downbeats, rhythms that can be grounded or floating; time can be suspended or moving forward. Sound affects the sensation of bodily position, presence or movement resulting from tactile sensation and from vestibular input. Distal theories locate the sounds we hear at an early stage of their causal sequence than proximal theories. Hearing causes spatial information, hearing might represent spatial content. It is known that we tend to look to where the sound is coming from and in the interactive space, to capture a sense of awareness of embodiment. Audio perception experiments have shown that physical hearing is quicker than auditory perception and shows that audio perception is first felt through parts of the body. It is these body-movement perception theories that I have integrated into my experimental research and concepts for the interactive designs into body movement interactive 'live data' environments.

BODY INTERACTIVE NEW MEDIA DIGITAL ART

I will discuss contemporary new media artists, media artists and arts research in this field, 1990s-2014, which have experimented in the field of body interactive new media art, which are relevant to this thesis to demonstrate what can be learnt from their experiments and how this has an impact on understanding a new aesthetic of body-movement installation in this research. It also places this research and its importance of the field of the body and technology in relation to new media interactive art. I have explored the creative potential implicit within the reconceptualising of human perception and as an active and fully rendering of body data. By opening extra visual modes of interfacing with digital information encoding the digital image, such experimentation foregrounds the specificity of human processing of image construction, thus drawing attention to the more central role played by embodied human framing in the contemporary digital media environment. At the same time it underscores the fundamental difference between human and computer processing. In so doing this double vocation manages to re-introduce this difference motivating such experimentation, the imperative to discover and make 'experience able' new forms of embodied human perspective perception that capitalizes on the perceptual flexibility, brought out in us through our coupling with the computer. To translate the micro-kinesthetic movements of the body into virtual transformations. What are the specific areas of interest and what ideas and positions have other artists/artist researchers, media artists, taken which is in relation to this thesis?

David Rokeby, Char Davies, Catherine Richards, Diane Gromola, Michael Scroggin and Stewart Dixon, Stelarc and Rafael Lozano-Hemmer's public installations have all explored body perception in interactive embodied environments. They have demonstrated by their approach, some aspects of what the interactive digital environment can do the body and to what can be achieved by engaging with the interactive digital audio/visual surround. This places the importance of this research in perspective with body perception and interactive installations.

Therefore the body experiences movement awareness, in a form of apprehending the next move. Aesthetic 'distance' and immersion can be elicited, by forms of body-movement in interactive-art, for example hesitancy and relearning states, forceful action, as opposed to 'immersion.' Katja Kwastek, states, "Aesthetic experience of interactive art is especially shaped by the interplay between immersion and distance, for only in this way can one's own actions become available as an object of reflection." [3] Marvin Carlson claims 'that states of flow impede reflexivity through the emerging of action and awareness the total concentration in the pleasure of the movement and the loss of sense of goal orientation.' [4] There are many different perspectives on whether Immersion reduces aesthetic perception and if states of reflexivity can induce this state.

Martin Seel in 'The Aesthetics of Appearing,' believes that the necessary condition for aesthetic experience is an appropriate

disposition on the recipient; he describes aesthetic perception, as always distinguishable by not being an exclusively purposeful activity and by being alert to a dysfunctional presence of phenomena. [5] According to Seel, when perception is sensitized in this way, it is able to detect a 'multitude of sensuous contrasts, interferences and transitions' that elude a conceptual definition and can only be felt in the here and now.

CATHERINE RICHARDS

Catherine Richards focuses on the virtuality that interpenetrates the body or materiality. Her work explores the extent to which the virtual has overtaken real life. Richards draws viewers into the actuality of their embodiment, in the early 90s she was experimenting with creating an experience of embodiment that was less dominated by vision. In her art video *Spectral Bodies*, Richards focuses on proprioception, the sensory system that uses internal nerve receptors at joints and muscles to give us the sense that we inhabit our bodies. *Spectral Bodies*, she draws upon exploring the possibility that proprioception, far from being secure except in instances of neurological damage, can quite easily be manipulated to give quite radical different experiences of body boundaries. http://www.catherinerichards.ca/artwork/spectral/spectral_statement.html.

Spectral Bodies consists of a videotape of various experiments that explore the limits of proprioception not as a medical or scientific actuality, but as a fiction that forms narratives. In the video Richards alludes to Oliver Sack's essay "The Disembodied Woman," in which Christine a patient lost her proprioceptive sense as a result of neurological damage. With great effort, Christine was able to learn how to sit, walk, stand, what she was not able to recapture was the sense that she was inside her body. She felt that she was positioned somewhere outside, forced to manipulate her body through conscious effort. In her art video, she conducts experiments in the lab, (Laboratory of Mark Green, University of Alberta), showing that the perceived boundaries of the body can be remapped by the low-tech method of stimulating the surface of the arms and hands with a vibrator. [6] The video shows her enacting the experiment with various blindfolded experiencers, who describe what they feel happening to their bodies. One woman feels that she feels her neck shrinking and then thickening, becoming like a bull's neck. The process continues until her head retreats into her chest, her shoulders forming an unbroken line across the top of her body. Another woman remarks that her arms are growing longer and longer, stretching six feet away from her body.

Her work explores more than any other artist, that by exploring or intervening with 'proprioception,' that the relationship between virtual is taking predominance over the body. In 'Virtual Body' (1993), she states that "Placing the hand through the side opening onto the floor (computer screen), triggers a set of perceptual and proprioceptive reactions. This disturbs the spectator's sense of presence." The recipient shifts from a state of a first person to a

virtual body. Richards demonstrates by her work how we engage our anxieties and surrender to technologies. Particularly her work shows how technologies are questioning our understanding of our own subjectivity.

STELARC

In viewing the body as more relevant in the perception of art and aesthetics, Stelarc's work suggests that the body is fit only for experimentation. Stelarc takes literally McLuhan's notion that technological media are extensions of the human senses and all his performances demonstrate a perverse insistence on body modification and the redesign of the bodies' architecture, skins and internal body spaces themselves. The body in this conceptual framework, is like the designated and increasingly useless "meat," in cyberpunk fiction after *Neuromancer*, William Gibson's cybercowboy protagonists are "jacked into computer generated virtual realities or are technologized with implants, biochip wetware, nerve amplifiers, neural interface plugs and designer drugs. Stelarc's work opens up post-human issues with agency, control, manipulation and appearances. Kathryn Halyes sees Stelarc's work as a concrete realization of the post-human ideas of consented embodiment.

Stelarc's body performances display a utopian evolution that posit the contemporary body both as virtually disabled by the increasing complexity of information/technological support systems and as potentially as evolving into more adaptive interface configurations. The objectification of the body, which underlies all body art, is pushed to an extreme in Stelarc's vision of a mutating somatic and nervous system that can improve if it opens up to cyborg synthesis. The metaphor of the cyborg is actually being performed in Stelarc's performances. "In Stelarc's work, the interface is a kind of negative "dialectic" (realized through electrodes, transducers, muscle stimulators, amplifiers, force-feedback systems and extra limbs) that probe the tension perhaps resistance between the human and machine." [7]

"In cybernetics, the cartesian idea of the body as a machine is merged with conceptions of the body as a self-regulating system. [8] Mechanisms of organisation based on coded messaging and computation are derived from both individuals and groups and these are extended outward into controlling devices and servomechanisms that can be made to simulate and regulate the behaviour of an organism or any complex structure through feedback systems." [8]

Digital/networked stimulation systems to allow for the external and remote manipulation of the objectivised body. The 'movatar' experiment demonstrates the 'involuntary' movements of the body controlled remotely by electrodes attached to the body. I attended a workshop and I had the opportunity to participate at 'transister,' 'robots, motion capture, special effects,' stelarc and louise phillipedemers. In a workshop organized by stelarc attached electrodes to my own body and stimulated these externally, so that I could

experience electrical charges to my body, to feel involuntary movement, to feel my muscles contract and move. No matter how I tried to counter react, with my body, it was impossible and produced the sense of disembodiment, even though i was feeling pain. I was stimulated from out of my body and was not in control. Stelarc's work undermines the conception that one's own body, is moved and activated by consciousness, that the out skin of the body is affected by an external outer consciousness that impacts the body from the outside, a fractal and dispersed body, animated by the forces hidden in the outer body.

In the virtual technologies that stelarc also has experimented with, 'movatar,' stelarc constructed a structure that allowed a body to animate a 3D computer generated virtual body in cyberspace. Markers in the body tracked by cameras are analysed by computer and the motions transferred to a virtual actor. Stelarc's hypothesises a virtual body that can access a physical body, enabling the later to perform in the real world, with newer technology the avatar can then be imbued with artificial intelligence.

Stelarc's art form of adapting the body to technology, demonstrates an art form that questions the evolution of the body and perception alongside advances in technology. It is more than comparative to all the research in new media aesthetics, that the body is affected by technologies. The questions that are raised can also be applied to the physical bodies' importance in interactive art.

VR technologies that are used in new media art are not just developed to increase immersion, which is usually of prime importance, but it is the bodies' interruption that can be explored and what that interruption of the body can realize aesthetically and aesthetics of response.

NEW MEDIA INTERACTIVE TECHNOLOGY

Earlier VR technologies, used body sensors for tracking and for moving through space in VR worlds, adapting the HMVR displays, cave and data gloves. 3D computer graphics, in earlier VR environments, tend to rely on 3D Euclidian geometric models, renaissance perspective and the xyz coordinates of Cartesian space. [9] "While the rest of the body is an imperfect and inconvenient matrix of consciousness that can be externalized as a data space." "The psyche clings to the memory of the real body and its formulations in physical space" P.60. In VR immersive environments, the body is disembodied, but is also partly embodied as the body always clings to the real, but not always? There are unconscious processors below the surface of the skin, which have memory and react in the virtually disembodied environment; standing on a virtual cliff, can have the same effect as the real on the body, this is what is called presence. The most recent development of computer vision, a camera that includes 3D depth vision, is the Kinect Sensor, which I have experimented with in this research. Using the Kinect sensor system and

transforming the data into interactive immersive surround, (rather than the VR system) it is easier to make the experiencer aware of cultural inscriptions, whilst reconfiguring the proprioception. I used the Kinect Sensor with the UNITY 3D game engine, OpenNI/NITE and the Microsoft Kinect, for the final main study after a series of experimental interactive designs. The game engine can handle large amounts of data crushing and is much faster, so has been easier for interactive installations.

Implementing the 3D data, for manipulation of full body joint manipulation of several 3D structures. I have explored Avatar creation and manipulation in numerous software and programming environments. The rendering of live body 3D data and orientation for 3D objects has contributed to further research on 3D manipulation and the Natural User Interface (NUI). There has been some research into the area I have proposed. Such experiments with this have been included, in the Journal of Otolaryngology. [9] This was research on manipulating virtual 3D objects in VR environments and devised series of hand gestures that increased the recipients ability to pick-up virtual 3D objects.

NON-CARTESIAN WORLDS INTERACTIVE DESIGN

A non-Cartesian virtual design was created for the audio-visuals. From the observations of the interactive audio/visual Installation it was decided that the overall non-structure of a non-Cartesian World; 3Dimensional objects, structures, spatial qualities, transparent qualities, needed to be developed in order to surround the recipient in an environment that engages their bodies' movement perception.

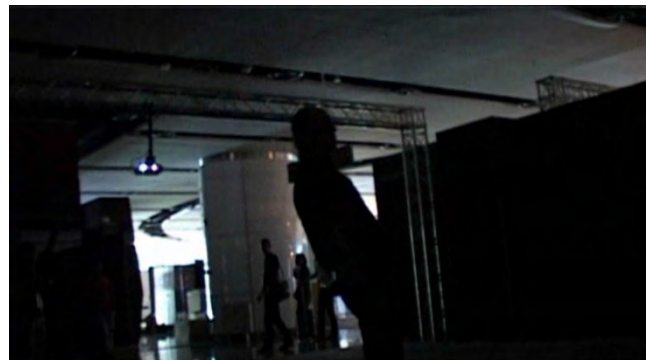


Fig. 1. Body-Motion Interactive Environment, 2012, © Ken Byers.

The concept is to make experiencers more aware of, their bodies embodied inscriptions and to transform these known feelings and experience. In the digital interactive virtual space in order to feedback to the user their habitual embodied body spatial dependency on the environment and also to increase the perception of complex visions, formed by the colliding of the unconscious with the consciousness to induce or release a creative awareness and creative imagination, that is attached to body-memory. The interventions made by the interactive design on the body-movement, flush and de-stabilizes proprioception and reconditions or makes the recipient aware of their movement

in comparison to the virtual environment causing a strange sense of presence. These micro-kinesthetic changes stored in proprioception allow a reflective perception that causes us to reflect on our body sense, in the designed-non-Cartesian-world.

The 'experiencers,' walk into a darkly art space in a gallery setting, with 3 adjacent wall projections and stereo sound (Fig. 2).



Fig. 2. Non-Cartesian Body-Movement Interactive, 2014, © Ken Byers.

If the experiencer stands still no 3D imagery will move or sound created. When the experiencer moves an arm or leg or walks or jumps, the 720 virtual worlds with 3D sound is activated. To direct full attention from the 3D cyborg world view and its parts, parallel attention is brought to body movement and pre formed movement by the displaced images and sound which are incongruent with the last body move. Zooming, increased speed of moving 3D imagery, changes in direction, shader effects and sound displacements, develop a theme for the experiencers (Fig. 3).

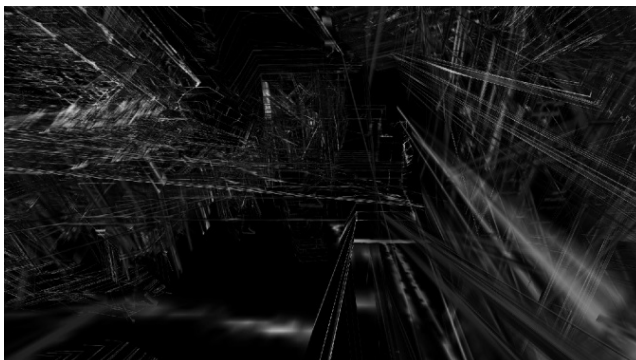


Fig. 3. Non-Cartesian, 2011, © Ken Byers.

The Kinect Camera sensor was coded to translate body skeleton movement data into xyz points in space, which were programmed with the Unity3D game engine. Unity 3D was chosen over other games engines because of its scripting API, c# and Java which I am familiar with. Most of the design for the virtual world was done in 3Ds Max and Maya, but the Microsoft Kinect was coded with OpenNI, to translate body-movement data from the skeleton to the Unity API. It was also decided to use Unity over Open Frameworks, Max MSP and Processing, for the 720° world, that

could be easily designed in Unity 3D. In this case the main camera in Unity was connected to the virtual and the physical torso, making it first-person. The recipient could walk around the virtual space. The Unity Game engine with the Kinect sensor allowed me to use OpenNI, follow_transform _scripts, so that I could move structures with 14 body joints and hand gestures. The experiencer could be immersed in an interactive 3D world with sound and could move around in the 720° virtual world, in the 270° physical space, whilst distorting the perspectives of the non-Cartesian structures, scale and viewpoint and navigating to sound hot points.

DISCUSSION AND ANALYSIS

The 'active realization' of body-movement perception, is an alternating or a parallel manifestation of reflective and immersive moments. The interactive design was designed to interrupt the recipients, body-movement perception, by using interactive and audio/visual perception techniques, to unhinge embodied body-memory, 'proprioception.' This was to in an embodied artist's environment, a more creative aesthetic experience is gained. It is known that the body's kinesthetic sense is capable of continually updating in micro-changes and with 'proprioception's' ability to relearn and store this in memory. The interventions made by the interactive design on the body movement, flush and destabilizes proprioception and reconditions or makes the recipient aware of their movement in comparison to the virtual environment causing a strange sense of presence. These micro-kinesthetic changes stored in proprioception allow a reflective perception that causes us to reflect on our body sense, in the designed non-Cartesian world.

The interactive design interventions of body-movement cause the body perception sense, to-relearn or re-form their next movements. This confounds the recipients' body movement and the aesthetic lies between the re-forming and the aesthetic imaginative engagement of the virtual audio-visual.

By enhancing body perception through digital technologies, awareness and consciousness turns to the body itself, as well as feeling to be in control of the media, rather the media controlling the recipient. They have to re-engage their body whilst in motion, which leads to exploring a changing and evolving embodied perception, in real-time. This bodily connection with the virtual then experiences a 'virtualized subjectivity.' [2] It is conjectured that these interactive installation cause the participants aesthetic subjectivity, to continuously reform, through a newly obtained body-memory attained from kinaesthetic memory and 'proprioception,' which is continuously changing and evolving. So by doing this the installations are exploring body-movement perception, an 'embodied movement awareness,' and aesthetic of behaviour. This alters the experiencers' awareness, perception and consciousness towards a more creative response from the individual. This challenges cultural body inscriptions that inform our thought systems and movement and also therefore by

definition embodied perception. The 'active realization' of body-movement perception is an alternating or a parallel manifestation of reflective and immersive moments. Aesthetic distance or reflection is possible and is an essential counterpart for body self-reflection, in the interactive environment. Aesthetic experience of interactive art is especially shaped by the interplay between immersion and distance. For only in this way can one's own actions become available as an object of reflection, in the audio-visual world of the installations. Specifically I wanted to gain a better understanding of body-movement perception, body-perception and consciousness in interactive audio/visual installations and how technology is changing our mind/bodies, affecting the way we perceive. Most media theorists have been concerned with disembodiment associated with cyberspace and virtual Reality, which were not only triggers for theories create a proprioceptive state of mind/body reflection, where 'embodied-movement-creation' can be 'relearnt,' with a real-time response to interactive aesthetics of audio and visual media. The interaction with projected 3D structures and parameters of synthesized sound, by body-movements, gestures, pre-formations, of the limbs of the body can be very complex and engaging, causing an aesthetic creation in relation to continuous body-movement. This is the presence of virtual enhancement of the senses, which gives a wider understanding and ambiguous perceptions in the interactive environment. It also gives the recipient an awareness of how their body movement is relearning to interact in a more meaningful way.

By observing our own embodied body-movement, we see a change in perception and consciousness of the virtual audio-visuals which is affected by the interactive body-movement installation? The problem was to discover if by affecting body-movement and turning the body inwards of disembodiment, but also with it a revival of the corporeal – in the form of bodily action in the virtual world. Interactive new media works like these simulate Virtual Reality (VR) technical systems that are linked to participators body movement. Interactive systems create possibilities and new contexts of perception/self-perception. The transformation of physical movement into spatial experiences in the physical space and in the virtual are brought about by information which is translated by the code. This calls into question the boundary between material and immaterial, body and space, between body perception and information flows. The interactive designs' intervention of repeated body movement causes a halting, of the body in motion, in which the recipient is caused to perceive the relationship between the virtual, the data and the body.

Contemporary artists endeavor in their work to uncover, for us to see out of the habitual, day-to-day, culturally inscriptive truths that affect the way we perceive? This practice-led-research has identified several areas within body perception, interactive design and human computer interaction, which needed to be further explored and that informed the interactive design experiments, to develop a theory of body-movement perception and aesthetics.

This was explored in the preliminary experiments that informed the main interactive art installation.

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