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Brigitta Zics

**Transparency, Cognition and Interactivity:  
Toward a New Aesthetic for Media Art**

Submitted for: PhD

University of Wales, Newport

2008

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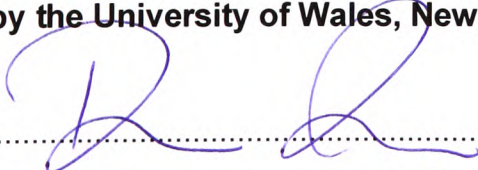
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## **Abstract**

This practice-based thesis undertakes research into the contemporary aesthetic of interactive media art, in order to propose a useful practical model of interactivity founded on a critical approach to both existing theory and practice. It proceeds from the identification of a primary lack in contemporary aesthetics that arises from the predominantly materialistic comprehension of technologically-mediated artworks. The thesis establishes a new model for interactive art that offers an immaterial engagement with technology at a locus where cognition and the aesthetic intertwine. This model is constructed following a revision of both the theory and practice of interactive media art, which identifies a materialistic bias of technology-mediated art production caused by a confused concept of technology as both tool and medium.

This investigation confines itself to the last forty years of interactive art and the new model of spectatorship that has accompanied it. The main objective of what follows from this investigation is an account of agency in the artist and spectator interrelationship. In the context of technologically based artworks various approaches to spectatorship have frequently remained within the constraints of the traditional model of art that inherently drew on a separation between body and mind. It is argued in this thesis that neither the technology nor the participation itself, but the cognitive interconnection between 'artist-artwork-spectator' produces the primary aesthetic dimension of interactive media art. In this respect, not the physical object creation but the aestheticisation of this triangle produces the here identified immaterial/cognitive experience of the spectators. This can be achieved when the technology is applied as a transparent medium — one of the core concepts introduced in this thesis — which can facilitate an aesthetic quality or meaning creation through technology. The 'transparent medium' enables the cognitive-based experience production, which is identified as the immersive flow of the spectator's aesthetic experience. As such, the re-evaluation of the artist- spectator interrelationship proposes a new immaterial model of art which is called the Transparent Act. The introduction of the Transparent Act leads to the main intervention of this thesis which lies in an effort to recover a lost dimension in interactive media art. A recovery of this dimension enables access to a knowledge practice which is not necessarily located in ordinary cognitive experiences but in unfamiliar conscious states that can be compared to accounts of so-called spiritual experiences. The model of the Transparent Act is concurrently applied as a practise-based intervention and proof-of-concept in a major installation, the Mind Cupola. This artistic and technological contextualisation of the original intervention of this thesis is exemplified as an affective environment which aims for an immediate cognitive affection of the spectator by generating mechanical and audio-visual effects in the spectator's 'mind'. The artistic system uses special face analysis techniques to close the feedback loop and affect the spectator through the analysis of her/his reactions. The installation is built upon a 'passive' modality of interaction in which the spectator contributes to the artwork with subtle, cognitive-based interactions which are fed back through a complex open response system. The implementation of cognitive feedback loops, also described as the fractal structure in the spectator's cognition, constitutes the essential transparent medium through which the previously lost immaterial dimension of a spiritual-like aesthetic experience in interactive media art is achieved. The thesis concludes with suggestions of further applications including the evaluation of technologically mediated artworks.



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## **Preface**

The research of this practice-based thesis draws on ten years of artistic practice that has integrated fine art, graphic design, technology-based design and creative technologies. It undertook an exploration of aesthetic solutions for the implementation of emerging technologies in art by reflecting on contemporary technologically-mediated artworks against the backdrop of its forty years of history. The research discussed in this thesis focuses on artistic practice and identifies how it has been transformed by the dynamics of changing technologies and how it has failed to produce an aesthetic continuum. This view is particularly based on the common perception that interactive solutions are risk factors for distribution and presentation (such as at contemporary media festivals) as they are unsatisfactory for both art and technology since they often mystify or restrain their technological qualities. This factor impacted greatly on the evolution of technology-based art, because its platforms, and as such its challenges, were restrained and offered no opportunities for finding an aesthetic solution.

Drawing on this observation, the following investigation focuses on what is often termed interactive media art, which brings a radical character to art with its particular quality of producing feedback between the spectator and the artwork. The notion of interaction is treated here as a phenomenological process of involvement created through the agency of body and mind; the quality of this interconnection suggests the effectiveness of the artistic meaning creation for human-machine interfaces. Seeking an aesthetic solution for this interactivity, the evidence for this argument is established by revisiting artworks that played an important role in the history of technology-based art, which are compared to the initial conceptualizations of the artists, resulting in the

observation that artistic outcomes often do not correlate with the artists' theoretical claims. Reflecting on this criticism, the following discussion draws from information and literature theory, theories on spectator perceptive processes, and media and communication studies in an attempt to outline and define specific qualities and aspects of technological interaction. A philosophical perspective on art production in particular examines the original source of contextual literature in order to rediscover lost aspects and qualities that can be applied in emerging art practice. A first hand reading of some key phenomenological arguments revisit and reinterpret a number of significant notions such as the 'structural openness', 'responsiveness', 'invisible tool' and 'creative ecstasy' that will be applied on the discourse of interactive art production. These not yet interconnected concepts will be synthesized and constitute a hermeneutic framework for the main argument in this thesis which introduces the concept of the 'transparent medium' as an artistic approach to technology. This discussion unravels the interchangeable nature of the terminologies 'invisibility' and 'transparency', which occurred in the contextual literature and calls for the differentiation of the cognitive qualities in the affective response to technology. Acknowledging their metaphoric potential, both terms are here applied to accommodate an immaterial scale of actions that differentiates aesthetic visibility from functionality

Through this, the transparent medium can be understood as an arena for the body-mind interconnectivity, which is characterized by immersion, body awareness and flow. Applying the body's cognitive capacities in the artwork, these concepts reveal a potential for knowledge production through aesthetic. This meaning creation goes beyond the embodied knowledge of the spectator, in the way that it incorporates new types of body

awareness along with inhabited sensory-motor knowledge. As such, new functionalities and associative meaning production can lead to so-called disembodied experiences, which are intensified by degrees of immersion. From a theoretical perspective, the transparent medium is both translucent and reflective: it applies embodied knowledge for functionality (invisible) and novel bodily involvement for artistic meaning (reflective). Transparency is here defined as an aesthetic quality of technology, which relates to the quality of the spectator's cognition; it is a body-mind status, which oscillates between inhabited knowledge and new knowledge creation. When the habitual bodily action turns into a submersive capacity, a cognitive flow is produced at the body-mind nexus. It carries a potential for new knowledge in the form of an uninterrupted cognitive experience between the artist and the spectator, which is also referred to as an immaterial dimension of the artwork.

This immaterial dimension of art re-establishes the intimacy between the artist and the spectator. This intimacy constitutes the cognitive quality that refers to the aesthetic potential of the body-mind nexus in technologically-mediated creations. As such, an immaterial approach to art is not a call for discounting material or physicality in the creation process, as contextual literature suggests, but is much more about how the immateriality provides a new meaning or functionality to materiality. It also diverges from approaches that understand immateriality in art as part of a particular religious or cultural ideology. The immaterial in this context instead refers to an aesthetic experience, which can reveal similar cognitive qualities as they are triggered in spiritual practices. This claim does not situate technology-based art in the framework of transcendentalist approaches; rather it draws attention to the potential of an immaterial dimension, which

has been lost in art production. As a consequence, a spiritual-like experience, as it is proposed in the main intervention of this thesis, is primarily an aesthetic experience that is produced through the heightened quality of transparency, termed as the *Transparent Act*.

The combination of the theoretical revision, the application of philosophical concepts and the analysis of existing interactive media artworks resulted in a multifaceted, interdisciplinary discussion that requires some forbearance from the reader. This excursion was also a result of extensive practice-based research, which created a dialogical investigation between critical discourses and artistic processes. Differentiating itself from other models, the *Transparent Act* is an aesthetic scheme for direct application in art practice. This model does not propose a universal aesthetic solution to technology-based art, nor a particular anatomy of consciousness in the aesthetic experience, but attempts to establish a sophisticated philosophical perspective for applications and evaluations in contemporary technologically-mediated art. Consequently it offers more than a contextual model for a better evaluation of technology-based art practice since it also serves as a basis for practical applications within a philosophical meta-discourse. It incorporates a particular utility for an artistic application, which draws on the ‘matrix of immersion’, ‘body awareness’ and the ‘degree of transparency’.

Through a focus on the earlier mentioned cognitive qualities of an aesthetic experience, the thesis proposes a new practical application for interaction based on the nexus of body-mind, which is termed as ‘passive interaction’. Central to this modality is the intellectual capacity of ‘affection’, which shapes human cognition during the interaction processes. It is proposed that directed or instant affection, in particular, will

operate within an experience design of the spectator that builds upon mechanical, tangible or audiovisual impacts on the body through technology. This concerns the aesthetic application of the body-mind interconnection, introducing direct affection via audiovisual and tactile effects with the aim to shape consciousness through a variety of bodily states. Through this application the thesis introduces a particular artistic form of an 'affective environment', which exemplifies a cognitive-based interaction instead of a responsive environment. This 'passive modality' of interaction is exemplified in the practical outcome of this research, which consists of an interactive media artwork called the *Mind Cupola*. The main objective of this method is to establish a network of interrelated feedback loops, which, through an evaluation process based on cognitive responses, return the information to the system, which reciprocally affect the spectator generatively. The philosophical approach applied in this art production creates a meta-layer of the artwork, by which the artist designs the fractal structure of the spectator's processes of consciousness through the affections triggered by the technology. In this way it contributes to an original knowledge production that revisits contemporary media art and, for a better comprehension of interactivity, applies a cognitive modality for a new aesthetic.

## **Chapter 1**

### **Introduction**

#### **i. Critical Discourse and Methodology**

This thesis investigates the interconnection between the artist and the spectator<sup>1</sup> and the impact this has on art practice. It argues that, although acknowledged as an important criterion of a particular genre of technology-based art, this interconnection has not been used as a potential tool in the creative process. This thesis proposes an aestheticisation of these interconnections through a triangular process of ‘artist-artwork-spectator’ which would serve as a new model for artistic and critical reflection on the artwork. The understanding of this process between the artist, artwork and spectator differs from old dualistic models which considered the artist-artwork and the artwork-spectator processes in a separated manner. This view breaks down the original linkage of artist and spectator that was based on materialistic conceptualisations of creative processes in which the attributes of the art object stood in the centre of creation. The model outlined here sees interactivity as an aesthetic process that rediscovers a lost dimension of the artwork.

Comprehending the ‘artist-artwork-spectator’ interconnectivity as potential characteristics of aesthetic, the thesis re-introduces a poetic layer which emphasizes an original volition of artist and spectator communication. The intimate interconnection between artist and spectator suggests a cognitive-based creation in which the ‘making art’ and ‘experiencing art’ processes are blended into one creative flow. In doing so, the epistemological gap between artist and spectator disappears and it can be proposed that such art produces new transcendental layers

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<sup>1</sup> The spectator in this thesis will be understood as a participant subject. It refers to an historical continuum of the ‘artist-artwork-spectator’ triangle, which was transformed by new interactive art form to an active spectatorship. For an extensive elaboration of this term please see later in this chapter the contextual terminology of this thesis.



of experience. This further suggests that the poetic dimension of the work leads to access of knowledge that is not necessarily located in a common material encounter. It is posited that these transcendental layers of the artwork provide artists with an effective tool for altering the spectator's consciousness through their dynamic perceptual processes. This suggests that qualities of aestheticisation emerging from this new triangle draw most significantly from the spectator's cognitive experience. It follows that the processes for the creation of artwork frame a chain of events or experiences rather than constant aesthetic values.

Through recognition of the 'artist-artwork-spectator' interconnection, the thesis develops a critical framework and reconsiders technology-based art practice, proposing an immaterial model of aesthetics termed the *Transparent Act*. This model suggests an artistic creation process as an intimacy through a creative flow between artist and spectator in which the technology within the artwork is a cognitively affective application. Therefore technology-based artworks cannot only be considered as forms of art but also as carriers of the immaterial dimension of interactivity which is crucial to the aesthetic of the work. As such, the notion of degrees of transparency serves to describe the quality of the creative flow between artist and spectator, providing the capacity for a transcendental quality in the experience. It is argued that the *Transparent Act* fills a gap which occurred in art practice by the ignorance of the interconnection between artist and spectator as a potential aesthetic tool. It reintroduces an immaterial dimension to the artwork, provided by the cognitive interaction potential of technology-based art.

This investigation builds upon a practice-based methodology, setting up a discourse focused on technology-based art and design processes and outcomes. Through practice-based research this thesis aims to develop a more effective model for human-machine interactions applied through the development of new interactive art installations.

This research applies an interdisciplinary investigation which uses accounts from the fields of philosophy, psychology, design and art theory, design and art history and computer science, looking for emerging concepts or approaches which, through a re-conceptualisation, may serve to produce contemporary solutions to technology-based art. The examination builds a body of evidence through a review of literature within these relevant fields, bibliographic and archival research of audio-visual media, analysis of technology-based artworks, critical reflections on contemporary art and design practices, and collaborative work with scientists and programmers in what is termed an evolutionary collective creative process (Fischer and Nakakoji, 1997, p.103). The evidence-based research also profits from concept-based investigations (for example the concept of transparency) in an interdisciplinary context, generating new insights of specific conceptions. Through the critical discourse of technology-based art, this thesis will suggest solutions for applications through this proposed new model. By applying the *Transparent Act*, the practice-based work of the research will attempt to present a sophisticated outcome which proves to be an aesthetic solution to the identified lack in art.

## **ii. Rethinking the Aesthetic of Interactive Media Art**

The critical discourse identifies a significant lack in practical applications of the conception of interaction through technology in artworks. It emphasises that although philosophical discussions of technology already provide meaningful solutions for how interaction can be understood, artistic applications appear to ignore them and therefore remain within a materialistic model of art, implementing technology-driven mechanistic frameworks. The thesis first revisits old models of interactivity in order to highlight their particular lack in practical applications which produced ambivalent concepts and artistic outcomes in interactive art practice. It proposes a philosophical

conception based on cognition in interactivity, which, by practical application, might serve as an aesthetic solution to the argument. This approach allows a psycho-philosophical approach to the creative process, suggesting a dematerialisation that brings forth an immaterial dimension to artworks. It is proposed that immateriality can be considered as a degree of transparency, thus it determines how far an uninterrupted cognitive flow can be created between the artist and spectator. The heightened transparency is considered as an oscillation between the technological stimuli and the spectator's intention which, in the following argument, is regarded as a potential for spiritual-like experiences. The research, laid out within the main contribution of this thesis, is an introduction of a cognitive-based model for interactive media art, which, through practical application, shapes the ways artists create and critique technology-based art.

The elaborate discussion in the first chapter intends to lay the ground for a new model of art, building up a network of interdisciplinary conceptions which serve as sophisticated applications in art practice. Chapter 2 opens up the critical discourse of interactive media art situated after modernism, when emerging technologies brought a previously unexplored characteristic to art: the potentiality of active spectatorship. Having acknowledged this, it is claimed that although the new role of the spectator changed the physical quality of the artistic outcome, it did not produce an aesthetic solution to art. The chapter explores this claim by discussing the pioneering practice of Myron Krueger who laid out the primary direction for interactive media art. The argument points out that Krueger produced an ambivalent approach to interactivity and new spectatorship, since he conceptually recognised a potential for immaterial qualities. Krueger saw the artist as creator of the spectator experience. In his application however, his work remained within a mechanistic, technology-driven interaction. He created works which attracted the active spectator through its technological novelty but provided no

artistic conception of interaction. The chapter argues that Krueger's initial aim of providing a technological version of John Cage's participatory model of art, has failed, leaving behind a legacy which has had a significant impact on the development of interactive media art. Through the identification of this lack in Krueger's work, the thesis attempts to illuminate that art production for centuries has followed a material or object-oriented approach in which the artist-spectator interconnection was established through a dualistic model based on the one way communication. Interactivity through technology has brought a potential to art through which the lost immediacy between artist and spectator can be rediscovered, providing a solution for a new aesthetic in technology-based art.

Chapter 3 revisits earlier models of interactivity which Krueger claimed to have been inspired by. In retrospect it can be said that he applied two main models: the artistic account and the technological account of interactivity. Although these modalities are significant for understanding interactive media art, yet they were not fully applied in Krueger's work and therefore could not carry further the foreseen potential. The argument in this chapter looks at two conceptions of 'openness' and 'responsiveness'. It is argued that openness can be viewed as an artistic concept and responsiveness as a technological concept and proposes a revision in order to produce a new framework for technology-based art production. The notion of openness is taken from Umberto Eco's investigations of participatory art. These explain novel aesthetic claims based upon a heightened involvement of the spectator. Although Krueger referred to John Cage's practice of real-time art events, in which artist and spectator were both involved, it is argued that openness provides a more comprehensive scheme of artistic accounts of interaction. By revisiting Eco's original concept of semiotic openness, the emphasis lies on the significance of the concept of 'meaning creation'. From this, a re-evaluation of openness for technology-based

artwork provides a crucial concept for a solution to Krueger's technologically driven applications. The re-evaluation, termed 'structural openness', defines not only openness in the spectator's perception but also a profound modifiability in the artwork itself. This redefinition of openness for technological application produces an aesthetic value through its potential to produce meaning. This chapter further identifies that structural openness is highly similar to that which Eco suggested as being an information-theoretical framework of art. He understood the artwork as a communication system which oscillates between a formal structure (in this case the technology) and the multiple meaning produced by a 'wonderment' of the spectator (Eco, 1989). In Eco's view, which contradicts Krueger's conception, an understanding of 'ambiguity' as disorder – a conception deriving from information theory – is significant for producing an aesthetic in the interaction process. This application of Eco's 'openness' is considered crucial for the development of an aesthetic model, particularly since it suggests that an aesthetic experience of the spectator cannot be produced through an efficiency of action-reaction in interactivity as Krueger believed, but rather through an artistic decision of 'order' and 'disorder' in the content, which creates the artistic meaning<sup>2</sup>. In this way, a technological interaction is defined here as the potential for responsiveness.

Chapter 3 also emphasises that there currently exist no accounts which determine the technological quality of interaction in art; therefore, the investigation uses a cross-disciplinary convergence of communication, information and media theory to construct an evaluation model. This highlights that an understanding of the technological and emerging qualities in the artwork is crucial, even though their quality does not necessarily justify an aesthetic outcome.

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<sup>2</sup> This is not to be confused with an order or disorder in the cognition, which discussed in chapter 5.

The legacy left by Krueger's work does not recognise this distinction and, as a consequence, interactive media artworks tend to only build upon an 'attraction' of emerging qualities without a significant meaning creation. The third chapter reveals that most of the modalities of technology, such as the conception of 'style of control' (Guedj et al., 1980) or 'control of the message' (Rafaeli and Sudweeks, 1997), cannot differentiate between subtle levels of interaction. The thesis investigates the four-dimensional model of Lutz Goertz which displays a great variety of responsiveness in a similar multiplicity as observed in artworks. Although Goertz' model focused upon divisions of media, it is proposed here to apply it to the artworks which implement interaction through unique technologies. The chapter opens up the idea of the separation of the artistic tool from the artistic medium in the creative process, which is explored further on in the thesis (see chapter 4). By revising Goertz' model through a focus upon technology as a tool or medium, different kinds of responsiveness can be factored in, opening the way for a new understanding of interaction. The investigation points out that Goertz' model is effective not in an aesthetic evaluation of art but for a purpose which can be described as a mystification of technological qualities. It will be claimed that Goertz' model provides a scheme through which technology-based artworks can be evaluated for their original contribution of technology. This revisionist critical approach reveals that the model of responsiveness as a tool or medium can serve as a method of technological effectiveness in emerging technologies for artistic applications. From this perspective it can be declared that the emerging characteristic of technology only provides an artistic solution if it is linked to artistic meaning creation. As such, this chapter argues that a new aesthetic should be based not on physical qualities but on the creation of immaterial meaning. It concludes that not only the content but also the novelty of the technology belongs to the meaning, which in this way

proposes an immaterial encounter of art that reveals an artist-spectator interconnectivity through aesthetics.

Chapter 4 draws on the revision in the previous chapter and proposes that this immaterial understanding, based on cognition, already exists in philosophical approaches of phenomenology. Heidegger's concept of tool-usage, in particular the concept of 'ready-to-hand', which in this thesis is termed 'invisible tool', provides a key approach to applications of technology in art that liberate an immaterial dimension. As such, invisibility, defined in this argument as 'readiness-to-hand', describes how far the tool becomes an extension of one's self. Heidegger's concepts of 'ready-to-hand' and 'present-at-hand' provide an approach for how technology can be understood through an immaterial application, with regards to the cognitive status in its user. Although contemporary conceptualisations of technology, such as the field of interface design, have implemented this approach, it has only been applied in relation to a technological effectiveness, ignoring a potential for aesthetic. A useful expansion of Heidegger's philosophy is provided in an application of these concepts by the scholars Don Ihde and Paul Dourish. They established the terms of 'embodied relations' (Ihde, 1979) and 'embodied interaction' (Dourish, 2001), both of which imply that interaction not only builds upon the question of whether the tool is embodied or not, but necessarily includes the spectrum of embodied knowledge. It is in this sense that it can be proposed that the artist's intervention is situated at the threshold between 'experienced knowledge' and the 'new knowledge' created through an artistic interface. This distinguishes the artistic application from solely technology-driven applications and identifies a lacunae on which a new model of aesthetics for interactive media art can be built.



As argued previously, there is a necessity for a division in the technological application in creative processes, between the tool and the medium. It can be proposed that the tool represents the technology-driven effectiveness (technology as a design application) when a technology is applied in the 'making art' process. The medium refers to the act when the technology becomes an artistic interface with the aim to provide novel experiences in the spectator's perception (technology as an artistic application). This is what has been identified earlier as the meaning creation of the technology. By applying Heidegger's concepts into a formulation of the 'transparent medium', it follows that the technology is not only 'ready-to-hand' (invisibility), which is an effective implementation of technology, but also 'present-at-hand' (opacity), which refers to the artistic meaning of the emerging character of technology. The core intervention of this thesis lies in the idea that technology as an artistic interface should not be invisible but transparent. As such, the artist's task is to produce a balance between the processes of 'mastering the tool' and processes which awaken novelty in the spectator's experience. This emphasises a differentiation between the notions of 'invisible' and 'transparent', which in contemporary theory are mostly not distinguished.

Chapter 4 discusses that in the literature invisibility has been commonly understood as a physical attribute, which is described in this argument as 'embedded technology' with regards to a cognitive evaluation. By introducing the new notion of the 'transparent medium' the cognitive involvement is characterised by the quality of immersion. To comprehend this cognitive-based immersion the chapter proposes a framework for 'body awareness'. The concept of body awareness, which is also commonly referred to as 'disembodiment' in interactive media discourses, will be described as the spectrum of cognitive layers, which refers to a body-mind status in technology-based art practice. It will also be applied as an artistic tool for experience

design of the spectator which considers the cognitive affections through technological interaction. As the quality of immersion also refers to an effectiveness of artistic implementation, this chapter introduces a matrix of qualities evaluating the cognitive involvement of the spectator. This builds upon the discussion in chapter 3 by examining the active and passive bodily status within interaction, which proposes a variety of means to an effective immersion for a practical application. Whereas the active bodily interaction is here defined as an associative action-reaction capacity, the passive interaction represents a more challenging way of immersion, in which the spectator's intention is not only represented by reduced bodily activity but also by a measurable cognitive response (such as changes in emotion). The form of body awareness in the application of immersion is significant in producing the specific qualities of the spectator's experience within the transparent medium.

Through the establishment of the terms 'invisible tool' and 'transparent medium', it is claimed that the creative processes of 'making art' and 'experiencing art' can stimulate an immersion; a cognitive level of the spectator. An immaterial level is created through the interconnectivity within the recognised 'artist-artwork-spectator' triangle. To accommodate this cognitive artist-spectator relationship, chapter 5 discusses the psychological theory of flow. Mihaly Csikszentmihalyi's application of flow (1975) suggests that human action frequently produces optimal states in cognition; these are harmonious states when one's intention matches the produced outcome. This characterises the cognitive state of immersion in the aesthetic experience which Csikszentmihalyi (1988) referred to as a heightened state of flow or ecstasy. Although the flow is controlled by one's intention, in the state of ecstasy the flow might take over the ability to control, thus producing a unique unintentional experience. The argument of this thesis identifies this conception as a crucial cognitive modality of the artist-spectator

interconnection and suggests the notion of flow as an immaterial boundary between the artist's action and the spectator's experience. It follows that the cognitive quality of the 'making art' process is immediately presented in the 'experiencing art' process; therefore the quality of this flow is represented in the spectator's subjective experience.

Through the notion of flow, Csikszentmihalyi furthermore draws out a resemblance between artistic and spiritual practices. The thesis borrows from this claim the idea that technology-based creation might produce an ecstatic or spiritual-like state in the spectator's cognition. This analogy is built upon in the chapter's proposal that both practices aim to enrich the spectrum of consciousness by using a variety of technologies and techniques of the body-mind nexus. It is suggested here that spiritual practices apply schemes of bodily techniques, which are similar in their effect to certain tools used in technology-based artworks. The chapter identifies the phenomenon of disembodiment as a significant quality in both spiritual practice and in the practice of producing technology-based artwork. It outlines the practices of Dervish dance and Sanskrit yoga, which are also discussed by Csikszentmihalyi, in order to exemplify the earlier established distinction between active and passive means of immersion. This examination suggests that whereas active interaction produces a fragmented body-mind interconnection, passive interaction is considered to be based on a body-mind fusion. It follows that a passive modality might produce more challenging ways of interaction, integrating not only technological feedback but also a cognitive feedback loop in which technology is used to capture cognitive processes. The modularity of active interactions has, for example, been displayed by Gromala's and Sharir's virtual environment; however, the modularity of passive interaction in their work has not been explicitly applied. Therefore, the endeavour of this thesis is to fill this gap and

represent an artistic framework based on passive immersion which produces a new spectrum of consciousness through spiritual-like experiences.

Chapter 6 synthesises the previous discussion in order to establish a new model of aesthetic, based upon an investigation into an immaterial encounter of art. This chapter suggests that the immaterial quality in art might emerge through a ‘dematerialisation’ of the art production. Even though numerous approaches acknowledge a process of dematerialisation through technological applications, most argue within a materialistic framework and do not consider immateriality as a new state of consciousness nor as a cognitive quality. Therefore, the argument observes that immateriality builds upon a conception which cannot only be interpreted as the ‘disappearance of the physical’, the process of conceptualisation (Lippard and Chandler, 1968) or a ‘substance of communication’ (Lillemose, 2005) but also as a flow-like quality (Lyotard, 1985) in a cognitive encounter of aesthetics (Moos, 2002). This new model might rediscover immaterial knowledge through the dematerialisation process; a lost dimension which existed before but one which the mechanistic applications of art have suppressed.

The thesis proposes to acknowledge the ‘artist-artwork-spectator’ interconnection as a new aesthetic declaration of art production. In this context, to seek an uninterrupted flow means applying the invisible tool in the ‘making art’ process, through which the transparent medium produces, an ecstatic state in the spectator’s experience. Thus, the aestheticisation of the artist-spectator relationship gives grounds for a new immaterial-based production of art. As the cognitive encounter expresses a quality of immaterial interconnectivity, chapter 6 lays out how the notion of transparency (established in chapter 4) may describe this quality and provide insight for artists. In this respect, the ‘degree of transparency’ relates to successful cognitive interconnections between artist and spectator which are achieved by noiseless flow and

supported by the constitution of immateriality as openness (meaning creation), responsiveness, invisible tool, transparent medium, body-awareness and immersion. The aim of an application of transparency is immediacy producing new knowledge for the spectator. As this knowledge is gained through an aesthetic experience, it can be defined as a poetic layer of the technologically-mediated experience. The transcendental dimension of the artwork is fulfilled when the meaning creation of the interactive act reaches a heightened transparency. The new spiritual-like experiences are the re-discovery of a lost dimension in technology-based art, achieved through the new aesthetic model of the *Transparent Act*.

The *Transparent Act* is an immaterial model of art. It breaks with the materialistic approaches to art and the mechanistic applications of technology. It introduces practices which do not focus on object creation or build upon attraction of emerging concepts of technology but build on a cognitive experience of the spectator. It is a transdisciplinary model which establishes a sophisticated network of conceptions in order to generate an evidence-based application for technology-based art. The *Transparent Act* provides a methodology through which technology can be applied in art as an aesthetic conception. In this respect, the main intervention of this thesis is not the cognitive-based modality that was already suggested by design-based applications of interaction, but the insight that this cognitive encounter can be linked to a poetic layer which stimulates a spiritual-like state of consciousness. Therefore the transparent interface can provide a potential instrument for the application of cognitively invisible technologies in the 'making art' process, which facilitates the meaning creation of the spectator. With this, the philosophical-based model of the *Transparent Act* aims to fill a gap, which has occurred at the threshold between technology and art, which has previously applied older modalities of aesthetic rather than produced a novel framework with an immaterial encounter.

### iii. Artistic Background and Practice-Based Research

The discourse here is based on artistic research through practice. This section provides the background of previous and current artistic activity, highlighting the artistic practices of the author. Two particular interactive installations, *Mirror\_SPACE* and the *Mind Cupola*, will be discussed in order to contextualise the practice-based methodologies used in the discourse and also to display an artistic continuum and development of concepts of interaction.

*Mirror\_SPACE* and the *Mind Cupola* are technologically-mediated interactive artworks which invite the spectator to engage in their particular immersive environments. Entering the space, the spectator is immediately affected with the aesthetics of the surroundings. These real-time environments are empty and non-operative until the spectators enter and the system is activated. The environment is a system formed of customised software and hardware, which appears to the spectator as both aesthetic and functional interfaces. Through these interfaces the spectators can control the events of the environment by active or passive participation. An active participation involves one or more spectators in the creation of the artwork through bodily movement of tactile control. A passive interaction involves the sensory technology collecting biometric information (like face attributes or face emotions) and the spectator's control of the environment based on their cognitive processes.

The artwork of *Mirror\_SPACE* (Zics, 2004/2005) (Figure 1.01, 1.02) established an active immersive environment. Spectators were invited to create their own 'mirror' image according to the rules of the artistic system. Users had to step into an illuminated circle in a dark room where they were scanned by a device directed towards their face. The mirror images appeared in front of the person on a large screen. Real-time three dimensional objects were generated through the particular space-time based data package of the person, including the value

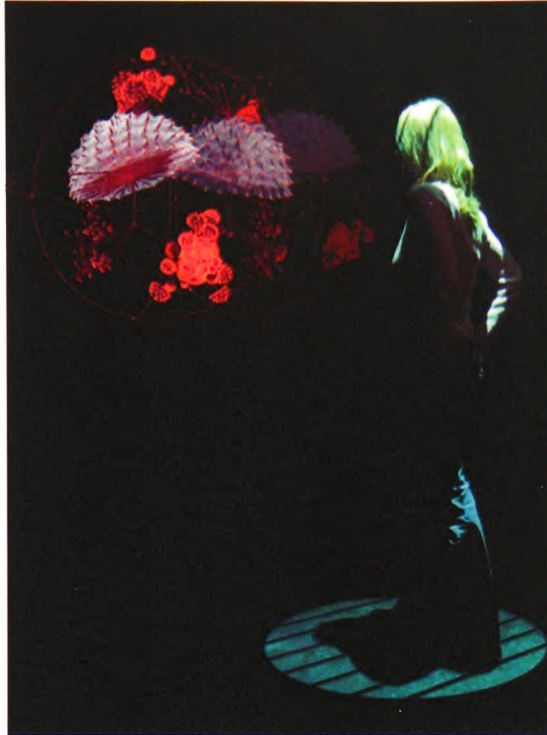


Figure 1.01 *The light beam of the 'Mirror\_SPACE' environment where spectators are scanned*  
(Zics, 2004)



Figure 1.02 *The Immersive Environment of 'Mirror\_SPACE' with interactors*  
(Zics, 2004)



of one's mood which is determined through face analysis and dynamic data. This analysed data, through a particular visualisation process, characterised an abstract sphere-like object on the screen, providing a variety of unique visual representations (colour, shape, complexity and movement). The aesthetic of the three dimensional object combined a microcosmic vision which was inspired by the drawings of the biologist Ernst Haeckel, and a networked structure which is based on contemporary visualisations of data networks such as the internet (Figure 1.03, 1.04). The stylised visual components of the aesthetic in *Mirror\_SPACE* simulated the reflection of a mirror image without reference to physical reality with the aim of creating a sensation of interconnectivity. Therefore this work suggests a representation with a unique visuality which through its aesthetic experience might recreate a phenomenon of interconnected co-existence. The experience design in *Mirror\_SPACE* is based on the body behaviour of the users and on the effectiveness of the interaction with his or her avatar. Whereas users who recognised and lived certain rules of interaction intensively had a greater opportunity of viewing and of being able to change their mirror image for longer, users who left their creature alone after its birth may have been excluded from virtual space. In this respect, the artistic system challenged its users to produce a more effective or even immersive quality of their experience. Just as the immersion was produced through the learning process of the rules of bodily movements, the aesthetic experience was achieved by a symbolic interconnectivity between bodily states and dynamic visual formulations. Although a spatial navigation of the user is common in virtual reality systems, *Mirror\_SPACE* attempted to create an experience where the unique aesthetic and its efficient source of representation (face and dynamic data analysis) produced a novel knowledge in the participators' consciousness.

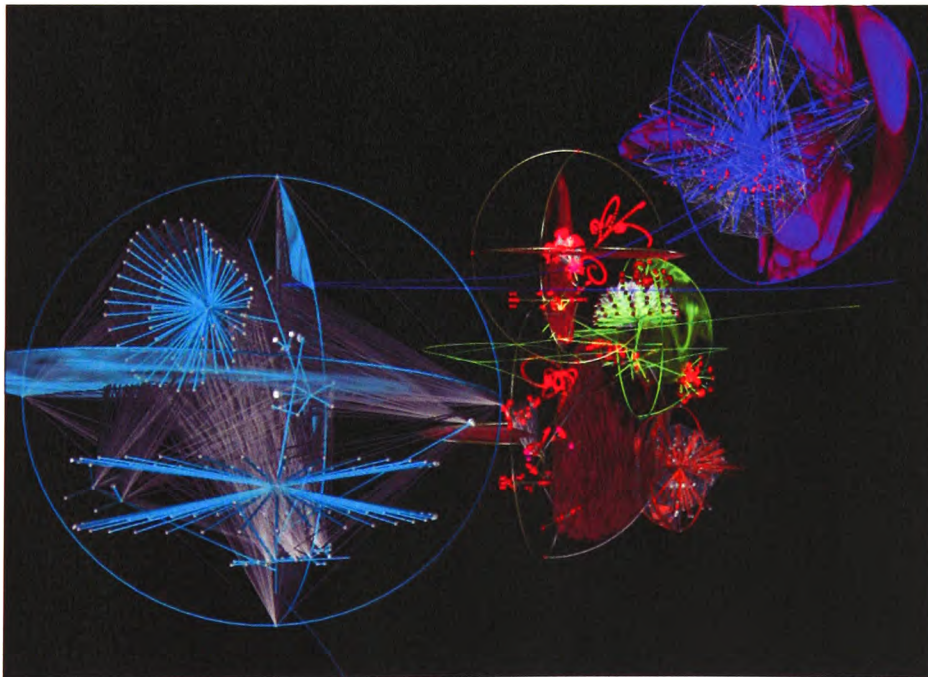
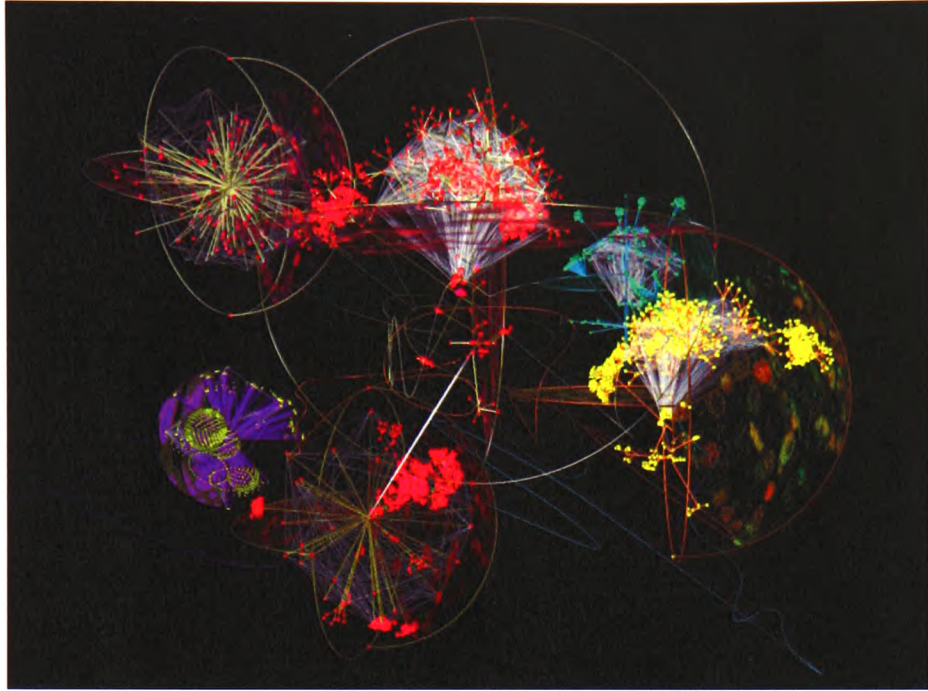


Figure 1.03 and 1.04 Screen shots of the 'Mirror\_SPACE' visualisation (Zics, 2005)

Whereas in *Mirror\_SPACE* the artistic novelty was focused on an active immersive involvement of the user through a bodily action that produced an interaction, the practice-based research as part of this thesis, introduces the project of the *Mind Cupola* (Figure 1.05, 1.06, 1.07), which is characterised by a passive immersive environment. According to the recognition of an artist–artwork–artist triangle, the artwork *Mind Cupola* has the role of producing intimacy between the artist and spectator. This outcome therefore is not based on object creations but rather on the production of an environment that stimulates a noiseless flow between the ‘making art’ and ‘experiencing art’ processes. Whereas the ‘making art’ process concerns the artist’s creative process when in his/her intentional interaction with technology, the artwork is the reflection of the overall creation process, which reveals a dynamic confrontation in the ‘experiencing art’ process of the spectator. The spectator internalises the artistic outcome through the cognitive process of immersion. The spectator’s participation is crucial as it activates the artwork and his or her subjective experience evaluates the ‘transparency’ between artist and spectator. The artwork creates the interconnectivity between the artist and spectator and establishes a flow between cognitive processes.

The *Mind Cupola* represents a bio-feedback device which, with its embedded instruments and specific aesthetic, triggers affections in the spectator’s perception (Figure 1.08). Entering the cupola, the spectator’s head is surrounded with a machine which recognises the spectator’s presence and attempts to affect him or her with various invisible or visible electromagnetic streams. The devices embedded in the cupola (such as cold stream, hot stream, vibration, light or sound) produce a pattern of affections which are linked to various conceptions of consciousness alteration. The devices react upon the data from the face analysis in order to produce a creative flow. Whilst in *Mirror\_SPACE* the person’s face was analysed for an emotional characteristic,



Figure 1.05 *Spectator in the 'Mind Cupola'* (Zics, 2008)



Figure 1.06 *The 'Mind Cupola's' affective environment* (Zics, 2008)





Figure 1.07 Spectator and the 'Mind Cupola's' illuminative environment (Zics, 2008)



Figure 1.08 *The 'Mind Cupola's' embedded instruments and unique aesthetic (Zics, 2008)*

the *Mind Cupola*'s software recognises features of the face and measures particular changes over time. The data from the face analysis creates a visualisation based on fractal-like structures which, whilst in motion, produces a kaleidoscopic effect (Figure 1.09). This concept derives from the visual language of *Mirror\_SPACE* which explored the affective quality of aesthetic and is developed further in the *Mind Cupola* for cognitive-based interactivity. This is achieved through real-time face analysis which continuously re-creates the visual experience according to the facial responses. A cognitive feedback loop was created through the analysis of bio-data which recreates the pattern of affection in the *Mind Cupola* and produces visual feedback. Therefore the system is continuously recreating itself according to the spectator's cognitive reactions and intentional actions. As such, the artistic system applies the idea of a functionally closed system which in turn accommodates the repetition of simple phenomena producing a heightened complexity. Through these features and set up, that the affections of the *Mind Cupola* might produce novel experiences in the spectator's consciousness.

Both artistic works aim for a novel quality in the spectator's experience which is achieved through the aesthetic conception of immersion. The novel contribution of the *Mind Cupola* project is that it re-introduced the meaning of interaction within a cognitive framework, rather than a physical activity. Thus, it applies technology in such a way that it has a particular affection in the spectator which might reveal a more effective way of interaction between human and machine.



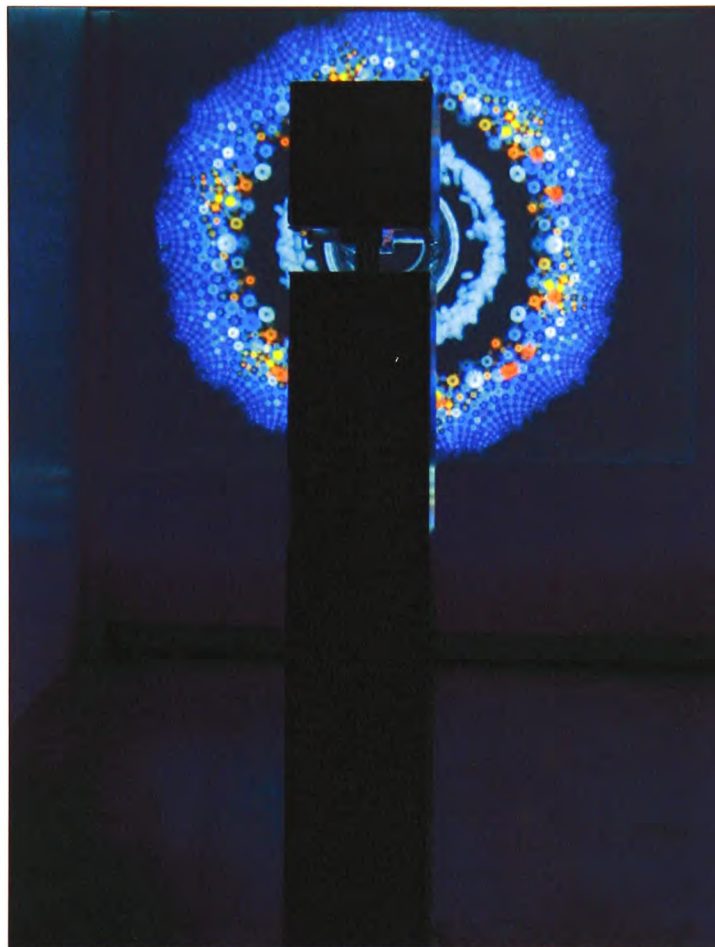


Figure 1.09 *The 'Mind Cupola' from the spectator's point of view;  
the interactive visualisation and the camera-mover interface*  
(Zics, 2008)

#### **iv. Contextual Terminology**

This investigation builds upon what is termed ‘technology-based art’ production, a contemporary scheme of art practice that applies technology for an aesthetic purpose. In this respect, the investigation looks at artworks which, in both the ‘making art’ process and ‘experiencing art’ process, apply technology to produce a continuum for the aesthetic experience of the spectator. More particularly, it is focused on ‘interactive media’, which implements the conception of interaction and active spectatorship through emerging technologies which aim for innovative information exchange with a poetic or aesthetic layer. ‘Interaction’ here, and as elaborated in the following chapters, is understood as an action-reaction potentiality that results not only in a dynamic change in the structure of the artwork but also in the spectator’s cognition. Thus the term interaction not only refers to a mental level between the spectator and the artwork (as, for example, through an application of Eco’s ‘semiotic openness’) but also on a level of structural transformation in the artistic system. As a result of this, artworks will frequently be referred to as systems, as they often represent a complexity of networked elements, which, through action-affection processes, produce a scheme of experience. ‘Active spectatorship’, as it is understood in this thesis, comprises qualities which might enable a recovery of an aesthetic dimension that was lost in older models. The notion of the spectator in this context describes a participant subject who actively contributes in the ‘making art’ process. The term extends the historical continuum of the ‘artist-artwork-spectator’ triangle whose application defines a primary understanding of art production. This version of spectatorship acknowledges the importance of the spectator as the co-creator but amplifies the idea of active spectator as user or, as Rokeby (1995) called it, interactor. The application of users and interactions are appropriate to art works which demand physical and tactile interactive processes (for example Mirror\_SPACE).

However, the discussion of interactive artworks, in this thesis, establishes a cognitive interactive modality (in thesis termed as ‘passive interaction’) which has spectatorship processes similar to cinema reception; as such the spectator is best understood as a particular kind of participating subject.

The thesis’ intervention in a philosophical encounter of technology-based art production and evaluation is based on the rediscovery of ‘immaterial’ qualities which are defined as a cognitive rather than a physical status. Although, in numerous accounts, immateriality has been acknowledged as having significant potential within technology-based art (Matta, 1976; Lippard and Chandler, 1968; Lillemose, 2005), most of these approaches interpret this as a new materiality. It is suggested that understanding a conception of the immaterial means not only a conceptual message but also the potential to reveal cognitive levels which are usually ignored in materialistic views. The notion of immateriality represents an examination of cognitive processes in particular affections, resulting in states of consciousness as an aesthetic experience. ‘Seeking new knowledge’ in the spectator’s experience, as proposed in this thesis, might introduce a transcendent dimension into the art work. From this perspective laid out here immateriality is identified as a cognitive experience which might stimulate spiritual-like outcomes through new cognitive levels of aesthetic. This has been identified as a breaking down of a materialistic and dualistic comprehension of art which previously, most frequently, considered the physical qualities of an object without an affective interconnectivity between the artist and the spectator. This materialist approach has been promoted through many generations of interactive media art (identified as Krueger’s legacy in chapter 2), constrained by mechanistic approaches and has built its aesthetic on attractions of emerging technology, rather than been linked to an artistic meaning creation. The thesis aims to establish a new model for art production which rediscovers

this lost creation of immaterial knowledge by working towards a more effective interaction between the artist and the spectator.

As stated above, the main objective of the argument builds upon ‘cognition’ and the ‘cognitive qualities’ most essentially characterised in the spectator’s experience. The term cognition is applied based upon a definition from cognitive science:

Cognition is the process involved in knowing, or the act of knowing, which in its completeness includes perception and judgment. Cognition includes every mental process that can be described as an experience of knowing as distinguished from an experience of feeling or of willing. It includes, in short, all processes of consciousness by which knowledge is built up, including perceiving, recognising, conceiving, and reasoning. (The New Encyclopaedia Britannica, 1993, p. 434)

As this definition of cognitive processes refers to ‘processes of consciousness’, the following discourse characterises qualities in cognition as states of consciousness. This term is widely debated, particularly in consciousness studies, and its definition changes by discipline. This investigation applies the terminology used by Mihaly Csikszentmihalyi, whose psychological conceptualisation of flow, as a substance of consciousness constitutes an important aspect of the thesis’ argument. Csikszentmihalyi refers to the function of consciousness as:

...to present information about what is happening outside and inside the organism in such a way that it can be evaluated and acted upon by the body... With consciousness, we can deliberately weight what the senses tell us, and respond accordingly. (Csikszentmihalyi, 2002, p.24)

Csikszentmihalyi’s insight is useful for the thesis as it provides an emphasis on the importance of understanding the interconnectivity between outside and inside; in other words, how bodily states might produce a change in consciousness. In this respect consciousness is understood not only as a state, or faculty, or awareness of anything, or one’s thought (Shorter Oxford English Dictionary, Fifth Edition, 2002, p. 491), but also as an inner knowledge, characterised by a

dynamic of a constantly changing quality or state based on body-mind interconnectivity. As consciousness is frequently linked to a dynamic change of the experience, this thesis also applies the notion of 'altered state of consciousness', introduced by Charles Tart (1969, p. 2) as the sensation when one: '...clearly feels a qualitative shift in his pattern of mental functioning'. This characteristic will also be referred to as 'noiseless flow', which frequently produces new knowledge or even an ecstatic state of consciousness (Csikszentmihalyi, 1988, p.4). These cognitive processes will be contextualised within a philosophical framework, investigating phenomena which are widely discussed in phenomenology as they provide essential insight into the key issues of human-machine interactions. The main objective this investigation is to apply the concept of a mind-body fusion that conceives of knowledge as a phenomenon of the (bodily) experiences. (Husserl, 1913) The phenomenological framework in this investigation is based upon classical concepts, as described by Edmund Husserl, whose understanding was developed further by Heidegger. Husserl proposed:

This phenomenology, like the more inclusive pure phenomenology of experiences in general, has, as its exclusive concern, experiences intuitively sizable and analysable in the pure generality of their essence, not experiences empirically perceived and treated as real facts, as experiences of human or animal experiments in the phenomenal world that we posit as an empirical fact. (Husserl, 1913, p.249)

The main intent of this phenomenological approach is to examine human actions as they appear to consciousness. Contrary to phenomenological approach that posits an 'essence of things' (Husserl, 1913), this discussion takes up the position of classical phenomenology in focusing on human cognition rather than an exterior quality of the thing. From this point of view the thesis examines the cognitive potential of knowledge-seeking and its aesthetic potential for art production. Based on this perspective, and to produce an account of cognitive qualities as a

body-mind state, the thesis introduces the notion of 'immersion'. Immersion is often defined as an: '...absorption in an activity or condition' (Shorter Oxford English Dictionary, Fifth Edition, 2002, p.1322) which in this thesis more specifically refers to a condition of cognition. As immersion is not a well defined term in the particular context of interaction, the thesis refers to one of the few definitions in the literature provided by Oliver Grau (2003, p.13), who suggests that: '...immersion is mentally absorbing and a process, a change, a passage from one mental state to another', which the thesis resituates through a phenomenological and 'positive psychological' encounter, as posited by Csikszentmihalyi (2002). As a result, immersion will stand for qualities which describe a body-consciousness state through the notion of body awareness. This approach allows the investigation to determine the quality of the experience as heightened immersion, suggesting a more effective interaction, which also includes a spectrum of experience design assuming diverse qualities in the alteration of consciousness.

## Chapter 2

### **Critical Discourse on Interactive Media Art: The ‘Artist-Artwork-Spectator’ Triangle**

#### **i. The Primary Model of Interactive Media Art and its Deficiency**

This thesis opens up an interdisciplinary investigation into contemporary art forms which are mediated through technological systems. It takes the approach that art within its historic forms and resonances have undergone shifts that were largely influenced by the social-economic-technological aspects of its spectatorship. This thesis recognises the significance of this approach and situates its discussion within the discourse that occurred after the collapse of the Modernist movement, when the introduction of interactive technology in art produced a rediscovery of active spectatorship. As such, the convenient starting point of this investigation is artist Myron Krueger’s concept and practice of the ‘responsive environment’ (Krueger, 1977, p.423), which brought a radical transformation to art practice allowing a more inquisitive quality of interaction in art (Rheingold, 1991; Dinkla, 1994; Wilson, 2002; Lovejoy, 2004). With Krueger’s artistic work the possibilities of interaction in artworks became intimately bound up with the aesthetic decisions that take place in the process of making art. Interactive technology provided the opportunity for artists to establish an immediate reciprocal communication with the audience (Krueger, 1991). In this respect, interactive media art began to establish a radical model of art and advocated a new spectatorship.

The problem identified in this chapter is that Krueger’s model of interactivity, along with its reception and further development, could not provide a sophisticated model for an aesthetic approach to technology-based art production. This observation emerges from a reflection on the forty-year history of interactive media art which displays only a fragmental solution to an

aesthetic in art. The discussion in this chapter recognises that Krueger's activity greatly impacted on the later development of interactive media art producing a technology-driven framework without an aesthetic solution for art. This chapter argues that revisiting Krueger's work helps to identify the lack of a contemporary understanding of interactivity. Proceeding from his work, the critical approach taken in this chapter segregates out the traditional strategies of technology and art, enabling the identification of the particular failures of Krueger's interpretation of interactivity. By recognising these qualities the chapter draws on and amplifies Krueger's primary recognition of immediacy between artist and spectator, but claims that his mechanistic, technologically-mediated understanding could not provide an aesthetic solution for interactive media art. Therefore, it can be said that, although Krueger's conceptualisation of spectatorship sets out a means towards a sophisticated model of interactivity his application in practice was restrained by an overemphasis on a fetishist characteristic of technological production. As consequence he could not fulfil his original intention which he articulated in one of his early works (*Metaplay* in 1970) as 'artificial reality' (Krueger, 1991, p. xiii). This was a concept now more widely known as Virtual Reality (VR), which in his later works applied a more technological than aesthetic solution to interactivity.

The following discussion outlines Krueger's concepts, based on the understanding that they have become a common approach to interactive media art. Through a critical discussion of this observation, this chapter elaborates Krueger's pioneering practice by introducing some of his interactive works, which provided a primary direction to the further development in interactive art. This investigation will emphasise that Krueger's practical work was not able to respond to his conceptual challenge and remained ambivalent. Whereas his primary understanding impacted on other pioneering works (for example those by Jeffrey Shaw or David Rokeby), these practices



did not recognise the principal lack of aesthetic in Krueger's work, since they followed his legacy, remaining within the same mechanistic conceptualisation (for example, the usage of physically invisible/visible interfaces). Proceeding from the legacy left by Krueger, the following discussion will reveal the contemporary conceptualisation of interaction and address the inherited lack of aesthetics. This critical revision serves as a framework for the suggested solution, which will be elaborated in the following chapters.

## **ii. Myron Krueger's Ambivalent Model of Interactivity**

The work of Myron Krueger outlines an early conflict between technology and art in the way that he conceived interaction. Krueger was trained as a computer scientist, and from this vantage point decided to develop 'responsive environments' as an investigation into a technology-driven aesthetic. Krueger's (1991, p.7) approach emerged from the appreciation of John Cage's work<sup>3</sup> of participatory art in which the artist: '...leaves the final realisation of the piece in the hands of each participant'. Krueger (1991, p.8) most significantly claimed that the artist's task is to design the spectator's experience: '...the computer can increase the artist's ability to experiment, so that the final compositions are based on a rich experience with the medium and the full expression of the artist's ideas'. His acknowledgment that experience is the central objective of creation contributed to a new understanding of interactivity in art. Krueger claimed that art had already developed a new rhetoric of interaction through historical forms, but it was suppressed because of an existing antipathy and a lack in skills of technology in the arts. In this matter, it can be said

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<sup>3</sup> John Cage's strategy of confronting the audience with unusual musical structure and action relies on chance generated in an interactive field where both sides developed dependency from each other. The spectators are inclined to a high degree of participation in developing different interpretations and ways to unfold the work. Through the indeterminacy that Cage developed in his multiple artworks many of his performances suggested a collaborative interrelationship between artist, performer and audience.

that Krueger has recognized an opportunity for a unique contribution in art that profits from his scientific skills and knowledge of technology. He believed that fusing the artistic heritage of participatory art<sup>4</sup> with science, particularly with the potential of emerging technologies<sup>5</sup>, provided a solution to an aesthetic of a new art form. This understanding that participatory art formulates an aesthetic built upon a philosophy of 'uncertainty' (such as improvisation, chance, confrontation or provocation), however, was not able to provide an aesthetic scheme for interactive media art, as Krueger thought. This is based on the observation that human to human communication provides diverse solutions for an artistic conceptualization between artist and spectator rather than human to machine communication. It is argued here instead, that technology-based art strives towards an intimacy between artist and spectator rather than randomised action-reaction capacity driven from 'nugatory attitudes'.

Krueger's concept initially revealed that interactive art is a form of participatory art which, through the integration of technology, empowers a broader prospect of spectator involvement. However, Krueger's aim to reproduce a participatory character of artwork led him to a mechanistic approach of interactivity, ignoring the potentiality of experience design as a solution to aesthetic. His critical framework of art expressed this perspective:

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<sup>4</sup> In this thesis participatory is understood as artworks or movements that are characterised by audience involvement in the artwork. The dada movement brought a novel aesthetic claim of immediate interaction with the audience to which it is often referred to as a form of art nugatory at the beginning of twenty century (Richter, 1997). The art nugatory haven't had a particular artistic form, their actions often carried out randomly or in a form of public congregation or demonstration. From this movement has grown John Cage's chance performances, the 'Fluxus attitude' and happenings whose artistic conceptualisation similarly builds upon the immediate reactions of the audience producing unexpected interaction (Smith, 1998).

<sup>5</sup> An important quality of technology is that it is always in continuum. The 'emerging character' is a quality that artistic creation has to deal with. Whereas it enables novel forms of meaning it also carries the danger that this novelty turns to an attraction that surprises artistic qualities. A technological approach, however, gains a full expression of the emerging character, producing more powerful technologies every time. This characteristic of technology will be termed in this thesis as 'responsiveness', which has significance in technology-based art production but it is only a tool for artistic expression.

It is the definition of that relationship in which both art and science are interested, and for which the aesthetic approach is more scientific. The scientific method works best when objects and forces can be isolated and studied one at the time. An aesthetic can be used to address complex problems with influences, ill-defined criteria, and diffused goals. (Krueger, 1991 [1983], p.9)

Krueger's understanding, as discussed above, appears to have served scientific mechanisms in interactive environments rather than constituting an inherent quality of the artwork. It appears that Krueger's ambivalent account of interactivity originated in the failed practical implementation of his theoretical conceptualisation. From the vantage point of the present day it is difficult to unravel whether Krueger's theoretical claims emerged prior to his practice or in a deductive way through analysis; what is clear is that many of his conceptual, artistic ideas were not articulated in his artworks. This gap between Krueger's theory and practice was generated through a post-historical approach in which he intentionally contextualised his practical work within the emerging framework of participatory art. This perspective on Krueger's work illuminates the characteristic of a mechanistic approach to art, which followed not the artistic but the ambivalent model.

With regard to Krueger's intention of a participatory solution through technology in art, he attempted to develop a tool that was able to react to the spectator's action. His concept of responsive environment was an enormous technological challenge at that time involving a great complexity in scientific realisation. Krueger (2001, p.106) described his concept of responsive environment as an environment in which: '...a computer perceives the actions of those who enter and respond intelligently through complex visual and auditory displays'. Krueger dismissed Ivan Sutherland's high-end solutions of interactivity (in 1965 Sutherland introduced head-maintained displays [HMD] and goggles) arguing that they were too impenetrable for a spectator's engagement. Instead, Krueger (1992) sought the development of a different application of technology that was more analogical to participatory art in order to enable a free interaction

involving several spectators in the experience. He envisioned a new ‘reality’ without the physical presence of technology (since Sutherland’s HMD was considered a visible interface) and focused on the participant’s behaviour in order to enable an ‘automated experience’ (Krueger, 1991, p.18). Krueger’s (1991) initial idea became the first technological solution of environment based high-end interactivity, which he referred to as ‘artificial reality’.

In 1969 Krueger, along with others<sup>6</sup>, created his first responsive light-sound environment titled *Glowflow* (Figure 2.01, 2.02). Even though the work was considered as the first ever known interactive environment (or installation), it only exhibited a limited responsiveness and generated a perceptual delusion rather than interaction, as Krueger himself also confessed. The environment of *Glowflow* was designed to stimulate participants in a dark room through a changing luminance of wall-mounted tubes that presented a distorted structure of the room. Krueger noted that participants could not explore an action-reaction interconnection in their experience; therefore the system’s responsiveness occurred rather randomly and did not meet the spectators’ expectations. Importantly, Krueger did not recognise that his ‘interaction-creation’ failed not because of a lack of technological responsiveness but because of the adaptation of artistic meaning in a particular action (designing the spectator’s experience). From this it can be suggested that the lack of Krueger’s artistic vision in technologically-mediated creation, perhaps inherited through his scientific background, created a mechanistic approach in his artworks.

The adverse reactions of the spectators in *Glowflow*, observed by Krueger, encouraged his closer examination of human-machine interactions, which led to the development of, what can be regarded as, the most appealing environment of his career. The artwork *Metaplay* (1970) (Figure 2.03, 2.04) was more similar to an artist’s laboratory (without making the spectators

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<sup>6</sup> The contributors were Dan Sandin (computer scientist), Jerry Erdman (sculptor) and Richard Venezky (computer scientist).

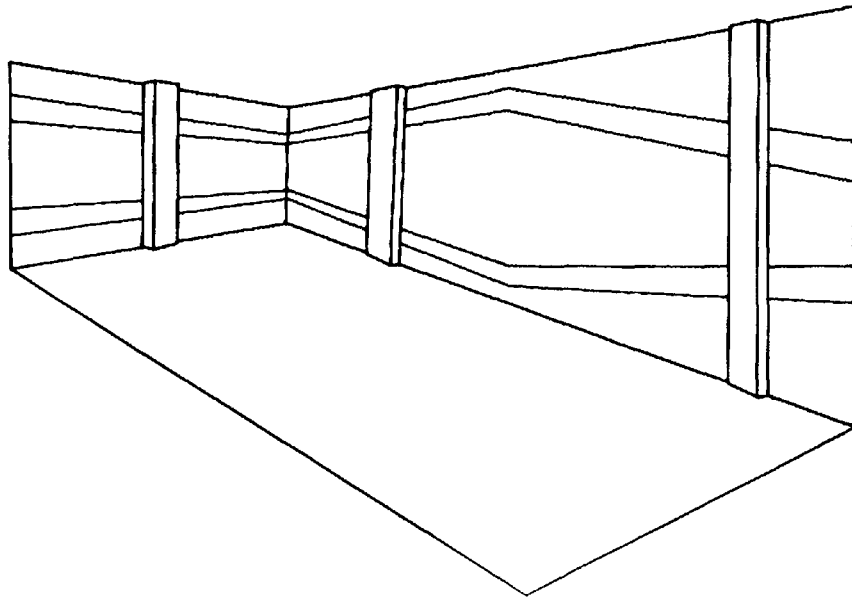


Figure 2.01 *The gallery environment of 'Glowflow' (1969) with the light tubes on the wall (Krueger, 1991)*

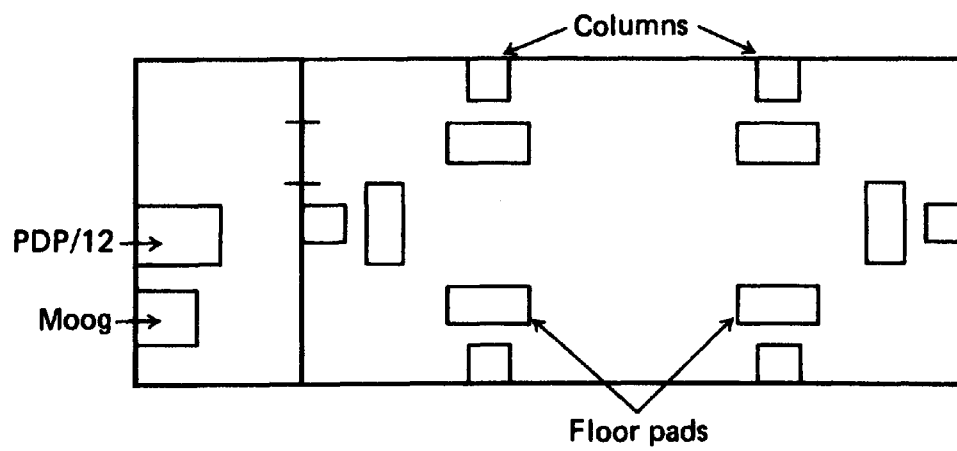


Figure 2.02 *The floor plan for 'Glowflow' (1969) (Krueger, 1991)*

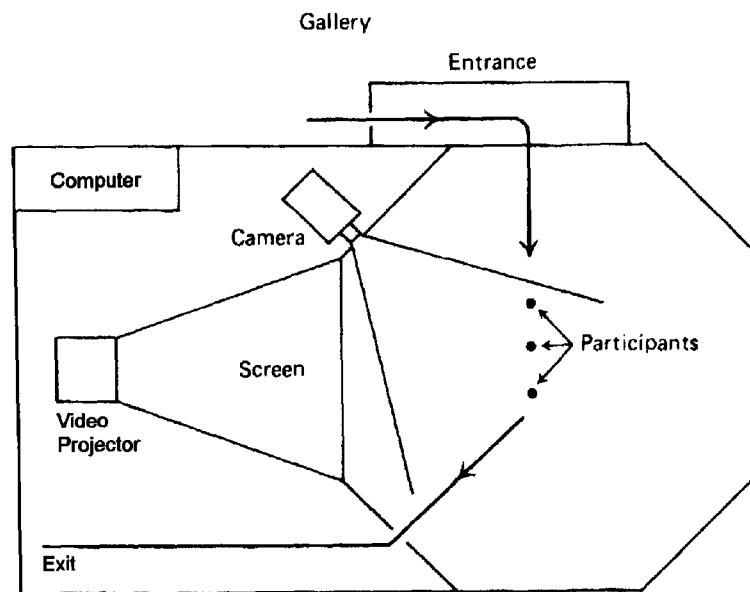


Figure 2.03 The floor plan for 'Metaplay' (1970) (Krueger, 1991)

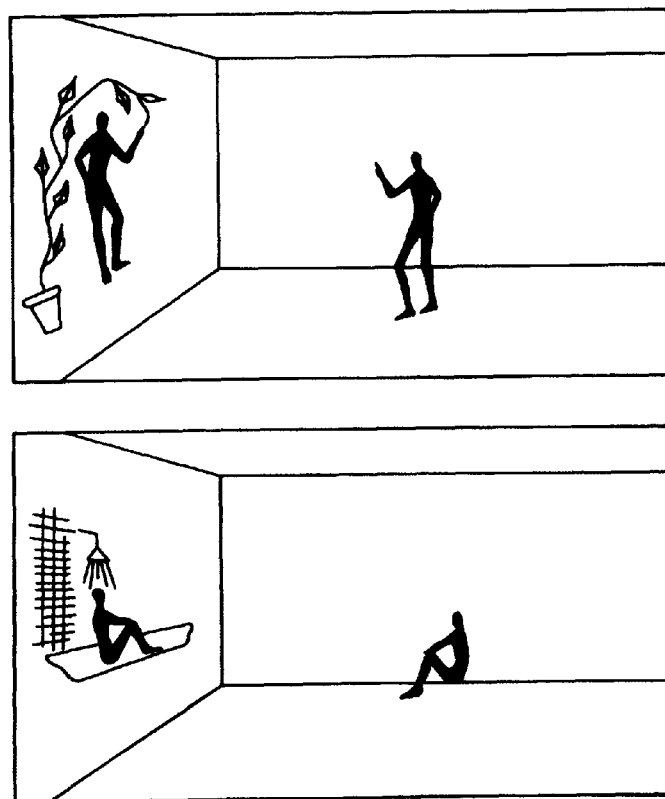


Figure 2.04 The 'Metaplay's' (1970) interaction (Krueger, 1991)

aware about this) allowing an immediate study of the spectators' actions and reactions. The *Metaplay* has only rarely been perceived by art theorist as an influential piece; however, this investigation recognises it as a watershed that addressed the concept of an aesthetic layer in technology-based art. Krueger had identified technological inefficiency in responsiveness, and through *Glowflow*, he built up a new environment in which the functions of the computer were taken over by the artist who simulated the machine interaction. He set up a communication system in which the artist could immediately react to the spectators' actions and reaction. In order to implement this, Krueger constructed two separated rooms connected by video-broadcasting through which the artist received a real-time picture of the spectator (Figure 2.05). The spectators, without knowing that the interface was controlled by a human (and not by the computer), started to interact with their own picture that was projected on the screen, expecting some form of response. The artist at that point reacted to the spectators' action through a drawing, which was projected back and was superimposed over the spectators' image. Krueger described this in one of his following experiments:

I attempted to draw on someone's hand. He did not understand what was happening. And he moved his hand. I erased what I had drawn and started over where his hand had moved. Again, he moved. This became a game, with him moving his hand just before, I finished drawing. I finished my drawing. The game degenerated to the point where I was simply tracking the path of his hand with the computer line. Thus, by moving his hand, he could draw on the screen. This idea became the basis for many interactions. (Krueger, 1991[1983], p. 13)

Krueger attempted to produce a new model of interface through the artist's observation of the spectator experience, which, by means of visual illusion, involved its participant in an interactive play. Even though the work conceptually explored immediacy between the artist and the spectator, Krueger did not produce further works which applied these conceptions on technology in order to provide a solution for aesthetics in interactive media artworks. Krueger's interaction

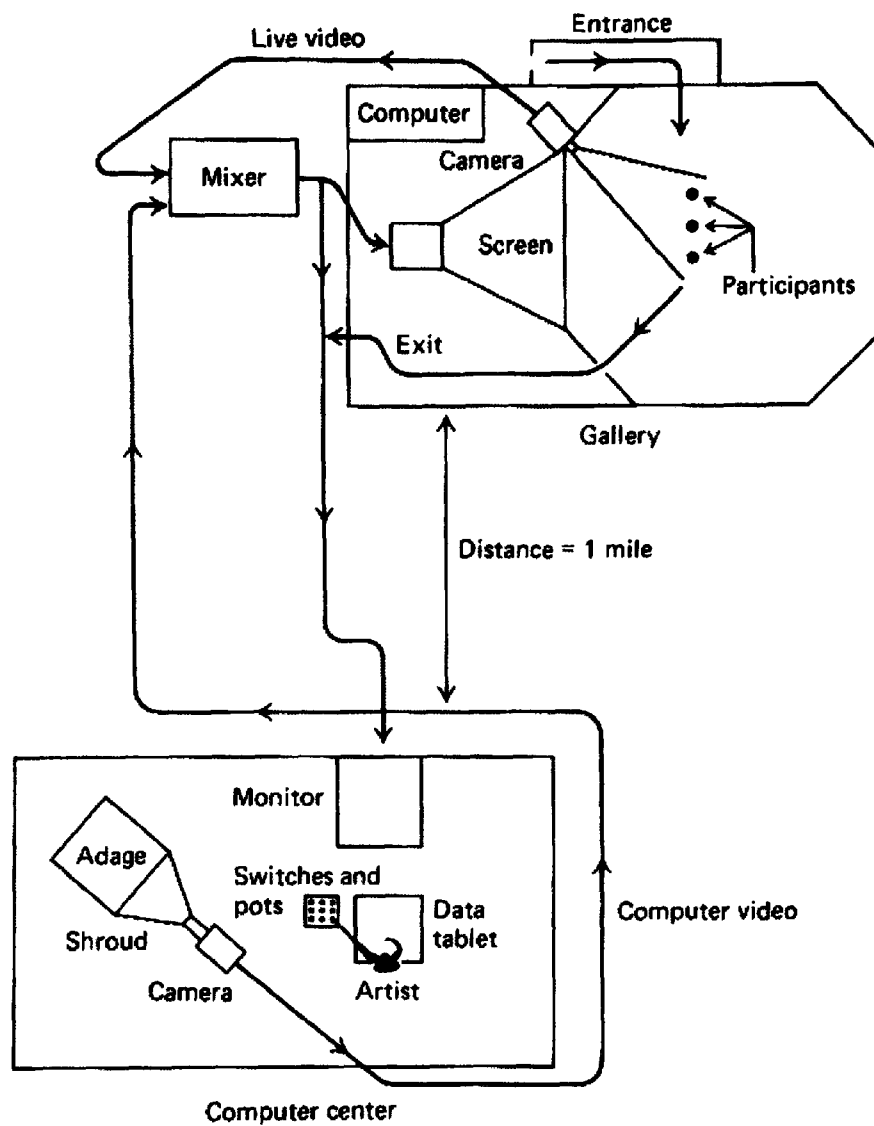


Figure 2.05 The system outline of 'Metaplay' (1970)  
(Krueger, 1991)



experiments instead turned to focus on visual affection and direct responsiveness between the system and the spectator, which he discovered by chance through the video-closed circuit of *Metaplay*<sup>7</sup> (Krueger, 1991, p.18). Krueger applied this discovery to his most frequently cited work *Videoplace* (1972-1990) (Figure 2.06, 2.07), which he constantly altered for twenty years afterwards. He produced various solutions to illusionistic visual displays, but only by exploring interactivity through technological variety. His responsive environments used visual metaphor of self-reflection in order to stimulate the participant into interacting with the virtual object or with another participant. Even though these environments initially formalised a 'mirror' quality to interactive systems (Rokeby, 1995), Krueger was not able to apply a meaning of this self-reflection, producing only a playful interaction. The best-known version of Videoplace is *Critter* (1984) (Figure 2.08), which enabled an artificial creature to interact with a person's silhouette. Although these installations motivated a playful engagement with technology, they offered only a technological novelty that ignored the immaterial approach of the spectator's experience design introduced in *Metaplay*. As Krueger's interest centred on technology produced attraction, this initial discovery of an aesthetic dimension to interaction was forgotten.

In opposition to Krueger's produced outcome, such as *Videoplace*, the argument here demands a full development of his initial idea of immaterial art, pointing to the considerable divergence between his conceptual claims and his practice. In *Metaplay*, Krueger intuitively

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<sup>7</sup> Krueger (1991, p.25) reports this accidental discovery, which appeared through the cameras that were directed on the computer screens, as: 'I realized that I was seeing more than an illusion. As I moved my finger to point to the data my colleague had just sent, the image of my hand briefly overlapped the image of his. He moved his hand. Although I noticed that phenomenon, its significance did not register immediately. When it happens again, however, I was struck with the thought that he was uncomfortable about our image touching. Without saying anything, I subtly tested my hypothesis. Sure enough, as I moved the image of my hand towards his, he repeatedly, but unconsciously, moved his hand to avoid the contact...The inescapable conclusion was that the etiquette of maintaining personal distance and avoiding touching that exists in the real world was operating at that moment in this purely visual experience.' This discovery is one of the earliest applications in videoconferencing technology.

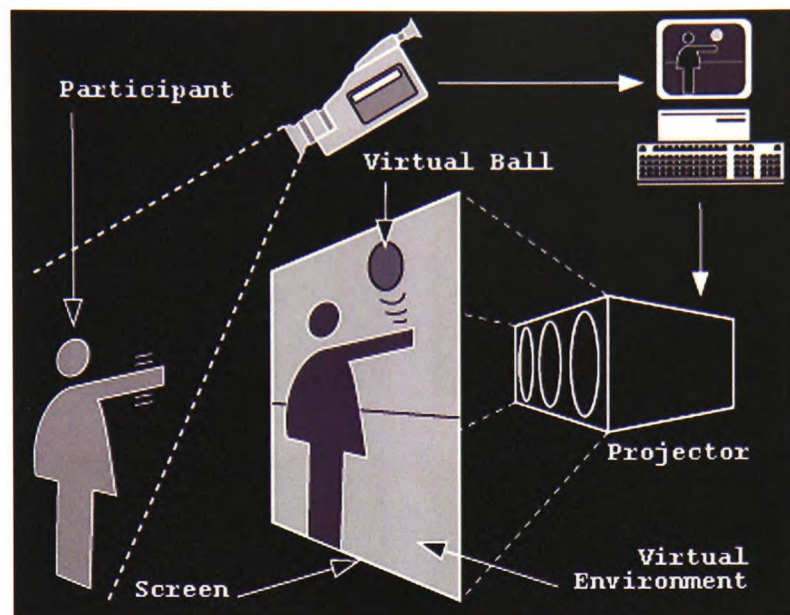


Figure 2.06 The system draft of 'Videoplace' (1974) based on Myron Krueger's Description (Oliveira, 2007)



Figure 2.07 Screen shots of the 'Videoplace' interaction between two participants (Krueger, 1991)

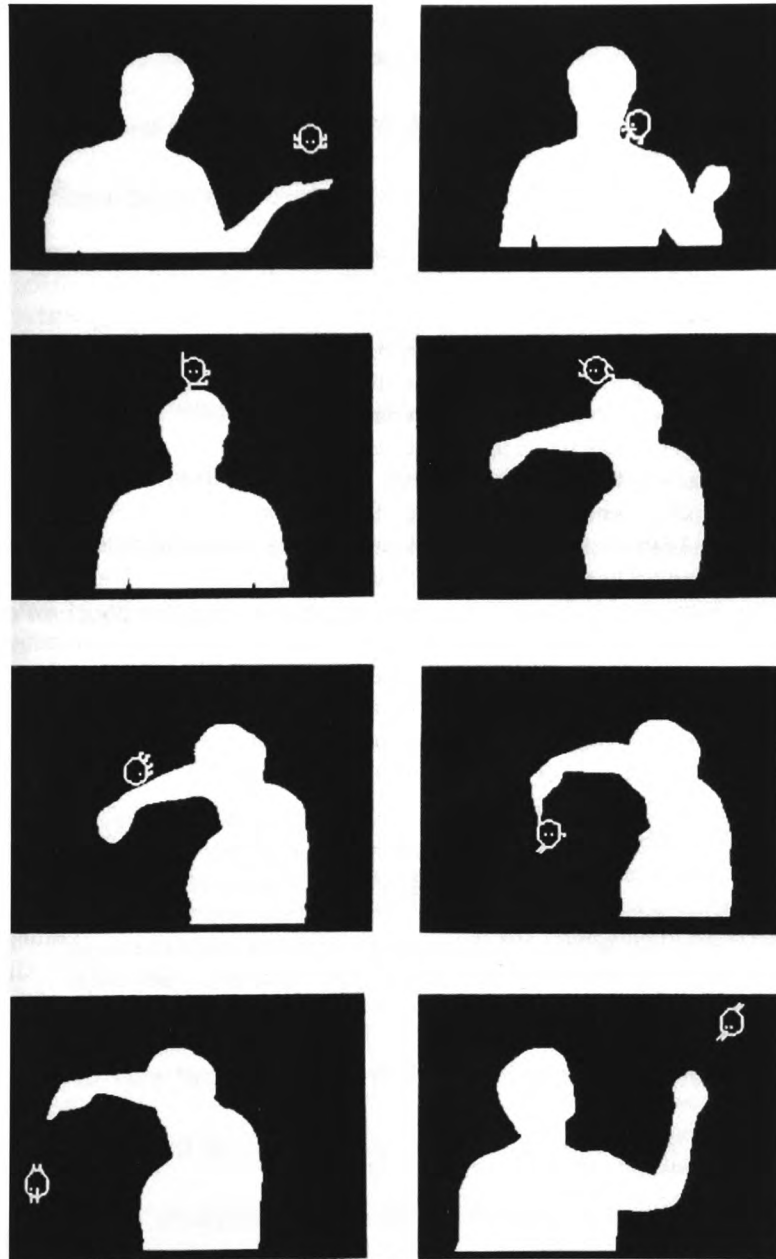


Figure 2.08 Screen shots of 'Citter' (1984) ( Krueger, 1991,)

identified the importance of the immediacy between the artist and spectator, producing interconnectivity through the spectator's self-reflection, which created a shared interactivity through the artist's drawing and the spectator's bodily experience. *Metaplay* situated the artist and spectator on the same level through both creative experiences, which are in constant movement through the action and reaction circle. As such, the creator became the spectator and the spectator's experience became the creator's extension of his or her action. From the perspective of the thesis, technology is not only invisible in a physical sense as Krueger suggested, but in an aesthetic sense, as it does not reflect novelty but serves the artist-spectator interconnectivity. As such, *Metaplay* does not display an attraction through the emergent quality of technology but through the artistic meaning. With this suggestion, the previous object-oriented model of art, in which artist-artwork and artwork-spectator relationships were not interconnected, is replaced with an immaterial approach. This primary claim of the thesis becomes even more obvious through Krueger's particular treatment of the artwork through the experience of the spectator:

The sequence of events started with a group of six to eight people entering the darkened environment. The lights were brought up and their projected video images became visible. The typical audience reaction at this point was surprising. Often, faced by the large screen where the only active element was their own image, people would sit down and watch. Large-screen video projection was apparently undreamed of by many of the participants... After they overcome their initial awe, one of the interactions would ensue. (Krueger, 1991, pp. 23-24)

From Krueger's point of view this experiment provided much more of a technological conception, since he interpreted the overlapping images as an application of video-broadcasting. As his idea was reserved for emerging technological solutions, he was not able to acknowledge the opportunity (not particularly by the formulation of overlapping images) for a novel aesthetic strategy that could rediscover a lost touch in art production. Thus, interactivity provided a

solution from the very early stages to resolve the materialistic character of art; however, it was only marginally conceptualised in theory and not applied in practice. Therefore, interactive media artworks that followed were based on a materialist model of production; although Krueger's work did not focus on the attributes of physical objects any more, his techno-fetishist approach of art still worked within a materialistic framework.

Through this, it can be pointed out that Krueger's approach constructed an ambivalent concept of interaction. Although he recognised the role of the spectator's interaction, he attempted to respond to it with a technological solution in his practice. Krueger (1991, p. 137) saw the result of his artistic practice as '...a whole new realm of human experience in which the laws of cause and effect are composed by the artist'. This provided a solution for an effortless interaction with the spectators in their playful interconnection with a novel system, but not with the artist directly. Thus, Krueger's model of responsive experience was more about accommodating visual affects and 'perceptive plays' in high-end interactive technologies than comprehending the aesthetic of interaction itself. His view remained within a technological approach that attempted to apply artistic ideas, such as John Cage's experiments. However, he was not able to reveal that interactive art is not only about participation but also an aesthetic endeavour or creation of meaning.

Through this chapter's overview of Krueger's work it can be concluded that his activity was not particularly artistic but predominantly technological. Although he claimed the objectless creation of art within a context of experience, he generated an object which, even though it remained physically invisible, by its fetishist character made it visible for reflections of attraction. His quest for aesthetic brought him to significant new technological developments

(such as artificial reality, video conferencing and networked video communities), without offering artistic solutions.

Krueger's artistic legacy had a reasonable impact on following interactive media productions, his approach widely influencing the technology-based art world and their practical characterisation. The revision of his work, provided in this section, helps the following argument to understand the contemporary account of interaction in the context of spectatorship and shows how this affected the development of interactive media artworks that followed Krueger.

### **iii. Krueger's Legacy in Interactive Media Art**

In the previous section it was argued that Krueger was unable to dissolve the old dualistic model of art, in which technology was not fully understood and created an ambivalent model of spectatorship. This section will consider concepts that followed Krueger's legacy and produced fragmental solutions towards a new spectatorship. It will elaborate on the idea that Krueger's conceptualised immediacy between artist and spectator was long ignored. As such, interactive art production based on Krueger's legacy mostly attempted to improve technological potentiality and novelty whilst not solving the aesthetic inquiries for interaction; the post-Krueger formulations still worked within a materialistic view of interactive media art.

Most of the concepts approaching technology-based art have elaborated on the revolutionary character of the new spectatorship that technology provides and even set up an interconnection between the artist and spectator (Kent and Williams, 1994; Dinka, 1994; Rokeby, 1995; Daniels, 2000); however, similar to Krueger they do not link their role to aesthetics. Maiocchi et al. (1994) for example argue that an artwork sets up various interconnections to the artist, as seen in Krueger's works. It is most likely that the assumption by

Maiocchi et al. arose not from Krueger's artistic outcomes but from his conceptual claims, as

Maiocchi et al. proposes:

Traditional art is created by an artist and appreciated by the viewer. In an artificial reality like those created by Krueger, the relationship between the artist and the viewer is only one of several possible relationships; the relationship of one viewer to another can also be the explicit subject of the work. In fact, an interactive exhibit augurs new relationships for artists with their audience and with their art. (Maiocchi et al., 1994, p. 56)

Krueger's interest in participatory art came from the 'dada' inspired works of John Cage and the 'Fluxus' artistic movement, representing an avant-garde aesthetic in which the immediacy between artist and spectator was founded on a deconstructive conceptualisation of spectatorship. A 'Fluxus attitude' was likely to include working with elements of disturbance or attacks on spectators to produce the particular meaning and not through a symbiotic co-creation in the artwork, which is seen in interactive media art. This suggests that Krueger set up a model for technological interaction influenced by the creation of discontinuity for the spectator and as a result was unable to produce an intimacy between artist and spectator and thus an aesthetic for interaction. Although the acknowledgment of the participatory engagement of the audiences needs to be credited to Krueger and his legacy, his deconstructive model of spectatorship has proven insufficient for the creation of a new aesthetic. This makes it necessary to look into a broader intellectual context of the contemporary literature strategies for potential solutions.

The theory of 'openness' for example, discussed most extensively by Umberto Eco (1989), describes a new aesthetic based on the active spectator. Eco took up Duchamp's (1987, p.187) assertion that: '...the spectator makes the picture'<sup>8</sup> and applied it to modern artworks

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<sup>8</sup> The wide-ranging consideration of the relationship between spectator and artifact is concentrated on the mental processes of the spectator that provide the interaction, therefore, such features as personal background, intellectual features and other capabilities of the person determine the achievable quality of the spectator - artefact interaction. This type of 'interaction' has no impact on the structure of the artwork and proves for a more

which, as Eco claimed, placed the spectator's perception in motion. Contrary to participatory art forms characterising live-performances, Eco's participatory art argued for an aesthetic collaboration of artist and spectator, a model which might produce a better understanding towards a new technology-based spectatorship. This perspective will be elaborated upon in the next chapter, which argues that 'openness' provides a better model for interaction in art instead of Krueger's interpretation of performance art, potentially serving a fuller consideration of aesthetic. Overall, Krueger's legacy produced a misinterpretation of the integration of the participatory concept in interactive art. Whereas performance art could not provide an aesthetic solution to interactive media art in Krueger's application, it set forth a miss-belief that technology-based art is only about participatory characteristics, whilst ignoring interaction as an aesthetic layer.

An immediate impact of Krueger's understanding can be observed by looking at other pioneering practitioners, thusly such as David Rokeby or Jeffrey Shaw, who created their interactive work in the mid-1980s. Both artists took on board Krueger's strategy of interaction, producing more technological responses instead of providing a new aesthetic solution. Shaw's work characterised well the mechanistic approach as he contextualised high-end technological systems in art providing no aesthetic insights (for example the interactive work of *The Legible City*, 1988-1991). Rokeby was experimenting with the same technological solutions that Krueger used (for example in his enigmatic work of *Very Nervous System*, 1986-90); invisible video interfaces for the capturing of a spectator's involvement, although Rokeby used the bodily

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objective experience. The artwork as object is not dynamic; hence the act of the spectator resembles an observer with attentive cognitive processes. On the other hand, very specific expectations are demanded from the artwork to provide the main features for the interaction. In view of this, the communication steps out of the spectator's psyche and is situated outside action. The physical and mental actions together form the spectator's experience. The artwork includes a new element of interface, which is the absorbing surface of the spectator's actions.



movement to trigger changes in a spatial soundscape (Figure 2.09, 2.10). Rokeby did not accept Krueger's claim that interactivity has to provide clear cause and effect interconnection, producing an unpredictably aesthetic solution in his work; instead Rokeby, through artistic experiment of practice, was able to achieve an aesthetic solution responding to Krueger's *Metaplay* concept. He produced a crucial level of meaningful interaction for the spectator as he critically engaged with technology in the process of creating the artwork, which immediately linked him to the spectator's experience. Although he acknowledged the importance of interconnection between artist and spectator, he still did not identify it as an aesthetic model for interactive art production. His practice remained curious as he intuitively produced an immaterial aesthetic in his work but without a consistent continuum in his art production.

Interactive artists are engaged in changing the relationship between artist and their media, and between artworks and their audience. These changes tend to increase the extent of the audience's role in the artwork, loosening the authority of the author or creator. Rather than creating finished works, the interactive artist creates relationships... The power of this expression is multiplied by the fact that the interactors themselves become referents of the work. The works are somewhat akin to portraits, reflecting aspects of the interactors, transformed so as to express the artist's point. (Rokeby, 1995, p.152)

With an instant and very practical approach, Rokeby could produce an intimacy to the spectators; however, this particular approach also was the cause for his limited success. Through his initial technological experiment he produced a one-off aesthetic formulation; but like Krueger, without a particular aesthetic intent he failed to recognise his experimental approach as key to an aestheticisation of interactivity. He was not able to set an aesthetic strategy for his later works which, through interactive art, remained without an aesthetic model of interaction.



Figure 2.09 Image documentation of *'Very Nervous System'* (1986-90) (Rokeby, 2000)



Figure 2.10 Screen shots of the video documentation of *'Very Nervous System'* (1986-90) (Rokeby, 1991)

#### **iv. Recognising the ‘Artist-Artwork-Spectator’ Triangle**

The primary cause of Krueger’s and Rokeby’s regression of the aesthetic character of the interconnection of artist and spectator was that their approaches were mediated by a materialistic and dualistic model of art. Both acknowledged that technology provided a potential tool for art which enabled the creation of an immediate experience for the spectator, but this was only fragmentally recognised and consequently not fully implemented in their works. As such, technology-centred creation reflected a materialistic quality of the artwork, which further manifested itself in a fetishist production in art. As a result, creators such as Krueger and Rokeby did not link artistic creation to the artist and spectator interconnection, but more to a dualistic model in which the artist-artwork relationship stands for the technology-inspired creation, and the artwork-spectator relationship for the technological attraction.

The recognition of the spectator experience as the extension of artistic creation provides the model of the ‘artist-artwork-spectator’ triangle, which the thesis establishes in an attempt to draw out a possible solution for an aesthetic of interactive media art. In the same manner as Krueger recognised in *Metaplay*, the interconnection is based not on the physical formulation of objects seen in a materialistic model of art or technology, which is a technician’s approach, but instead on the experience itself. The argument points out that the artistic experience mediated by technology produces the quality of the spectator’s experience, which is the crucial aesthetic layer of the work. As such, the new spectatorship brings an immaterial connection to art, which means immediate interconnectivity between artist and spectator.

Early accounts of the ‘artist-artwork-spectator’ triangle have already been conceptualised, for example by Cezanne and Baudelaire (1860), although they were not practically applied in Modern art. They mainly emphasised that the artist creation should not focus on the physical

creation of the artwork but on the triggered experience itself. One of the rare identifications of the importance and nature of aesthetic experience was also made by the French philosopher Mikel Dufrenne (1973[1953]), who proposed a view of aesthetic which already included the essential qualities of technology-based art. Within the context of traditional art he displayed a phenomenological concept of aesthetic experience of the spectator, drawing out a philosophy of interactive art:

...at a deeper level, the experiences of creator and spectator are not unconnected; for the artist becomes the spectator of his own work as he creates it, and the spectator associates himself with the artist, whose act he recognizes in the work. (Dufrenne, 1973, xlvii)

Dufrenne suggested a similar aesthetic concept to that which Krueger had created, or which Rokeby distinctively achieved in his interactive pieces, whereby the artist's and spectators' cognitive experiences overlap each other. Dufrenne's concept suggested that 'making art'<sup>9</sup> and 'experiencing artwork'<sup>10</sup> are immediately interlinked; the former is the generator and the latter the processor of the creative flow. He refers to the similar way that art production must enlist the aesthetic life of the creator as well as the aesthetic experience of the spectator (Dufrenne, 1973, xlviii). Similar to this idea is Gordon Pask's (1971 [1968]) notion of 'aesthetically potent environments' (later in the thesis this will be linked to the newly introduced notion of 'affective environment' with a critical perspective on Krueger's 'responsive environment' (1977)), which was an artistic approach to Pask's well-known theory of cybernetics; the conversation theory (1961). Pask's constructivist approach explains interactions as constructing meaning between

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<sup>9</sup> 'Making art' is the process of creating the artwork. In this thesis this term will be used as a denotation of being in creation. The artist carries out this action.

<sup>10</sup> Experiencing artwork refers to the spectator's perception processes of the artwork. This is the fulfillment of the 'making art' and is carried out from the spectator or user.

two cognitive systems<sup>11</sup> in a conversation. The aim of the 'universe of discourse' (Pask, 1961, p.22) between the participants is to reach similar modality of understanding generating new meanings. Through this alternative perspective of cybernetics and communication theory, Pask came to similar declaration to Dufrenne. Namely, that the relationship of artist and 'observer' interlinked through their conversations and reciprocal negations produce fluidity between mental processes and material formulation so that their conversations might become one entity. Pask explains this as follows:

It does not seem useful to make a rigid distinction between the types of mental process that go when one occupies these different roles [artist and observer]... the composer is, in some sense, mentally akin to the performer, the listener; the man who views a picture is mentally akin to the artist who painted it. (Pask, 1971, p. 76)

Additionally, as early as 1959 Pask discussed approaches to 'artificial organisms' suggesting that there is a significant distinction between an 'observer' actively engaging with the system (in this thesis active spectator) and the scientific observation that is one's attempt at objective experience. This perspective might explain why Krueger failed in an aesthetical application for technology and that artists can potentially apply technologies through a non-scientific approach to produce aesthetically potent environments.

Applying Dufrenne's and Pask's concept it can be proposed that the 'events of art making'<sup>12</sup> can be mapped onto the 'events of experiencing art'. Following this application it can be suggested that this flow is characterised by the artist's externalisation which is then

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<sup>11</sup> In Pask's (1976) theory there is no such a distinction as human or machines. However, he differentiates entities of 'psychological' (P-Individuals) and 'mechanical' (M-Individuals). Whereas P-Individuals are converse, M-Individuals provide the matrix of being embedded and observable. P-individuals are only assessable by language processor (as M-Individuals) through conversation as they independent entities. They are also self-reflective and self-generative and contrary to M-Individuals they evident self-awareness.

<sup>12</sup> The events describe the various sequences of artistic creation. For instance, the creative process of painting includes the use of a brush, the implementation of different techniques, the making of drafts and discussions about the work.

internalised by the receiver<sup>13</sup>; a circulation through which the aesthetic layer of the interaction emerges (this concept will be elaborated in chapter 5). It can be concluded that both artist and receiver operate within the same artistic qualities of experience during their creative activity, producing an immaterial level of aesthetic to which Dufrenne might have referred as the notion of 'deeper level' (Dufrenne, 1973, xlvii).

Contemporary accounts of technologically-mediated creation, such as by Rokeby (1995), emphasise that it is not only the spectator but also the artist who interacts with technology. This is a key acknowledgement as it engenders a new, immaterial quality of technology-based art production in which the artistic creation concerns a similar process to the spectator's experience, interlinked within a dynamic flow. This suggests that technology provides not just a novel spectatorship but also a shifting flow of creation, in such a way that both artist and spectator have similar dynamic environments in a shared artistic process. Similar to this, Rokeby acknowledged the artistic action as a process of experiences which emerges through the spectator's experience. He (1998, np.) claims that: '...the process of designing an interaction should also itself be interactive. We design interfaces, pay close attention to the user's responses and make modifications as of our observations'. His assumption places Dufrenne's concept in the technological environment and substantially illuminates the fact that experiences from both artist and spectator apply the same equipment but with a different approach (this is explored further in the next chapter discussing the tool-medium distinction). Rokeby's claim provides a key approach in the way that the active spectatorship in technological production creates a much closer linkage of artist and spectator. Whereas in traditional creation artist and spectator have a

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<sup>13</sup> Pask (1961) described a fluidity between mental processes and reality, it is an intermediation or interactions between the material-language-virtual.

very different environment and experience of creative processes (creating art and experiencing art), in this new model the creative processes bare similar qualities through the dynamic of interactive technologies. Rokeby illuminates this with the acknowledgment of the new role of the artist who is greatly depending on the spectator's actions:

As the role of the spectator is questioned and transformed, so is the role of the artist...The act of realizing a work is a process of progressively narrowing the range of possibilities by a series of creative choices until one of the possibilities has been manifested in the finished work. One might say that the interactive artist decides at some point in this process not to choose from among the remaining possibilities but to create some sort of audience-actuated choosing mechanism. (Rokeby, 1995, p.136)

Correspondingly, Bolter and Gromala (2003, p. 36) describes the immediacy through the spectator's point of view whose experience recreates the artistic creation process: '...as the viewer, you were supposed to be able to reproduce the experience of the artist as he looked on the scene (or the imagined experience as he constructed an imaginary scene)'. Evidently, the spectator's experiential recreation provides a cognitive flow, which is the inimitable aesthetic quality of the interactive artistic system.

It can be argued that, although these conceptions have emphasised an aesthetic through the interconnectivity of artist and spectator, since they emerged from traditional modalities of art (not technology-based), they could not provide a solution for a realisation of the immaterial and remained purely conceptual. Most of the accounts acknowledged the significance of the triangle of 'artist-artwork-spectator', yet the common encounter of the interconnectivity was implemented as a product of technology and not as a significant dimension of an aesthetic. Since the technological medium of interaction emerged through Krueger's work, the attention to the development of interactive media art shifted from an intuitive interest in artist and spectator interconnection to a potentiality of technological interaction. Krueger's solution focused more on

the process between the system and the spectator, which led to a disregard of the artistic generative role. Thus, technology brought an evaluation to spectatorship in which the active role of the spectator stands more as a bi-product of the technology rather than a prospective to aesthetic. Importantly, it can be noted that conceptual and philosophical perspectives as Dufrenne's approach acknowledged the immaterial qualities of artwork, and some accounts determinate significant result, but these examples could not engender a drastic impact on the practical processes of interactive media art.

In summary, this chapter elaborates on a critical investigation into the initial concept of active spectatorship by recognising significant tendencies in the development of interactive art as they reflect contemporary lack of aesthetics. Myron Krueger's pioneering practice provided a logical starting point, since it mirrors crucial insights into an emerging art form. His work is of profound importance in this context, as it illuminates the radical transformation of art brought by technology as a medium; however, his legacy of technological art production led to a substantial fault, creating an ambiguous model of aesthetic in interactive art.

The problem was found to lie in the traditional materialistic view of art, which did not recognise immaterial qualities of the artwork but rather emphasised physical attributes of objects. This produces what this chapter argues to be a dualistic model in artistic processes, in which the 'making art' and 'experiencing art' processes were not considered to be interconnected. The new interactive technologies brought a mechanistic understanding to art, which emphasised a technological continuum of novelty leading to a fetishist attraction in art production. Artistic concepts of interaction only underlined the participatory character of interaction, reducing the chances of recognising the crucial aesthetic layer. As such, this old technology-based model of art has not provided an opportunity for the new spectatorship to reveal itself in its essence.



Krueger's model led to an understanding which still worked within the old model, producing an object-oriented view through its technological fetishism. It can be concluded here that the technology-centred understanding of interactive art could not resolve the initial conceptions, revealing the aesthetic challenge of the 'artist-artwork-spectator' triangle. Contemporary interactive media art has to reconsider the recognised triangle of 'artist-artwork-spectator' and bring to it an aesthetic dimension. The aestheticisation of this triangle reveals how artistic meaning can be produced through technological interaction. This is achieved by the unification of the participatory character and the technological novelty generating a new aesthetic.

As Krueger's initial practice left an ambivalent aesthetic legacy for interactive art, the following chapters provide a critical revision of the existing models of interaction, and will discuss in particular concepts of participatory art (openness) and technological approaches to interaction (responsiveness). It will be acknowledged that the concept of 'openness' would serve as a better understanding towards a new aesthetic than that of Krueger's suggested live-performance models of participation. Through resituating the concepts of openness and responsiveness, it will be argued that it is possible to work towards a novel aesthetic in which participation and technology are embedded as potential tools, rather than qualities of an aesthetic.

## Chapter 3

### **Old Models of Interaction: Participatory Art and Technological Responsiveness**

#### **i. Former Models of Interaction in Art and Technology**

In this chapter, two approaches to interaction, which shaped initial accounts of interactive art, as mentioned earlier in Myron Krueger works (see chapter 2), will be revisited. The concepts of ‘openness’ and ‘responsiveness’ are frequently applied in theories of art and technology and are considered here to have impacted upon the dominating materialistic model of interactivity in art. In the previous chapter it was argued that these concepts were misunderstood in the context of technological interaction because they were not considered in this new context but applied in an older scheme of aesthetic. Reflecting on this, it is claimed that, although interactive media art emerged from an artistic desire of new spectatorship, it cannot be considered as the further development of participatory art as Krueger’s practice suggested. Whereas analogue participatory art forms displayed an avant-garde aesthetic scheme, the active spectatorship in interactive media art is based upon a ‘constructive spectatorship’<sup>14</sup>. From this perspective, this chapter identifies two major concepts (artistic and technological interactivity) misapplied by Krueger which, as it is suggested here, with revision and reapplication, can provide the backbone of a novel aesthetic in art. The artistic approach of interactivity, as suggested earlier in chapter 2, elaborated by Umberto Eco (1989 [1962]) through the term of ‘openness’<sup>15</sup> or *opera aperta*

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<sup>14</sup> The thesis terminology of ‘constructive spectatorship’ refers to participatory art forms, which, in their aesthetic claim aim for a collaborative contribution of artist and spectator rather than numerous avant-garde real-time events that build upon provocation and immediate, unproductive action of the audience. Constructive spectatorship emphasises a spectator-artwork interaction by an open artwork.

<sup>15</sup> Besides Eco’s concept, there are other approaches to the notion of openness that were presented by Italian novelist Italo Calvino (1986). The openness in Calvino’s work is represented as an unconventional way of comprehending novels, that he terms ‘hypernovels’ or ‘literary machines’. They include a system of choice where

(which translates as 'open work'), depicts most profoundly the meaning of active spectatorship in modern art (Figure 3.01). Although Eco's theory is mainly built upon a materialistic characterisation of art focused on physical object creation through examples of modern art, it provides a significant conception of how proactive spectatorship can be understood. Differing from Krueger's reference to Cage's participatory art, Eco emphasised the importance of science in artistic production, which, as the following argument will elaborate, provides a more applicable version of participation in the framework of technological interaction. In this manner, this examination notes that, because Eco did not account for a technological interaction at all, his model leaves a conceptual gap between his participatory interpretation of interactivity and models of interactive art. Recognising the lack of applications of Eco's model, a re-evaluation of openness within the framework of technology is taken up in the following discussion. It will be shown that a revision that implements Eco's crucial concept of 'meaning creation' provides a new, meaningful conceptualisation of interaction. By applying Eco's resituated concept, it immediately reveals the potential of an active spectatorship which comprehends an interaction as a unique poetic level of aesthetic. This thesis argues that although Eco's concept was, in its earlier applications, misunderstood and implemented as a materialistic approach of openness, on the contrary, the new framework of active spectatorship provides an essential ground towards a new aesthetic of art.

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readers are able to select between different paths. Calvino renews the concept of narratives as he presents a new understanding of literary sense. The fusion of different facts of perception creates an open-ended structure. Consequently, the emergent narrative has a structure of intertextuality or even hypertextuality as the content brings together reality and virtuality. The 'interactive' reading structure dissolves the linearity, single-authority and expositional logic and hence generates a field of immersion with a higher degree of interactivity. The outcome of hypertextual literary creation is not intentional; the text develops its own life as it is not foreseen or deliberately controlled by the author. Throughout, the creative process is not distinctive and represents a multiple transparent structure which leaves space for creativity of the receiver. The writing and reading process as a creative act fuse together and the reader becomes the writer and the writer becomes the reader. It is open to diverse transformation of the literary text. Calvino applies his openness process in various novels, with his 1979 book *If on a winter's night a traveler* being of most note.



Figure 3.01 *Conceptual representation of Umberto Eco's 'opera aperta' (Zics, 2007)*

In the same manner as with the treatment of openness, the chapter also examines and re-evaluates the conception of technological interaction (in this thesis comprehended as ‘responsiveness’, see later in this chapter) and suggests modalities for a symbiosis of meaning creation through openness and technologically-emerging responsiveness. Through Krueger’s work it becomes clear that in early interactive art, technology-driven interaction was the major trigger towards an active spectatorship. Therefore, it was noted that by technology brought profound changes to the creative process could not reveal its potentiality for art since its initial application was situated within the framework of the old dualistic artist-artwork and artwork-spectator model. As such, Krueger’s concepts proposed new approaches to art but, because of the gap between conceptual and practical approaches, it maintained a materialistic model. Through Krueger’s mechanistic approach and Eco’s significant conception of a particular role of science in art, this chapter elaborates upon the technological approach of interactivity emphasising a significant divergence from what technology stands for in art. Through an investigation of contemporary theories the aim is to elaborate the emerging character of interaction within its diverse role for technology-driven artistic applications.

Furthermore, this chapter suggests that a conception of technological interaction can serve as an evaluation tool for artistic systems; because of its systematic approach, this evaluation tool can separate subtle layers of technical qualities in the artistic system. This might be useful as it supplies an application for analysis which might demystify technological standards that are often falsely claimed in artistic works. In this sense, the account of responsiveness provides a dual function in this thesis. Firstly, it re-characterises the technological function in art, moving away from Krueger’s misinterpretation which explained the creation of artistic meaning only through the emerging technological character of the work. Secondly, it

produces a spectrum of scientific qualities which more clearly describe the degree of the technological framework. As such, the term of responsiveness produces a novel interpretation of this argument, in that information and communication theoretical accounts are re-interpreted by the artistic conception of openness.

## **ii. The Artistic Account of Interactivity: Openness**

Eco's initial concept of open work emerged from a semiotic investigation of literary transcripts which he explained as potential applications for the creation of multiple meaning and interpretation, which can be comprehended as an open system. He developed this concept into an aesthetic examination of modern art revealing that open works activate their reader/spectator to co-create the artwork. Through this, Eco's concept produces an innovatory understanding of art production in which the artist and spectator were linked together in the framework of an unfinished work of art (Eco, 1989). Eco used the notion of 'work in progress' to declare the new spectatorships whose duty it is to finish the work. The essential point of Eco's proposal is that he interlinked the participatory character with what he termed an artistic meaning creation (Eco, 1989), which he elaborated as multiple meaning perceived by every spectator differently, establishing the new characteristic of spectatorship.

Eco's claim of meaning creation is a crucial conception for the thesis because it might provide a solution how technology produces artistic meaning based on information theory. Elaborating on this notion it has to be noted that Eco differentiate meaning from those qualities in art which refer to 'information' or 'message'. He comprehends that whereas information or message is the content without an interpretation, meaning is the essence of the work which is formulated by the artistic intention and subjectively recovered by the spectator. As such, the

active spectatorship suggests that single meaning produces a spectrum of interpretation in the artwork, which is based on the particular actions of a spectator. In Eco's sense, the degree of openness is determined by the balance between the formulated meaning of the artist and the acquired meaning interpretation of the spectator provided through the artwork. Therefore, it can be said that balance is an aesthetic scale of openness, which elaborates a creative capacity between the artistic creation and the spectator's act.

In order to provide a clarification to the allocated error in the applications of Eco's original conception, the investigation here defines three different layers of the notion of openness. The first layer is Eco's original concept (which the thesis will term as 'semiotic openness'), which in his time was a progressive conceptualisation of modern art and crucial for a profound comprehension of interactive art spectatorship. In this approach the spectator was an active interpreter only in their mental activities, without physically interacting with the work. As this model worked within a materialistic framework, in which no structural modification of the artwork was enabled, this first layer is unproductive to the thesis' aimed application of openness. The second layer relates to applications in interactive art, which recognise Eco's concept as being similar to interactive spectatorship but do not re-evaluate this in a new technological context, therefore providing a false implementation to art. The thesis will introduce a new third layer of Eco's concept (termed as 'structural openness') which identifies his model as an early example of the 'artist-artwork-spectator' triangle established in chapter 2, and suggests a re-evaluation of the first layer of openness. These three layers serve a main objective of this chapter by laying down technologically-mediated openness.

Eco's original concept built on the negation of modalities of art which solidly places the artist at the centre of the creation. He examined the Italian theorist Benedetto Croce's (1909

[1902]) primary idea that declared art is a pure intuition (not logical knowledge) which can directly communicate with the receiver's mental apparatus and therefore the artwork and the spectator's interpretation has no efficiency in the creation. Croce's model suggests a fairly restrained conceptualisation of the spectatorship, ignoring its role in creation entirely. For this reason Eco denied this model and argued that the spectator has a crucial status as a translator. By characterising openness, particularly in art, Eco engendered a cross-genre art form termed 'informal art', which is particularly driven from an aesthetic of active spectatorship and is here defined as the first layer of (semiotic) openness. Eco stated that the initial characterisation of informal art, which he declared as a visual art form, concerned intentions about reproducing the phenomenon of 'motion' in the artwork. He referred to painting techniques which tried to express mobility, most profoundly identified in the conceptualisation of dynamics in futuristic and cubistic works. Eco comprehended these new characteristics as significant as they redefined the structure and created deconstructive forms. He declared that artworks exhibiting kinetic movement (for example kinetic sculpture) produce a heightened openness and non-reproducible experience for the spectator. Exemplifying this experience, Eco depicted that, whilst the artwork and spectator are in motion, the spectator chooses his or her point of view, producing the specific connections and interpretations. Eco asserted this as the following:

The 'reader' is excited by the new freedom of the work, by its infinite potential for proliferation, by its inner wealth and the unconscious projections that it inspires. The canvas itself invites him not to avoid causal connection and the temptations of univocality, and to commit himself to an exchange rich in unforeseeable discoveries. (Eco, 1989, [1962], p. 91)

Through this conceptualisation, Eco's model of active spectatorship declared a different account to that presented earlier by performance-based participatory art form. Whereas live performances



produced a variety of interpretation by the provocation of the audience, Eco explained an activation of the audience through the diverse qualities of ‘motions’ implemented in artwork. The similarity of these accounts is that both still elaborate a ‘one-way’ communication in which the spectator is just a receiver with a higher involvement (through the motion of the spectator or the artwork).

Interactive media artworks offer the potential of a two-way communication that leads to a structural modification of the work (Figure 3.02). A common error of Eco’s concepts in applications of technology-based art production was the false acknowledgment that they both work along an active spectatorship, not acknowledging the diverse quality of artwork-spectator interaction. Eco’s concept, as it was illuminated earlier, was situated in avant-gardism when art and science had rediscovered each other once more and technologies were rarely implemented in art creation; therefore he could not characterise a technology-based application. As such, the misapplication was caused through a direct use of the avant-garde aesthetic, which merged with a new materiality of technology in initial forms of technology-based art. Therefore, the problem lies in the application, in which Eco’s original concept could not operate effectively, as it was not able to produce a meaning to the structural modification of the artwork.

Elaborating on a constructive implementation of openness, this chapter separates Eco’s initial model, termed here as ‘semiotic openness’<sup>16</sup>, from the thesis adaptation of Eco’s model into the novel technology-based application of ‘structural or physical openness’. The ‘structural or physical openness’ refers to Eco’s (1989, p.87) early proposal of informal art: ‘...they [artworks] characteristically consist of unplanned or physically incomplete structural units’. The idea of ‘structural or physical openness’ is different to the earlier accounts as it triggers explicit

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<sup>16</sup> A ‘semiotic openness’ refers to Eco’s initial concept of openness that allowed a multiplicity in the interpretation or meaning creation (mental processes) but no modification in the work itself (as interactive artwork allows).

## WINDOWS

*Other World - recreation*

## MIRRORS

*New World - simulation*

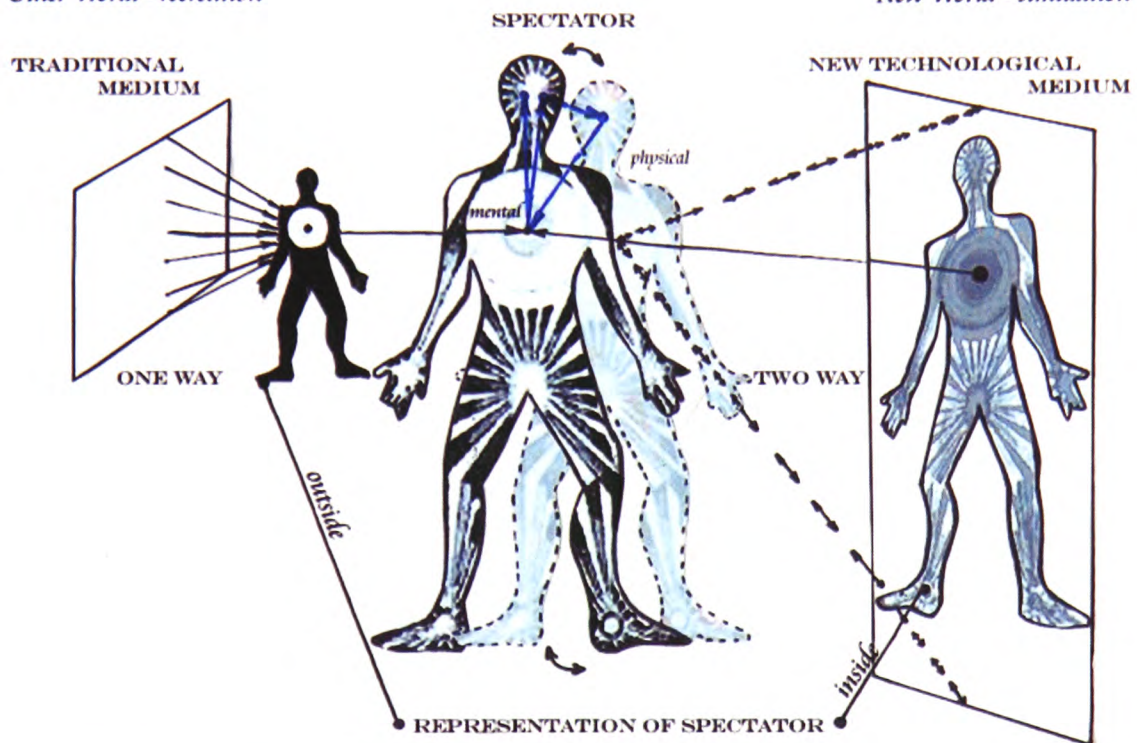


Figure 3.02 *Conceptual draft: Communication processes in traditional mediums (one-way) and in technological mediums (two-way) (Zics, 2007)*

changes in the artwork which immediately reflect upon the spectator's experience. A radical change occurs, formulated through the generated immediacy between the artist and spectator; this allowed for an increase in the spectator's involvement and generated modifications in the artwork itself. Through the re-evaluation of Eco's model, in which the artist still carries the central role of the creative processes, 'structural openness' was found to provide a new approach to art production in which the artist and spectator are interconnected through their experiences and so are placed on the same generative level. As such, structural openness is considered the meaning creation of interactivity, which is most significantly characterised in the spectator's subjective experience and through this generates a unique aesthetic dimension.

Therefore, Eco's initial view that the spectator has a generative role in the creative process produced a revolutionary recognition that draws out a new understanding of structural openness, in which the concept of meaning creation established an interconnection between artist and spectator. Following these claims, it can be suggested that the concept of open work segues an immaterial conceptualisation of art. As a result, Eco's dualistic interpretation, in which the spectator's activity was reduced to multiple meaning creations, is transformed into a constructive model contributing a novel aesthetic of interactive media art.

### **iii. Meaning Creation as the Crucial Quality of Artist-Spectator Interconnection**

As mentioned earlier, Eco's openness is of particular significance, as it provides an account of multiple meanings, which signifies the linkage between the artist and the spectator. The new adoption of structural openness brought a solution to interactive art which explained meaning creation as a solution to aesthetic. Elaborating the meaning creation in technology-based art,

Eco's application of information theory<sup>17</sup> is particularly meaningful because, through a mathematical-based evaluation, it reveals qualities that are not only useful as an aesthetic tool for an artist (see chapter 6 discussing a practice aspect of this thesis, the *Mind Cupola*) but also provide new insight and address a new immaterial dimension between artist and spectator. From Eco's point of view the artwork is a communication system. A message of the artwork, according to Eco, can be described as a carrier of information which, by the means of the interaction, transports the meaning to the spectator. He comprehended creative processes as a highly compressed information-exchange which displays 'contravention of conventions' and therefore exhibits a high improbability and unpredictability:

The meaning of a message is a function of the order, the conventions, and the redundancy of its structure. The more one respects the laws of probability, the clearer and less and less ambiguous its meaning will be. Conversely, the more improbable, ambiguous, unpredictable, and disordered the structure, the greater the information – here understood as potential, as the inception of possible orders. (Eco, 1989, [1962], p. 91)

Eco termed this phenomenon as 'ambiguity' and he elaborated it through the mathematician Norbert Wiener's<sup>18</sup> theory of disorder (Wiener, 1948). Wiener's theory explained the message as an organised system which might produce disorder regarding its degree of organisation. Following Wiener's claims, the mechanical approach evaluated information as order and the

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<sup>17</sup> Eco presumes that information theory is the science that accounts for the quantity of the information in the message. Nevertheless, Eco points out that large quantity of data in artwork does not necessary mean a high degree of meaning.

<sup>18</sup> Norbert Wiener (1894-1964) is a well-known American mathematician and theorist whose work had greatly influenced information and communication theory. He was pioneering in the study of probability theory and the development of informational theoretical consideration of noise. He is also the founder of cybernetics which examined complex systems, communication processes and control mechanisms and initially established the notion of the closed loop or feedback. Wiener also used the term to compare animal and human information and communication processes to technological systems, with an eye to the potential development of artificial intelligence (Ilgauds, 1980).

contrary is consequently the entropy<sup>19</sup>. Therefore, from an information theory point of view, to increase the information in a message requires an increased probability of noise. Eco proposes that the level of disorder is immediately linked to unpredictability and multiplicity; therefore, multiple meaning in art is an aesthetic challenge of disorder. He further suggested particular tools with which to achieve ambiguity in art; for example, encountering accidents and chance in experience or using 'uncommon connections' or 'unusual laws' to create wonderment in the experience (Eco, 1989, p.94).

With his conceptualisation of information theory, Eco built a strong connection to other participatory forms mentioned earlier in Krueger's account, which differ from Eco's theory of informal art, as they are built upon the structurally altering potentiality of technologically-mediated art. It is argued here that, through the concept of openness, it is possible to observe where Krueger's error lay in its application using John Cage's aesthetic claims of spectatorship. As a consequence, it can be suggested that Eco's model of meaning creation also provides a potential tool to evaluate Cage's participatory understanding. From this perspective, John Cage's work was entirely based on the idea of indeterminacy, which he conceptualised as the participatory involvement of the audience. In a similar manner to Eco's suggestions of 'uncommon connections' or 'unusual laws' (Eco, 1989, p.94), Cage (1961) suggested the model of 'chance operation' which processed patterns of sound and silence involving accidental voices in the performance to avoid closed structures in the creation, as, he claimed, was common in traditional art. The usual physical manifestations of art through his model were replaced by sound, movements and gestures, which constituted his formulations of meaning creation based

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<sup>19</sup> In information theory entropy means the measurement of uncertainty with regards to random variables, random processes and dynamical systems. It is based on Shannon's theory of communication (1948), which quantifies the expected information value in the message (Gray, 1990). In this respect noise in the communication channel means a high uncertainty or entropy in the dynamic system.

on an aesthetic oscillation of order and disorder. Through imitating nature-like processes, which generate close interaction between chance and audience selection, Cage enabled the audience to make their own interpretation, with the result that the audience and creator were equally involved in the meaning creation. One of Cage's well known performances was his instruction of a performer to sit at a piano and to raise the keyboard cover at the beginning of the piece and then remain motionless for 4 minutes and 33 seconds. The piece finished with the act of closing the keyboard cover and bowing to the audience. In this performance Cage conceptualised the chance events drawing the spectator's attention to a re-discovery of everyday sounds as meaningful events. Cage's participatory art introduced a particular form of interaction which focused on more destructive ideas between artist and spectator, producing a very particular aesthetic. From this perspective, Krueger's misinterpretation of Cage's work lay on this particularity, as Krueger could not deal with the deconstructive qualities of aesthetic in technology; therefore, he only partially applied Cage's model, losing his original aesthetic message. As a result Krueger's work inherited a participatory character without a particular aesthetic for technology-driven spectatorship.

Since the thesis has revisited and resituated the old participatory art forms of live performance and semiotic openness within an aesthetic declaration of the errors of Krueger's work, it will now suggest a particular application of information theory as meaning creation in technological art, elaborating Eco's declaration of ambiguity for art. Eco states that an artistic system needs both certain forms for obviousness within a practical function and a characteristic of ambiguity, the oscillation of which creates novelty in the meaning. Eco depicts the example of the Byzantine mosaic that includes both a formal system through the matrix of the mosaics and an ambiguity through the repeated representational forms. Thus, the entire matrix of the mosaic

encompasses the message in which every mosaic has its own place and angular offset. As the system has to communicate a clear figurative signal from a particular perspective, the colour and angle of the bits within a collaborative process duplicate each other's signals. Through the ambiguity of the particles it produces a clear noiseless message of a holistic figurative representation. The argument here proposes that, in the same manner, an interconnectivity between technological interaction itself and artistic meaning creation can be comprehended. According to Eco's assumption, an ambiguity between action and reaction informs an aesthetic layer; thus, between the spectator activity and the artistic meaning, an unambiguous and heightened openness of an aesthetic experience might be created. In this thesis it is proposed that informational theory for meaning creation provides meaningful ways for an aesthetic in which the artist's decision on proportion of order and disorder produces the quality of interaction.

Importantly, this chapter acknowledges that this new technologically-mediated meaning creation is not only based on artistic content (seen earlier by Eco's semiotic openness) but also on the technological surface or interface (which later in the thesis this will be called 'medium', see chapter 4 for more). This new character of technology in art is defined by the fact that technology is not only a tool in the creation processes but also constitutes an aesthetic representation which is the artwork itself. It carries novel functionalities which lead the spectator to a wonderment of ambiguity by the artistic message. As such, in structural openness the medium itself becomes part of the meaning. Through this character it can be suggested that Eco's ambiguity concept can be applied in a more general sense, pointing out that interactive media art applies both a formal system which is obvious (in the form of the technology) and an ambiguous artistic content, to which the novelty of technology belongs. Therefore, designing artistic interfaces (using technology as medium) is understood to reproduce Eco's idea of an oscillation

between functionality and content production within the novel surface of meaning. As a consequence, artistic interfaces have to diverge from the typically technology-driven interfaces because they are created with the requirement of both functionality and artistic meaning creation (chapter 4 expands upon this, discussing the transparent medium). One application of information theory in art production is that Eco (1989) declares that a ‘controlled disorder’ is the crucial decision that the artist has to make between the functionality and artistic content for a noiseless interconnection between artist and spectator. This recognition is significant since Krueger dismissed interaction through a formal application and, instead of a meaning creation; he prioritised the functional certainty of action–reaction. Krueger, after his initial work of *Glowflow*, continually attempted to improve the functionality of interactive technology, whilst ignoring the possible artistic meaning of interactive processes which did not implicitly rely on powerful functionality. As such, Krueger’s work missed the opportunity for recognising that concepts of participatory art are not just about participation but also about a meaning creation as well.

The interconnection between the artist and spectator can instead be described using Eco’s meaning creation, in which the spectator’s actions have subtle meanings towards a novel experience. When the interaction embraces meaning creation, the artwork generates a poetic level which might produce a new knowledge in the spectator’s consciousness (which will be expanded upon in chapter 6). Through Eco’s account, Krueger’s deficiency is accounted for, since, instead of applying a meaning to the actions, he worked towards functional solutions. Eco’s multiple meaning has shown that interactive technology is able to evolve a crucial artistic dimension, which does not initially rely upon how effective the technology is. Therefore, Eco’s



concept of meaning creation in the framework of technology-based art production provides a crucial conceptualisation of interactivity, allocating significant quality towards a new aesthetic.

#### **iv. The Technological Account of Interactivity: Responsiveness**

The previous sections of this chapter have highlighted that approaches based upon information theory, despite their general mechanistic approach, can offer a meaningful application which should not be understood as an aesthetic scheme but rather as a tool for creation. This chapter will now examine the technological account of interaction, which provides an emerging character that enables new ways of artistic expression but which in itself cannot articulate an aesthetic. The discussion emphasises that understanding technological potentiality is crucial to art, and therefore it has to be defined in a sophisticated framework to avoid the misapplications in aesthetic produced in initial accounts of interactivity. It is also crucial to clarify that this emerging quality is a mechanistic approach which dynamically redefines itself within a technological effectiveness that often produces an attractive novelty to art. As an aid to art in comprehending these characteristics it is suggested that modularity identified in order to help the evaluation and application of technology in creative processes. The argument here will point out that interaction can be applied only in the framework of structural openness if it ought to generate an aesthetic dimension through interactive technology.

This chapter examines a technology-driven interaction through the notion of 'responsiveness'. As no common account exists for the specific role of technology in art, the thesis builds upon a cross-disciplinary investigation of media theory, communication theory and information processing theory which attempts to summarise scientific approaches of technology that assert a machine-centred quality of the interaction. The notion of responsiveness describes

here a reaction capability (such as feedback) and its various qualities in the system; this reveals the technological aspect of an interactive system. Practically, responsiveness appears on the technological surface of the system as the 'interface', which is the artistic medium on which the spectator is invited to act upon.

The approach that this chapter focuses on is the characteristic which bares most similarity to interactive artworks, the so-called human-computer interaction (HCI). The theories show an agreement that interactivity is an over-used, under-defined concept (Heeter, 2000) and cannot be defined by a single description because of its multiple characteristic (Braman, 1989). As a result, the discussion initially attempts to recognise a meaningful application for art, which enables a differentiation between diverse technological qualities and subtle states of the system. In order to achieve this, this chapter will outline numerous theories exemplifying meaningful characterisation of responsiveness. Identifying an appropriate approach, the argument here draws out a potential model for technologically-mediated interactivity which meaningfully applies technological capacities in the creating art process and in the same manner evaluates this based on scientific models. This model does not claim an aesthetic quality of interaction but provides a useful tool to artists.

In this respect, there is a common approach formulated in numerous accounts (Dance, 1967; Winograd, 1977; van Dijk, 1985; Durlack, 1987) which links technological interaction to a desire to recreate a quality represented in human-to-human communication:

...face-to-face communication is held up as the model because the sender and receiver use all their senses, the reply is immediate, the communication is generally closed circuit, and the content is primarily informal or adlib. (Durlak, 1987, p. 744)

This suggests that a technological approach to interaction can be understood as a desire for the highest degree of unexpected action in the machine and human information exchange; thus, it

aims to mimic human-like communication. The idea of humanised interaction was suggested initially by the English scientist Alan Turing, who introduced the ‘Turing-test’ (Turing, 1950). This test attempted to inquire into the question of whether machines can think or rather are able to produce intelligence. Turing’s model was based on the assumption that machines have to perform as humans do, and in order to measure this he set up his ‘imitation game’. In the test, two agents are questioned, a human and a machine, and their responses examined based on the hypothesis that they were human. Turing presumed that if the two results cannot be differentiated from each other, the machine is ‘intelligent’. Although the Turing-test never truly gained a success as machines were far from acquiring human capabilities, Turing’s concept stands as a symbol of working towards a desired level of human-machine interaction. More importantly, interaction through Turing’s imitation game was described as a ‘degree of humanisation’, which enabled a measurement of responsiveness according to the degree of stimulation. The way Turing elaborated interaction led to a higher complexity of interaction, termed Artificial Intelligence (AI). AI is a prospect of interaction aiming to model intelligent systems with heightened interaction, which might provide an answer for Turing’s vision and therefore also an answer for technological interaction.

Whereas the ‘Turing-test’ generated a vision of mechanistic accounts of interaction, interactive technologies only produced qualities which were far from characteristics of human-to-human communication. In order to elaborate on a spectrum of interactive qualities in technologies it is necessary to allocate theoretical treatments that efficiently display these layers. As it was mentioned earlier, a model of interaction cannot be generalised, but only specified; therefore the following discussion focuses on particular interactive technologies and their applicable qualities in artistic productions. In this respect, it will focus on the particular

interactive medium of VR<sup>20</sup> in art as it exhibits a variety of qualities and degrees of interaction. By addressing this perspective, the intention in this thesis is to select a comprehensive model of interaction which is able to evaluate the degree of interaction in an interactive system.

In the contemporary conceptualisation of interaction, various accounts have been characterised that often provide only a theoretical explanation without a coherent practical model. Numerous theories explain interaction, for example, as a 'style of control' (Guedj et al., 1980; Rafaeli, 1988; Finn, 1988; Rogers, 1995) which evaluates interactions through its features. Accordingly, Rafaeli (1988, p. 110) stated that: '...one of the distinguishing dimensions [of interactivity] is the level of control the consumer has over the information system'. In a similar manner, Finn (1988) described interactivity as the sender/receiver proportion of control in the creation and presentation of the message. Thus, concepts of the 'style of control' elaborate on how well the user can act in the system, particularly using characteristics such as timing, selection and to what extent the system is able to 'control' the user. Through the potential to control and the quality of its displayed content, the 'style of control' accounts for the degree of controllability. Extending this towards a model of multiple qualities, Sally J. McMillan and Edward J. Downes (2000, p.157) suggest that the primary characteristics of 'control' and its 'amount of distribution' should be considered, as well as the characteristics of 'action-reaction efficiency' and 'perceived goals'. As such, the thesis acknowledges that the features-based approach elaborates significant aspects; however, in a comparable manner to that which McMillan and Downes have illustrated, this single process is not able to sufficiently elaborate characteristics produced in artistic VR systems. A particular feature analysis is only useful when

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<sup>20</sup> See also Krueger's account earlier in chapter 2.

an artistic system specifically uses this tool as meaning creation (see earlier in this chapter; structural openness).

Besides concepts that allocate interactivity in features, the other broadly treated concepts of interactivity are approaches which describe interactivity through the 'quality of the message' (Rafaeli, 1988). Rafaeli (1988, p. 120) explains responsiveness as: '...feedback that relates both to previous messages and to the way previous messages related to those preceding them. With the term 'contingency view', Rafaeli claims that interactivity is a 'process-related construct' with its own entity. Thus, interactivity is not implicitly a feature of the medium as seen by the earlier models but rather a quality of information exchange (Rafaeli and Sudweeks, 1997, p. 3). The interactive system in Rafaeli's account is suggested to generate a response which, to a certain extent integrates the user's previous responses. In his view only relatedness beyond action-reaction evaluation can describe interaction. Applying Rafaeli's concept, the first level is 'non-interactive' or 'declarative' (Rafaeli and Sudweeks, 1997) in which interaction constructs a one-way communication without a feedback system. The second level is the 'reactive interaction', which dictates that the message has just one immediate response: a system in which just one party is really active. Thus, it does not represent a feedback system but is 'quasi-interactive'; though the user can achieve changes, the recursive system only responds on a limited level. The 'fully interactive system', as Rafaeli classifies it, not only communicates an open message but also precede it with a qualitative response, which means that the roles in the communication are interchangeable between the participants. Rafaeli concludes that full interaction can be achieved just by technologically-mediated human to human communication. In a similar way to the earlier accounts of 'style of control', Rafaeli's model provides meaningful elaborations towards a mechanical definition of interactivity. Yet, because it only focuses on characterisation of an

exchange and does not account for a great variety of interaction levels, the discourse here does not apply this for artistic system production and evaluation.

Although the simple process models of 'style of control' or 'quality of message' describe important characteristics of how interaction can be understood in the context of technology, they do not provide a scheme for the artistic creation which represents subtle and multiple dimensions of interactivity. The problem possibly lies in the fact that these conceptualisations focus only on conflicting, various qualities of interaction, but do not examine variety within one medium, such as the interactivity between two different web-pages. As a model does not exist which describes qualities in such a high complexity of the medium, the investigation relies on models which mainly focus on 'media interactivity'<sup>21</sup> but are able to provide more dimensionality in the interconnectivity of qualities. Even though the outcome of this investigation offers a model for responsiveness in artworks, it still remains provisional due to the need for further re-evaluation. This is caused by the earlier mentioned emerging characteristic of technology, which produce higher complexity or novel structures extending and reframing existing modalities of responsiveness.

Working towards an efficient model of technological interaction, the following argument will undertake an investigation into multi-dimensional approaches of interactivity (Laurel, 1986, 1990; Heeter, 1989; Goertz, 1995), which might provide a more suitable evaluation towards responsiveness, as they embrace multifaceted characteristics of interaction. Through an investigation into the multiple characterisation of interactivity, most particularly the spectrum of qualities, complexity and functionality, the thesis allocates Lutz Goertz' (1995) four-dimensional

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<sup>21</sup> The term 'media interactivity' in this thesis refers to a tendency in media and communication theory to describe interactivity as a spectrum of qualities in media and differentiating those qualities from each other (for example interactive TV from internet). This approach does not elaborate on a spectrum of interactivity within one particular medium.

approach as being particularly useful<sup>22</sup>. Goertz' model draws out more than 500 patterns of interaction through his criteria of 'degree of choice available', 'degree of modifiability', 'quantitative size of the available selections and modifications' and 'degree of linearity/non-linearity', exhibiting a wide spectrum of qualities required in artistic applications. All of these dimensions contain their own separate continuum which Goertz valued with a degree of interactivity rated between 0 and 4. Through this, it can be suggested that responsiveness offer meaningful application through Goertz' model providing subtle differentiation of interactive qualities in particular artistic systems.

The first dimension of Goertz' model is concerned with the amount and variety of possible options during the viewer's reception (see Appendix 1.1). This dimension differentiates between predefined choices, such as those given by web-sites, and where the options are multidimensional and users can reach different levels of experience, such as in VR. The second dimension is the 'degree of modifiability' (see Appendix 1.1), which describes the potential of creation for the user; namely to what extent the system can create new content through the actions of the user and the potentiality to store the messages. Applying this to interactive art, this dimension can be exemplified through two diverging approaches. The first approach describes the modification through the spectator's real-time actions creating a particular time-space experience and in this way does not fulfil Goertz' requirement of storing the content. The other approach, which fulfils Goertz' proposed quality of storing, is when the user's action is captured and saved in the system or, even more, their action modifies the system. In this approach the spectator's act does not disappear but is recallable or permanently affects the system's status.

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<sup>22</sup> There are numerous concepts which use multiple characteristics to describe interactivity such as Brenda Laurel (1990) and Carrie Heeter (1989); however, the investigation here understands these as not the most meaningful application for interaction of artistic systems.

Through this it appears that Goertz' concept of the quality of saving capability builds more upon the requirements of technologies which are used in the 'making art' process (more extensively explained as the concept of 'tool' in chapter 4) rather than technologies which are itself artistic presentations (more extensively explained as the concept of 'medium' in chapter 4). This dimension allows the user the highest input of change. The third dimension (Appendix 1.1) is the 'quantitative size of the available selections and modifications' which describes the quantity of the two former dimensions (Goertz, 1995, p.487). Lastly, the 'degree of linearity/non-linearity' (Appendix 1.1) refers to the qualities of information narrative, such as the tempo or progression of information, during the time of user communication. As an example, on one hand a movie provides the viewer with a system where they have no influence in the temporal sequences, whereas on the other hand hypertext would provide highly connected information.

This multiple model of interaction, here elaborated as a potential model of responsiveness, describes a more meticulous scheme, as it provides a spectrum of interaction with particular combinations and degrees of quality. Although some criticism claimed that Goertz' model is not coherent in practical application, as it produces too many variables and the third and fourth dimensions might be repetitive (Jensen, 1998), through this chapter's argument it can be pointed out that artistic systems can be meaningfully evaluated only through this multiplicity that defines the subtle differentiations of responsiveness. Furthermore, the argument presumes that through using a multi-layer structure, redundancy can be reduced by simply blending out unimplemented dimensions, producing a compact tool for technological potentiality in interactive systems.

Accommodating Goertz' systematic approach as a framework for interactive media art production, this chapter's argument suggests a particular differentiation, as was acknowledged



earlier by Goertz' second dimension, between 'implementations as tool of the artwork'<sup>23</sup> and 'implementations as medium of the artwork'<sup>24</sup>. The two approaches, which will be elaborated on in the following chapter as the division of tool and medium, describe diverse characteristics and functionalities in the creative processes; therefore, they need to be treated separately as they are seeking diverse kinds of responsiveness. The 'making art'<sup>25</sup> process, in which technology is used as a tool, stresses qualities which provide a high degree of modification through which high scale information is transformable (for example programming languages and modelling software). In the 'experiencing art' process<sup>26</sup>, where technology is a representation (as in artistic interfaces), there is more emphasis on the qualities which immediately effect the user and do not carry a complexity of provided information (as in certain interfaces which may be easier to learn) (Figure 3.03). Therefore, technology as a tool is related to qualities provided in the second and third dimensions and technology as a medium is linked to qualities of first and fourth dimensions. This chapter has also identified that there are variations in, and overlaps between, the 'technologies as tool' and 'technologies as medium', because artworks are often multifaceted in their technological qualities. It has been emphasised that an application of Goertz' model as a tool for analysis on established artworks might dissolve the artistic mystification that often occurs in technological elaborations of art systems. In this application a state of interactivity serves to describe qualities of the artwork without an aesthetic declaration.

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<sup>23</sup> Implementing the tool means using the technology in the 'making art' process; for example, when the artist uses specific software to create, program and model the work of art.

<sup>24</sup> Technology as medium is mostly considered as an interface or other functional unit of technology. It is significant to the argument here as the user with this surface of technology interacts. As such, the design of this surface shapes the user's perception. Therefore, this type of implementation bears different qualities from the tool.

<sup>25</sup> The 'making art' process refers to the creative process when the artist produces its artwork. It also described as artist-artwork interconnectivity.

<sup>26</sup> The 'experiencing art' process refers to the creative process when the spectator is confronted with the artist produced artwork. It is also know as artwork-spectator interconnectivity.

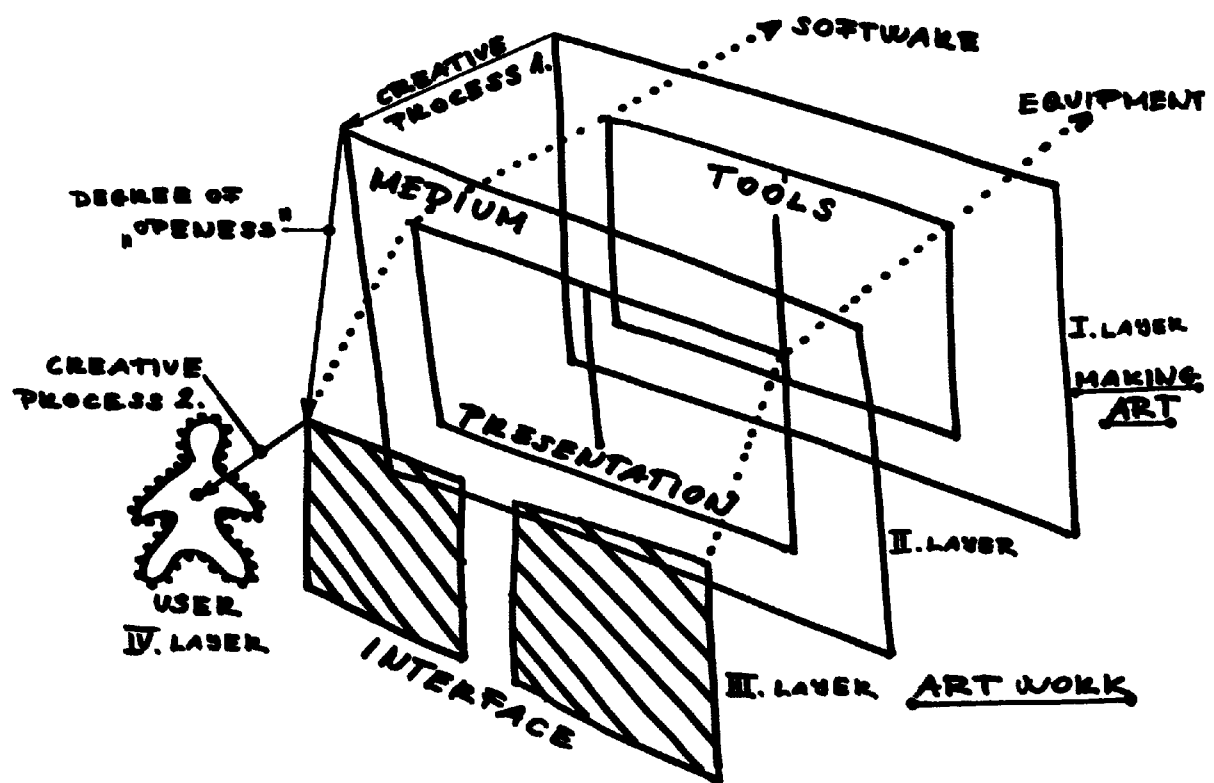


Figure 3.03 Conceptual draft: tool and medium as applications of 'making art' and 'experiencing art' processes (Zics, 2006)

As such, it has been recognised in this chapter that applications of Goertz' model on art production or on complete interactive media artworks exhibit diverse processes. An application in art production characterises an implementation which uses the technology's emerging character as a tool (but not meaning) of aesthetic. This is based on the thesis' observation that in interactive art production artists create not only artistic content but the technology (artistic interface) as well. From this perspective, the technology provides a new layer of meaning and also still serves as an instrument for the creative process. This acknowledgment is key since many of the misunderstandings emerge from this novel characteristic of art creation (that technology is also a medium), which mistakenly elaborates emerging qualities as a meaning. The argument in this chapter criticizes this approach and points out that this concept is what produced the mechanistic bias in Krueger's legacy. The constructive application of technology, as it is proposed here, concerns a technological functionality that is intrinsically linked to artistic meaning; therefore, technology in art does not stand for itself but as support of the artistic concept and experience.

However, a meaningful application of the mechanistic model is the technological analysis of the artwork through Goertz' four-dimensional model. This model might offer a useful conception since interactive media artworks often provide technological descriptions which do not concern the original contribution of the technological development. A recognition of emerging qualities in the artwork is significant, since they often influence the 'artistic meaning creation' and also because the functionality might contribute to other, perhaps non-artistic, technological developments. Goertz' systematic analysis enables to make this gap between conceptualisation and application visible. Although the systematic technological analysis does not provide an aesthetic improvement, it enables validation of conceptual claims, in particular

the interconnectivity of technology and artistic vision and how far technology provides an emerging or creative character. This application is effective through an independent evaluation applied on the artistic system, as such possibly not from the artist.

Through the overview of contemporary concepts of interactivity, a particular approach has been identified, which uses interactive technology for creative knowledge or experience and has not yet been explored through a systematic evaluation based on technology. The models of interactivity, which usually emerge from information and media theory had to be re-evaluated using an analysis of interactive systems, which do not attempt to compare media (as in many earlier models, including Goertz') but describe the degree of interaction in a unique interactive media artworks. Goertz' model assists and evaluates aesthetic qualities revealing the potentialities of the novel role of technology in art production. From this point of view, the emerging character of technology is a quality but does not determine the aesthetic. This thesis furthermore attempts to establish a new approach to how interaction treats attributes of choice, modifiability, available modifications, linearity or non-linearity as tools of meaning with which the emerging character of technology can be improved, refined and combined in new ways. As a result, the emerging character of technology means not an amplification of unknown sensations of technology but an extension of earlier characteristics of artistic meaning creation.

In summary, this chapter has resituated two major concepts of technology-based art production: openness and responsiveness, which, in re-evaluation, serve as useful modalities in establishing a new aesthetic in interactive artworks. Eco's semiotic openness has been re-evaluated as structural openness, which re-allocated the spectator in the same generative role as the artist's technologically-mediated creation process. Through this new understanding, which depicts technological interaction as an application of structural openness and meaning creation, it

has illustrated Krueger's practical errors which were located in the false interlinking between participatory character (openness) and technological quality (responsiveness). The identification of this by the thesis brings an immaterial dimension to art, which is identified as the meaning creation and aesthetically interconnects the artist with the spectator. The revision of the role of the technological quality of the artwork has further amplified the dimension of immaterial aesthetic as it situated emerging characteristics of technology into a tool function instead of an aesthetic quality. In this view, technology in art represents a unique implement, which, by means of experience, enables immaterial qualities of art and so provides an innovative perspective for artists in their practice.

The critical revisions in this chapter produce a useful application providing the grounding for a new aesthetic model for interactive media art. The outcome of this chapter's investigation, which characterised a novel immaterial dimension in art, is that has opened up an insight into art production which will be discussed in the following chapter through Heidegger's phenomenological theory of technology. The application of Heidegger's concept to the term of 'invisible tool' will address the earlier mentioned division of technology into tool and medium within an evidence-based declaration of immateriality. This will provide a solution to how the earlier recognised 'artist-artwork-spectator' interconnection might be understood as a new aspect for an aesthetic within interactive media art.

## Chapter 4

### **Technology in Art: Invisible Tool and Transparent Medium**

#### **i. The Philosophy of Immaterial Art**

This chapter attempts to establish a philosophical conception based on the framework of phenomenology, which has recently been recognised as meaningful for practical approaches to human-machine interaction (Ihde, 1991; Dourish, 2002), but has not been considered specifically for technology-based art production. With this, the thesis seeks an experience-based approach which can serve as a relief from the Krueger inspired mechanistic comprehension of interactivity in art. Through the re-evaluation of Eco's participatory account of openness and Goertz' technology-driven responsiveness the thesis has prepared the foundation for strategies to revisit Krueger's misguided aesthetic. In their new formulations these accounts emphasise a meaning creation of interaction where the interactive technology is only a potential instrument for the art production and not an aesthetic solution itself. Through this critical revisionist approach it reveals an understanding for art which has the potential to describe the characteristic of the 'artist-artwork-spectator' triangle accommodating an immaterial layer of technology-based art production.

The phenomenological approach in the thesis serves as a solution to Krueger's mechanistic view of art, as it is based not on formalised knowledge but on the phenomena of experience. From this perspective, this chapter's discourse focuses, in particular, on Heidegger's concept of the tool which, it will be argued, provides a model for describing technology through a cognitive and immaterial encounter. Comprehending tool-usage through experience in a Heideggerian sense provides an object-oriented ontology of technology which in this thesis will

be termed 'invisible tool', and declares an interaction between an interface (the tool) and its user as being cognitive processes.

The term 'invisible' emerges from Heidegger's conceptualisation of the tool which he comprehends as something that is invisible through which things become visible (Heidegger, 1967 [1927], p. 97). Invisibility in Heidegger's case refers to the phenomenon he described as the tool disappearing for its user during its use (which he termed as 'ready-to-hand', described later in this chapter). Based upon a meaningful elaboration of technology-based art production, the thesis draws out the essential understanding of Heidegger's concept that the 'invisible tool' can be applied to both physical and cognitive properties. In many previous applications of this concept these two perspectives have mostly not been differentiated<sup>27</sup> and led to many misconceptions.

In order to avoid similar errors, this chapter suggests differentiating Heidegger's original concept and its application through other interpretations, to generate a meaningful understanding for technology-based art production. In one account invisibility stands for a non-material quality in art, which claims that technology-based creation opens up an opportunity for experience-based applications, which result in a dissolving of physical object creation. This means that there are no actual physical properties involved in the production of the artwork, but that the instruments are embedded in the user's environment. The other conception that emerges from Heidegger's writings, and one that in this thesis is assigned as an absolute necessity, is the cognitive modelling of the 'tool-user' (in this argument's case, the spectator/user) which embraces technology as an affection of the spectator's psychological processes. As will be exemplified in

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<sup>27</sup> In many concepts the one characteristic triggers the other. For example, a physical invisibility of technology might produce a cognitive physical phenomenon that, however, in most concepts is comprehended only as a quality of invisible characteristics (see later in the chapter's argument).

this chapter, both conceptions make meaningful contributions to the creative processes, but the latter is the one which lays down a backbone for a new aesthetic for interactive media art.

Heidegger's phenomenological understanding leads to fuller consideration of Goertz' responsiveness, which produces a particular division of technological implementation in the creative process as either tool or medium. The division helps to account for agency in the interconnection of artist and spectator, elaborating on the creative processes as a linkage between them. This chapter's main contribution is a re-interpretation of Heidegger's invisible tool in the context of interactive media art, through which artistic interfaces (the medium) are considered not only as an invisible but also a transparent entity. The relationship between the invisible tool and transparent medium and their particular reflection on the spectator's experience (later described in this thesis as the concept of immersion) moves the argument towards a new aesthetic of interactive media art.

## **ii. Heidegger's Invisible Tool**

Heidegger's influential philosophical approach which built upon the writings of Edmund Husserl (1920) negated a formal mechanistic understanding from the sciences and envisioned a philosophical approach based on subjective experience. Heidegger, as a student and developer of Husserl's work, established his phenomenological approach in his text *Being and Time* (1927). Applying this text as the primary source of this chapter's discourse, Heidegger's essential idea of the tool will be introduced in an attempt to produce a practical account for art that conceptualises his metaphysical approach. Although Heidegger, in his later work (1949/1954), enriched his



phenomenological conception of technology<sup>28</sup>, this discussion will rely on conceptualisations which provide a novel insight into technological applications for art and the new spectatorship (discussed earlier in chapter 2). As Heidegger's philosophy most frequently relies on a hermeneutic approach within a particular rhetoric, this investigation will attempt to remain within his terminology, expressing the aspiration of the thesis of providing a comprehensible articulation of his idea.

Heidegger's concept is one of the original comprehensions of object-oriented ontology, which has been rethought by many scholars since (Schultz, 1932; Merleau-Ponty, 1962; Ihde, 1979; Harman; 2002) and also applied in practice (Winograd and Flores, 1986). The primary approach of Heidegger's tool argument arises from questioning the meaning of 'Being'. To comprehend the tool within the framework of the Heideggerian philosophy, an investigation into the ontological conception of Being, which immediately links to Heidegger's understanding of the world, seems necessary. The central notion in his philosophy is *Dasein* ('there-being'), which, in Heidegger's view, is the essence of being human and describes a quality of self-awareness. Heidegger asserts that *Dasein* means 'Being-in-the-world' as it occurs in the present; however, it has to be clarified that *being-Dasein* does not equate to an objective presence of *Dasein* but to that which in the terminology of the thesis may be described as an invisible essence of Being. This key distinction profoundly clarifies Heidegger's view, explaining that the essence of Being is *a priori* 'within-the-world'; it is independent of the knowledge of physical representation. In this respect, tools (Heidegger used the broader term 'Things') are entities that

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<sup>28</sup> Heidegger's work *The Question Concerning Technology* (lectures in 1949, first published in 1954), which is often seen as only an fragment and unfinished proposal, through a hermeneutic framework turns to ethical issues of modern technology suggesting that technology has to be understood within its essence otherwise it is a supreme danger to human kind. The thesis acknowledges this aspect of Heidegger's theory on technology but since it does not contribute to the thesis argument it does not discuss it further.

show themselves within-the-world in our concern of Being-in-the-world. Heidegger's comprehension of the 'world' is maintained by the totality of Things, which are in this context constituted by the tools ('things-at-hand', 'things objectively present') and *being-Dasein*.

The common idea of Heidegger's concept of tool is that there is a distinction between what a person does with a tool and the manner in which a person thinks about a tool. In applying the tool it becomes invisible to its users during its implementation, thus becoming an extension of them. The objective presence of the tool only occurs if it breaks during its application. Thus, the terminology of invisible tool, introduced here, proposes an approach which understands technology not according to physical qualities but to an immaterial, experience based approach.

Heidegger's more particular terminology of tool, besides the earlier mentioned Thing, is 'equipment' (*das Zeug*), which through its ontology elaborates on a novel characteristic of tool implementation. Heidegger (1962, pp. 96-97) explains equipment as: '...that which one has to do with in one's concerned dealings'<sup>29</sup>. The Heideggerian equipment does not describe only the tool as it is, but the tool within its task, such as writing, sewing, working, transporting or measurement. In particular, he suggests that there is no such a thing as equipment, just the 'totality of equipment', to which the 'Being of any equipment' belongs (Heidegger, 1962, p. 97). Heidegger refers here to the characteristic that all equipment in some way describes its relation to all other equipment, and thus the role each has within the system of a 'totality of tools'. Therefore, equipment is always 'something to order to', and the totality of equipment displays the various ways of 'in order to' which can be 'serviceability', 'conduciveness', 'usability' or

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<sup>29</sup> The notion of 'concerned dealings' emerges from Heidegger's hermeneutic application of the Greek word of 'praxis'. He insists that praxis refers to the concerned dealing with 'pragmata' (which is in Greek 'things'), meaning that they are 'in order to something'. What Heidegger emphasises with concerned dealing is that tools are comprehended according to their function and application and not to their appearance in disinterested contemplation. This is what later in the chapter will be called as the condition of 'ready-to-hand'.

‘manipulability’ (Heidegger, 1962, p. 97). Applying this, there is a Being of tool and a Being of something ‘in-order-to’, which, although both occur as ‘equipment’ within the world, are described as one being materiality and the other immateriality. Heidegger explains this through an example of the hammer, to which ‘in-order-to hammering’ is assigned. Using the hammer signifies only the action of functionality in which it is experienced, but not the hammer itself. The technology disappears in one’s hand as the user focuses on the immediate performance of the tool. Heidegger terms this condition of the tool as ‘ready-to-hand’ (*Zuhandenheit*) because the tool, through the experience of the user, is fused with the body. He describes this phenomenon with the hammer example as:

The hammering does not simply have knowledge about the hammer’s character as equipment, but it has appropriated this equipment in a way which could not possibly be more suitable... the less we just stare at the hammer-Thing, and the more we seize hold of it and use it, the more primordial does our relationship to it become, and the more unveiled is it encountered as that which it is – as equipment. The hammering itself uncovers the specific ‘manipulability’ of the hammer. The kind of Being which equipment possesses – in which it manifests itself in its own right – we call readiness-to-hand. Only because equipment has this ‘Being-in-itself’ and does not merely occur, is its manipulability in the broadest sense and at our disposal. (Heidegger, 1962, p.98)

In order to return the tool’s presence as an object and making the user aware of it, its functionality must be damaged. A broken hammer loses its functionality and becomes what is described in Heideggerian terminology as being ‘present-at-hand’. Heidegger claims that the hammer, in the act of ‘presentness-at-hand’, shows its ‘equipmentality’ and becomes invisible through ‘readiness-to-hand’ and thus it ‘withdraws’.

Applying Heidegger’s object-oriented ontology to technology (ready-to-hand and present-at-hand), Paul Dourish (2001) describes an interaction through invisible tool as:

I act through the mouse; the mouse is an extension of my hand as I select objects, operate menus, and so forth. The mouse is, in Heidegger's terms, ready-to-hand. Sometimes, however, such as when I reach the edge of the mousepad and cannot move the mouse further, my orientation towards the mouse changes. Now, I become conscious of the mouse mediating my action, precisely because of the fact that it has been interrupted. (Dourish, 2001, p.109)

In Heidegger's ontology within-the-world means being present-at-hand, thus Being-in-the-world characterises the ready-to-hand. Whereas 'readiness' for Heidegger is the 'Being of beings' initially encountered by *Dasein*, the 'objective presence' is the concern of Being of beings, which emerged through what *Dasein* encountered at hand. As such, Heidegger suggests that *Dasein* reveals itself through human experiences (by implementation of the tool) which are embodied (cognitive invisibility) and embedded (physical invisibility) in the world.

Heidegger claims that the world and encounters within it, only fragmentarily acknowledge the essence or readiness-to-hand of entities because humans account for the world through presentness-at-hand. He (1962, p.69) states that an objective and every-day encounter is not able to establish a comprehension of the world in its essence: 'That which is ontologically closest and well known, is ontologically the farthest and not known at all'. Andrew Collier (2003) meaningfully explains the Heideggerian differentiation between readiness and 'objectness', referring to a frequently acknowledged gap between practical and theoretical knowledge:

That the world of our practical concern, composed of the ready-to-hand and understood implicitly by what Althusser would call 'knowledge in a practical state' is necessarily both historically and biographically prior to that given by theoretical knowledge, and remains closer to us even when we have theoretical knowledge. (Collier, 2003, p.187)

Through Collier's interpretation of Heidegger's ideas, it is possible to suggest an experiment-based approach that would operate against a mechanistic notion of encounters, determining the

world through immateriality. Comprehending this is crucial as it establishes Heidegger's essentiality in the framework of immaterial account (ready-to-hand) in opposition to materialistic conceptions (present-at-hand).

As such, the phenomenological formulation of invisible tool contributes a substantial diversity to the earlier mechanical comprehension of interaction exemplified by Goertz. Heidegger's conceptualisation of human action has emerged from recognising a lack in formalised scientific views and established a model which suggests that knowledge occurs not only through contemplation but by practical engagement. Through this suggestion he contributes a substantial understanding to immateriality, declaring that it is not the physical presence of the object but one's participation and experiences that make tools comprehensible. Underpinning this in one of his late writings, Heidegger extends his phenomenological view of equipment, considering technology as an immaterial matter:

Because the essence of technology is nothing technological, essential reflection upon technology and decisive confrontation with it must happen in a realm that is, on the one hand, akin to the essence of technology and, fundamentally different from it. (Heidegger, 1977, p. 4)

The notion of 'essence' here refers to the cognitive processes triggered by the technology and not to the ontological quality of an object. Through this evidence-based philosophical comprehension this chapter's argument suggests that technology cannot be accounted for via objectness or by technological productivity, as it was displayed in Krueger's work, but by readiness-to-hand, through an interconnectivity between the tool and its user.

As mentioned earlier in this chapter there are two prevalent approaches to the interpretation of Heidegger's concepts<sup>30</sup>, which will now be examined as applications of the invisible tool. One approach understands invisibility as a physical quality with the object becoming invisible, the other as a cognitive quality, which argues that during tool-usage the experience is characterised by a quality that ignores every other externality during this activity. The former considers the immateriality of an object, the latter the quality of awareness, which often reflects on the physical qualities of the tool. Whereas Heidegger considers entirely the latter aspect, the diversities in invisible tool applications arise through the various perspectives on the body-mind problem<sup>31</sup>. In some conceptions the tool is perceived not only as cognitively invisible but also as physically invisible, assuming the existence of an object whether it is perceived or not. This thesis acknowledges that interaction might exhibit features of physical invisibility (for example embedded technology), which is not particularly an application of

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<sup>30</sup> There are other concepts that explain invisibility and transparency regarding the phenomenon of affection by technology. Although they provide different perspectives on this terminology, in order to be able to differentiate them from the thesis points of view a short overview will be provided. For Greg Elmer (2002) transparency and invisibility are the abilities to understand technology as a working construct. For example, the automobile is transparent to us in a sense that its mechanism is commonly known. Elmer claims that 'these technologies 'transparently' laid out their 'rational workings' the invisible magic of the automobile is contained in its cylinders, but no one would imagine the 'horseless carriage' contained miniature horses under the hood' (Elmer, 2002, p. 14). Alternatively, post modern technology, as Elmer explains, has to hide functionality in order to encourage the every day experience. As a result, Elmer states that the digital machine is opaque and the average user denounces any attempt to reveal its internal workings. New technologies are everywhere yet they remain quite invisible. He argues that digital technology is impenetrable and that it is this 'invisibility that creates a mythic power for new technology, its magic power' (Elmer, 2002, p.15). Another account of transparency by Larry A. Hickman (1988) is the notion of 'transparency effect', which can be seen as another application of Heidegger's invisible tool. He argues that there is a danger in the habitualisation of technology. 'Transparent effect' is the situation, facilitated by technology, in which the observer (user) is not conscious of the processes anymore. Hickman (1988, np.) points out that the observer is not able to render the situation because s/he is fully immersed into the effect of the technology and therefore the situation from his or her point of view becomes uncontrollable. He explains this in the following: 'This complex effect has to do with areas of our experience that we have habitualised, of which, therefore, we are not directly conscious...Even though we are not asleep, there may be great areas of our experience that have become transparent to us, or which we fail to recognize for reasons other than their opacity'.

<sup>31</sup> The body-mind problem is a long-term discussion in philosophy that has produced a variety of views of body and mind interconnectivity. This thesis takes the view to which phenomenology refers to, as it sees body and mind as a unity, however, it declares that there is a great spectrum in the quality of this interconnection.

Heidegger's concept but often claims cognitive invisibility as well. These two approaches, handled here separately, allow the conclusion that creating a tool is a mental modelling of the user and not a physical object creation, which in a Heideggerian sense means the tool is either in use (ready-to-hand) or broken (present-at-hand).

In this respect, one of the most direct applications of Heidegger's invisible tool, which suggests meaningful ways to understand technologically-mediated experience as a cognitive process, is Don Ihde's (1979) notion of 'embodied relations'<sup>32</sup>, which was later further developed as 'embodied interaction' by Paul Dourish (2001)<sup>33</sup>. The main intervention of Ihde's experimental phenomenology is that he revises Heidegger's concept through qualities of man-machine interaction. Critiquing Heidegger's concept as it only accounts for two conditions of tool implementation as being in usage (ready-to-hand) or broken (present-at-hand), Ihde points out that the tool is not only a perceptual extension of the human but is based upon learned relations, which means humans inhabit tools by using technology. He explains these embodied

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<sup>32</sup> Besides embodied relations, which Don Ihde considers as first level, he introduces two other levels of technological implementation ('hermeneutic' and 'technology cocoon') out of which the characteristic of 'technology cocoon' is akin to the application of invisible tool as embedded technology (see later in the chapter). Ihde argues that these two characteristics are a reconsideration of Heidegger's invisible tool as he did account for the impact of these concepts. As such, the second level of hermeneutic relation is used for the exploration of the world. Here the interconnection between world and machine is considered, which Ihde describes as partial in opacity. As an example, Ihde describes the exploration of macro and micro phenomenon or revealing invisible realm which generated new layers of knowledge giving a reconsideration of the man-world relationship. The last level of technological mediation is the condition of ubiquity or what Ihde describes as 'technology cocoon'; man lives in an artificial environment where technology embodies him. In this, machines are embedded in life and affect the way in which mankind expresses itself. In this level transparency becomes a territory. Technology cocoon represents various levels of transparency which apply diverse methods: the first level is through the technology, the second with technology, and the third within the technology. All three characteristics provide a useful artistic application. The first level, as seen before, opens up consideration for the practical implementation of transparent interfaces. The second level allows for implementation of technologies which may reveal new information both human and environmental (for example: thermal imaging, galvanic skin response, EEG). The third level gives opportunities for the artist to consider higher levels of complexity in technologies as the environment embodies their usage serving for models of the spectator.

<sup>33</sup> Also a practical model for HCI (Human Computer Interaction) design in which technology is approached not from a mechanical comprehension, as earlier stated by Goertz, but rather from a phenomenological point of view.

relations between man and machine as a quality of the tool's readiness in interaction, displaying its diverse grades of transparency<sup>34</sup>:

With this we have one type of human-machine relation, an experience through machine. The correlation structure of intentionality remains, in that I do experience something other than the machine being used, and at the same time, my experiencing is extended through the machine for that intentional fulfilment. I may thus describe the chalk as having partial transparency relation between myself and what is other. And in fact, the better the machine, the more 'transparency' there is. (Ihde, 1986, p. 141)

Both Heidegger's invisibility and Ihde's transparency assign the disappearance of the tool through interaction to the fact that the person becomes cognitively immersed during its use. Thus, while the mind is immersed the ordinary awareness of the body dissolves. A differentiation is claimed by Ihde as he explains that a tool cannot be instantly invisible to its user. There is a learning process of tool-usage (later in this chapter called 'mastering the tool') – especially using tools with new functionalities – when the tool is still visible and only cognitively disappears if there is an embodied relationship (the tool is mastered) between the user and itself. Thus, it can be declared that Heidegger provides an account only for invisibility regarding the condition of the tool, whether or not the tool is applied. More profoundly, Ihde's conception of embodied relations focuses on the condition of the user; that is, how far one can recall knowledge related to the particular experience. This explains how invisible the tool is to the users, defining a cognitive quality of the tool-usage.

The concept of embodied relations is further expanded by Paul Dourish who introduced the idea of 'embodied interaction'<sup>35</sup>. The thesis identifies Dourish's conceptualisation as

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<sup>34</sup> This does not cover the same meaning of transparency as that of this thesis (see later in the chapter).

<sup>35</sup> Dourish explains that 'disembodiment' is a contradictory notion to embodiment, through which he (2001, p.102) claims that experience in the VR is 'disconnected observation and control'; therefore is inefficient (the thesis handles the term 'disembodiment' with a diverging approach; see later in the chapter). Dourish negates the pattern of interaction in VR because humans do not have inhabited knowledge about it and therefore cannot



significant as it provides a more holistic understanding of the invisible tool and potential practical applications for artistic interfaces. Dourish declared that the epistemology of the body suggests an embodied model of cognition arising from the learning process through body experiences, which Dourish explained as follows:

Embodiment is not a property of systems, technologies, or artifacts; it is a property of interaction. It is rooted in the ways in which people (and technologies) participate in the world...Our actions cannot be separated from meaning, which both makes our activities meaningful and is itself transformed by them. Embodiment is about engaged action rather than disembodied cognition; it is about the particular rather than the abstract, practice rather than theory, directness rather than disconnection. (Dourish, 2001, p.189)

This proposes that experience-based knowledge is saved in the memory and can be recalled by the same bodily action. For example, the learning process of driving becomes embodied knowledge and therefore the car can disappear for its user. In this manner, ‘embodied design’ develops a particular understanding of interaction that suggests interfaces can be designed in a way that produce a balance between the process of recalling experience-based knowledge and the learning process of the tool (interface). This conceptual innovation, which later in this chapter will be handled as a significant characteristic of ‘mastering the tool’, provides an important explanation of effective technological (not artistic) functionalities as connective processes of the spectator.

Ihde’s notion of transparency should be resituated into a notion that here will be understood as invisibility. This differentiation is crucial to the argument, as the notion of

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produce effective engagement. The rejection of virtual reality systems within unknown properties of interactive engagement emerges from Dourish’s philosophical beliefs, formed from a phenomenological view. He sees Cartesian Virtual Realities as a loose copy of the world without the embedded meaning triggered by the real world. The things that Dourish negates in his theories are the things that artists find crucial in VR, hence creating a new world, giving new symbolic forms and language and revealing new understanding towards the ‘real reality’. Therefore the thesis emphasizes that Dourish’s concept of embodied interaction might give a comprehensive solution for a designer towards to an improvement and better understanding of the technology mediated world; however, artists cannot just rely on inhabited knowledge as the world restricts their artistic creation on known models of the world.

transparency is reserved as another characteristic of interaction, describing the crucial quality of artistic interfaces (see later in this chapter for further explanation). Therefore, embodied interaction provides an expanded notion of the invisible tool and so describes invisibility in cognition through the embodied knowledge between tool and user. What is novel in Ihde's theory is that it suggests a state of cognitive transition of tool application, in which process the tool is still presentness-at-hand (visible) but already shows qualities of readiness-to-hand (invisible). These qualities will be comprehended as significant to artistic interfaces as they provide a guideline for functional applications of interactive technology. An effective application of mastering the tool means a cognitive immersion (see later in this chapter) of the user into the artwork.

Another application of Heidegger's invisible tool, which is based on technological functionality, is in the invisible equipment. As invisibility is here understood to be a cognitive quality, it has to be clarified that invisible technology does not always produce invisibility in experience and a non-invisible interface might also generate cognitive invisibility. Numerous accounts claim an interconnection between physical and psychological dimensions. Mark Weiser (1988) embraced physical invisibility as a quality which immediately provides an immersive experience. With this he draws out a characteristic of 'embedded technology'<sup>36</sup> which means an environmental invisibility that Weiser (1988, np.) comprehended as: '...so imbedded, so fitting, so natural, that we use it without even thinking about it'. Importantly, Weiser's observation refers not only to a physical invisibility but explains that the invisible tool in the experience determines how conscious the person is during the implementation of the tool. In this matter

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<sup>36</sup> Embedded technology means being embedded in the nature or environment so that the user does not perceive great changes in interaction with these machines.

physical invisibility means a cognitive invisibility as well. The same inter-linkage between psychological and physical qualities has been described by Heer and Khooshabeh:

There is a distinct aesthetic appeal to rendering systems physically invisible, but total invisibility, and the lack of feedback and control that implies, is obviously undesirable. From the psychological perspective, designing calm or ubiquitous technologies is clearly a valuable goal, but just what factors are involved in creating such systems are often not elaborated – many times it seems assumed that these invisible technologies will be amenable to a simple walk-up-and-use paradigm. (Heer and Khooshabeh, 2004, p.2)

This approach identifies that physical invisibility often leads to simplicity in function which despite creating a psychological invisibility, does not provide enough functional multiplicity. Therefore, it can be proposed that, in Heer and Khooshabeh's view, physical invisibility is still much more connected with the quality of embedded environments than with particular cognitive qualities. Embedded technology aims for the disappearance of objects for a fuller quality of experience and therefore technological tools are embedded in the environment to become a part of the everyday life experience. Heer and Khooshabeh (2004, p. 4) describes this as 'invisible computation', aiming to infrastructuralise computing which moves a desktop application: '...into more diverse and immediate contexts of use'. Tolmie et al. (2002) proposes the most profound interpretation of this interconnectivity, suggesting an emphasis on cognitive qualities which can be produced by physical qualities. He suggests that invisibility is not a literal transformation into the physical, because it would exclude the most important characteristic of the interface, the cognitive qualities. He introduces the term of 'invisible in use' with which he draws out the issue of a bipolar application of invisibility:

The notion of 'invisibility in use' is a difficult idea. Its full implications for the design of technology have not yet been discovered. Often 'invisible in use' is understood as meaning literally (perceptually) invisible as enabled by the miniaturisation of computational technology that allows devices to become smaller and (perhaps) perceptually less visible... The aim is not for a hidden computer. Indeed a computer that

behaved as computers currently do and required the same form of interaction but which could not be seen or heard could be more remarkable, more present than before. The challenge for design is to go beyond simply focusing upon the perceptual qualities of devices and to make computational resources that can be unremarkably embedded into routines and augment action. (Tolmie et al., 2002, p. 404)

Tolmie et al. acknowledge that interaction design needs to consider both the desire for physical invisibility and also non-distortion of cognition. They suggest that the centre of every interaction is the cognitive process which can be supported through the conception of embedded (physically invisible) technology but is not necessarily considered an application. From this it can be argued that interactive media art production has to consider both a Heideggerian invisibility and physicality, with the acknowledgment that only a cognitive invisibility can provide effective interaction.

There exist examples of creative applications which reveal how the invisible tool can be understood as a cognitive quality. Scott Amron's switch-hook creation called '*Off*' (Figure 4.01) presents the example of the everyday scenario of someone taking off his/her coat and hanging it on a hook, which 'hooks up' the light connection in the installation. With this device Amron creates invisibility for the act of coming, and leaving, home. His design serves to reduce the noise between the different levels of affection during the crossing of the threshold when coming in and out; by linking two oppositional actions together he produces a smooth cognitive transformation. The action of hanging is a metaphor of being home; thus the act of switching on the light transforms the event of hanging into electrical energy. The event of coming home, hanging the jacket and turning the light on are metaphorically assimilated, producing an 'invisible experience'.

Another example is prominent in automotive design where the sounds of different mechanical parts of the car are designed to make the driving experience more intense. In this

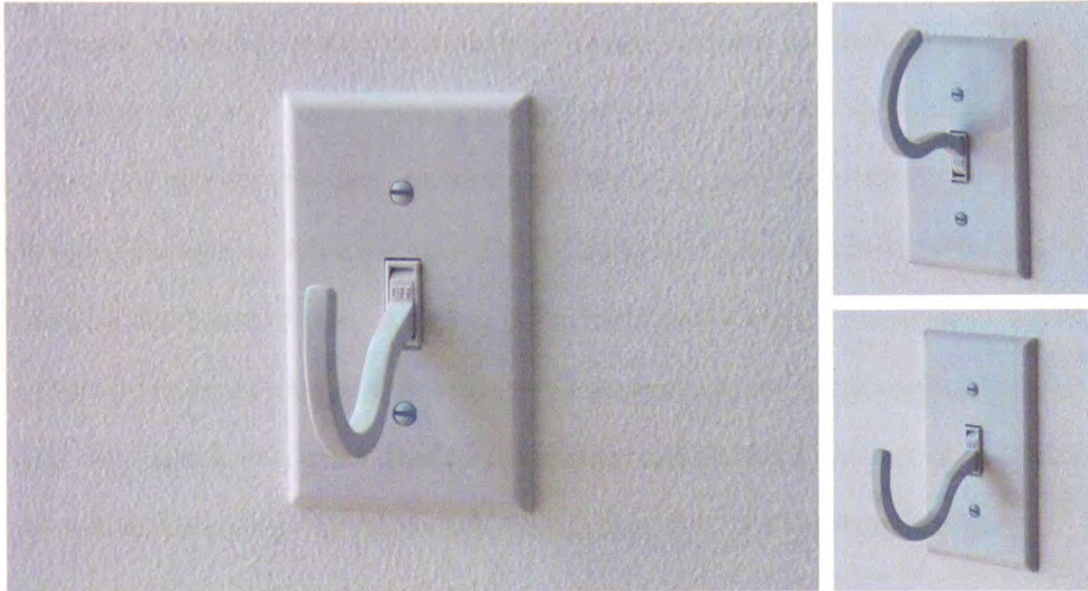


Figure 4.01 *Scott Amron's light 'switch-hook' titled 'Off'* (Amron, 2007)

case, in a similar way to the media artistic implementations, the interaction between man and machine is at the centre of the design experience. The ‘psycho-acoustic’ research is based on the subjective human perception of sound and its aim is to create an aesthetic experience of driving through balancing emotional states according to sound variations.<sup>37</sup> In this instance the invisible tool is created through cognitive modelling of psychoacoustics.

Overall, designing interactive technology involves a need to comprehend its phenomenological quality, thus creating the spectator’s chain of actions. Seeking invisibility means an experience design which reflects the spectator’s cognitive status within the technological function. In this sense, invisible tool is not an object but a quality of the resulting experience in the spectator’s consciousness. It concludes that Heidegger’s phenomenological framework and its application provide a thoughtful resonance on the earlier recognised lack in Krueger’s approach to interaction. Heidegger’s original contribution to interactivity manifested an approach which explains the thesis earlier recognition of an ‘artist-artwork-spectator’ relationship and so provides a primary solution to an immaterial aesthetic in art.

### **iii. The Potential of Heidegger’s Invisible Tool for Artistic Application**

To apply Heidegger’s invisible tool on the previously established ‘artist-artwork-spectator’ triangle as a potential solution towards a new aesthetic, this section will suggest unpacking the division of technological application as tool and medium, which was touched on in chapter 3.

The tool is the technology that is applied in the ‘making art’ process; consequently the medium is

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<sup>37</sup> For instance, the car manufacturer BMW creates a complete soundscape for the car interior to enhance emotional response (Thoma, 2007). The invisibility is produced through the sound feedback as it comforts the user and generates an aesthetic pleasure through the activity of driving the car. Therefore, designing the sound emitted from the engine is an aesthetic response to the acceleration of the vehicle, represented through the particular acoustic that the design of the car provides. Thus, there is a difference between how a sports model sound compared to a limousine, even if they carry the same engine.

part of the ‘experiencing art’ process. This claim arises as technology-based artworks use technology not just in the creation process but in the artwork itself. As such, the argument here suggests that Heidegger’s model of tool can be implemented not only on technologies which are most likely to be used in non-artistic applications and serve for the art production (see earlier in this chapter) but also on the technologies which represent the artwork. Through this claim, technologies used in the triangle’s initial processes (the making of the artwork) will be termed tools, as according to Heidegger’s invisible tool, and technologies which are implemented in the latter processes (the experiencing of the artwork) will be termed as medium, referring to their representative character. In this matter, this chapter reclaims a novel application of the invisible tool, which provides a solution to technology as a medium.

The key point that this chapter acknowledges is that artist and spectator use the same equipment but with diverse qualities. Both artistic and technology-based theoretical accounts have identified that technology assists in different qualities in the work of art and artwork (Lansdown, 1988; Paul, 2003; Walter, 2004; Lovejoy, 2004); however, the discourse here takes a more particular examination. Whereas these concepts relate to a mechanistic evaluation without a profound investigation and application of those qualities, the examination in this chapter aims to build up an immediate connection to an immateriality, recognised earlier through the artist-spectator relationship. In other words, it will be claimed that the art production (tool) and art experience (medium) require diverse means of technological application because they produce a cognitive ‘creative flow’<sup>38</sup> between them.

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<sup>38</sup> Creative flow here elaborates on an interconnection between artist and spectator. The concept will be later revealed in the framework of Csikszentmihalyi’s psychological investigation (see chapter 5).

To provide an evidence based examination, this chapter's argument builds on existing accounts which underpin the later proposal for an application of invisible tool as artistic interface or medium. John Lansdown characterises this division in the following:

...tool: in which the computer is used to help us to do things that could be done more laboriously or more slowly by hand; medium: in the way that printing, or oil painting, or lithography can be seen as a medium; catalyst: in other words, as a way of inspiring new creative approaches to art and design; smart apprentice: as assistant having enough intelligent to explore new possibilities and approaches when shown how to do so. (Lansdown, 1988, p. 147)

Lansdown's definition shows that technology offers a spectrum of application relying on the function in the creative process. The thesis' examination is focused only on the diversity of tool and medium because these applications are based on creative processes, and not on the artistic content creation, as with the other classification mentioned by Lansdown. The notion of the tool in this investigation is comprehended as an instrument of artistic creation, the notion of medium as the artwork itself. Thus, although the categories of 'catalyst' and 'smart apprentice' describe important qualities of technological contribution to artistic content, they do not contribute to the thesis' primary investigation of artist and spectator relationship.

The technological tool and technological medium model draws out a key characteristic of technology-based artworks, which provides a basis for segregation from artworks implementing either a 'traditional tool'<sup>39</sup> or a 'traditional medium'. To accommodate this quality, the argument here suggests outlining a matrix of tool-medium schemes, which helps to the understanding of the status of technology in artworks and therefore helps to the comprehension of their

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<sup>39</sup> The thesis understands traditional implementations that are forms of medium or tool using established techniques, and technologies, which throughout art history may be considered as well known representations of artwork. New technologies and artistic implementations cover every kind of new technological development, emerging technologies and creative technologies. It is important to distinguish these as many artworks using technology cannot be considered as technology-based because they do not exhibit technology as a creative tool.



characteristic for a technology-based aesthetic. Besides the implementation of tool and medium, which are both technological in interactive artworks, it is possible to draw out four patterns which exhibit the entire spectrum of the artwork's qualities (Figure 4.02): (1) tool: traditional and medium: traditional, (2) tool: traditional and medium: technological, (3) tool: technological and medium: traditional, (4) tool: technological and medium: technological. These classifications are meaningful to the thesis, since they clarify the misinterpretation of artworks claiming to be technological although they follow 'traditional' aesthetic claims. These artworks apply technology rather as a replacement of traditional methods or as an aid in art production, rather than a holistic application with its own aesthetic. In this respect, it will be emphasised that artworks which are only fragmentally technological cannot be considered as technology-based artworks because they are 'remediative' applying a hybrid scheme (for example digital prints as a technological tool or digital documentations of traditional artworks as a technological medium). This perspective is suggested by Jay David Bolter and Richard Grusin's (2003, p.83) notion of 'remediation', which is: '...the making of new media forms from older ones', emerging from the specific feature of technology as medium and operating not just through its technological function but in the way in which it relates to earlier and alternative technologies.<sup>40</sup> Bolter and Grusin assign this as follows:

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<sup>40</sup> One such example that Bolter and Grusin (2003) depict is that of paint software that builds upon methods of traditional art practices; yet their quality is far behind traditional implementations. Such tools of remediation do not help the artist to express their intention in a remediated environment. The inadequate understanding of the tool as an artistic implement is reflected in the issues of remediation. Towards a solution, it will be suggested that artists need to understand technology-based art not as a formulation for replacement of traditional methods, but, as an exploration of technology in its own essence for extension of a range of artistic expression. In every age of art novel, means for creation were developed; however, the demands of new media are understood in the perspective of previous forms of art in order to implement independently and approach its spectator effectively.

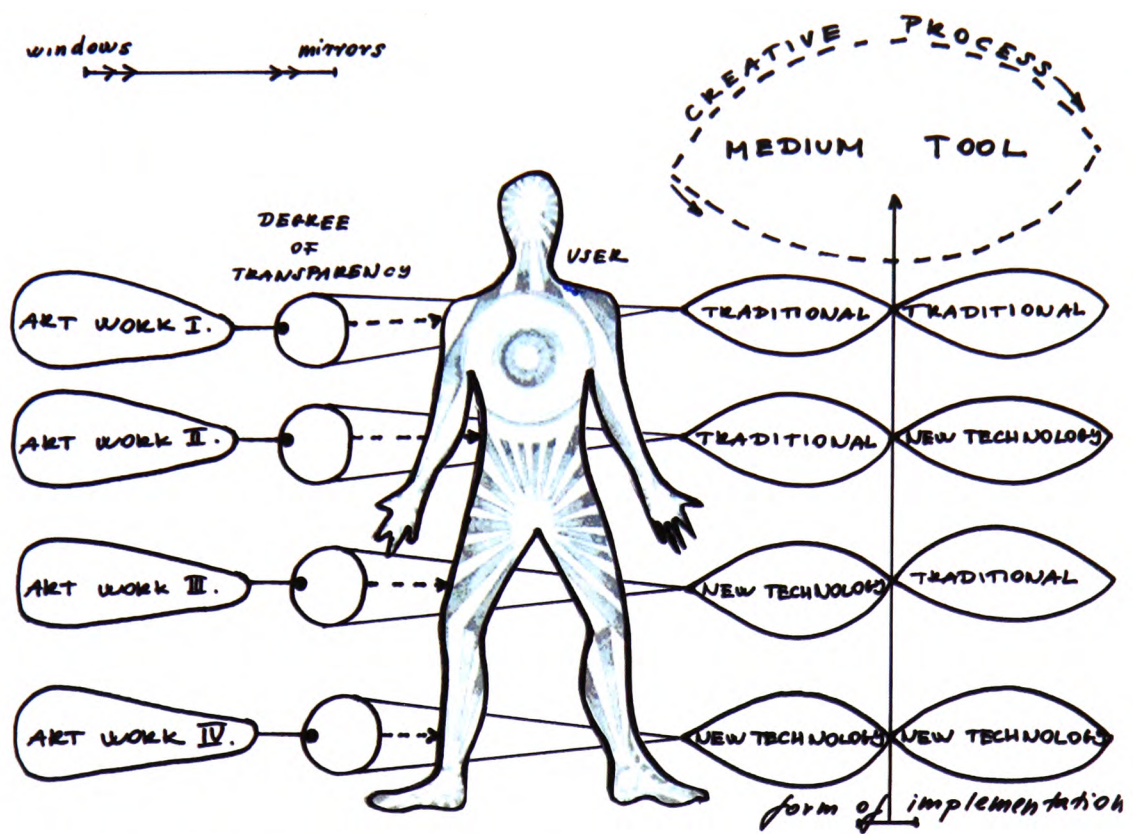


Figure 4.02 Conceptual draft: The matrix of artworks based on their qualities in medium and tool  
(Zics, 2006)

Whenever we focus on one aspect of a medium (and its relationships of remediation with other media), we must remember to include its other aspects in our discourse. In the case of film, for example, when we look at what happens on the screen (in a darkened theatre), we can see how film refashions the definitions of immediacy that were offered by stage drama, photography, and painting. (Bolter and Grusin, 2003)

As such, Bolter and Grusin describe that the danger of remediation through new media is justified only by their long-standing qualities, which reached a satisfactory conclusion in their original context. This approach led to frequent misuse of new technological media that multiplied old characteristics without an adequate aesthetic claim. Therefore, this chapter proposes that hybrid tool-medium applications often exhibit a misinterpretation of tool, in which the creative processes are much more linked to remediation (digitalisation or transfer to analogue) than to innovation of emerging technology. A remediation of analogue to digital or digital to analogue, however, cannot display artistic continuity. The main cause is that they do not produce an active flow between the creative processes and, as such, are not able to fulfil the aesthetic aim of immediate and authentic experience (Bolter and Grusin, 2003). Thus, the process of remediation breaks down the continuity of flow, causing less invisibility (invisible tool) in artworks. It can be concluded that technological tools and media bare crucial characteristics, as they display generative qualities of cognitive processes, creating continuity between them. Technology-based artworks, in which both tool and medium display dynamic means of creation, greatly diverge from earlier media as they enable an immaterial encounter of aesthetics.

Thus, technology-based artworks resituate art production and representation through the technologically-mediated creative processes, which is facilitated by the triangle. The artwork is now a system which comes into presence by means of technological interaction; it is a representation of 'tool-using' (the creation of the artwork) and itself as a medium (the spectator

experiencing the artwork). The initial artist-artwork act is the creative process of ‘making art’ where the artist uses tools in order to express their concept. The tool potentiality lies in a readiness-to-hand as seen by Heidegger, which can only occur through the artist mastering the particular tool for that creative process. The most profound characteristic of a technological tool is its permanently emerging nature through its continuity and dynamic qualities, as discussed earlier in responsiveness (see in chapter 3). Because of this particular emerging characteristic, art production is often formulated as a ‘creative collaborative process’ (Fischer and Nikkei, 1997) which occurs when the artist, in order to realise the potential implementation of technology, collaborates with specialists, scientists and programmers (the same emerging characteristic in the medium often enriching the artistic meaning with its novelty). The process describes a constructive arrangement where the artistic intention compromises the specialist’s knowledge and the technological potential:

Visual interaction design [or other technology-design] is viewed as a process of seeking for compromises between what is desirable (expressed by the designer) and what is possible (expressed by the programmer). In the collaboration, each of the designer and the programmer collects, represents, interacts with, and reflects on various types of representations. (Nikkei, Yamamoto and Aoki, 2001, p. 103)

As such, it can be suggested that programming skills and activities serve as non-mechanical tools<sup>41</sup> of creation. Artistic and scientific collaboration brings a new dimension to the creation of artwork, which opens an explicit layer to the artist-spectator interconnection, in which human skills are invented for an immediate interconnection between tool-artist and artist-spectator. This emergent feature of the ‘making art’ process is substantial as it generates a novel pattern of art production, which profoundly changes the traditional actions of tool-usage. Through this feature,

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<sup>41</sup> This thesis produces the notion of ‘non-mechanical tool’ to assign a quality that is produced by human skills in the application of tool. Non-mechanical tools represent a specific quality, in which not only the tool’s capacity but also the quality of the application assigns the superiority of the tool.

the artist handles not only the beneficial scientific expansion but also the reduction of co-authorial processes.

The other part of the triangle, the artwork-spectator interconnection, is represented by the technological medium which is the artwork itself. The medium is one of the most crucial formulations of the 'tool', characterising a particular artistic conceptualisation through which the spectator's experience is carried out. It is the surface of the system (screens, interfaces) existing in that particular moment in time, on which the quality of the artistic creation builds. The centre of the medium is the interface, which is a 'sensitive membrane' of the artwork, where the artistic idea interacts through the technology with the spectator's expectations. In interaction, the spectator's attention draws upon the surface of the interface where the artistic content through that particular experience emerges. Here, the earlier classified physical visibility or invisibility becomes part of the representation of the artistic decision. Visible elements are tactile, visual and wearable sensors; all physical objects of spectator interaction. The invisible utilities are technologies (such as sensors, motion tracking cameras, position trackers or pressure mats) which are embedded in the artistic environment and are not noticeable to the spectator.

A crucial characteristic, on which one of the original contributions of this thesis is based upon, is that technology as an artistic interface provides a revolutionary quality differing from other technological applications. As the artist designs the medium, it can be noted that not only the content of the artwork but also the tool itself is formed by an artistic formulation. This chapter claims a novel interpretation of Heidegger's invisible tool, incorporating this with the earlier account of meaning creation by Eco, which, in the artistic interface, assigns the Heideggerian condition of presence-at-hand. Therefore, it is proposed that all technology requires 'invisibility' to function, which is understood in a Heideggerian sense as readiness-to-

hand; however, technology as an artistic medium has a crucial character as an artistic surface, which is the characteristic of presentness-at-hand. Present-at-hand, as described here, means not a functional visibility, as in the application of tool, but rather as a layer of artistic meaning, which ensures that the artist, through creative technologies, supports the artistic content. Supporting this claim, Masaki Fujihata (2001) proposes that the interface should not be invisible but instead transparent. He suggests that the interface should have some visibility as it is also a part of the artistic meaning creation. The innovative artistic interface bares layers of new meaning, which allows novel exploration for the spectator:

...a sophisticated interface is called 'transparent', if it connects human and machine without any stress...I would like to say 'interface' must not be invisible. Interface is an object or an icon which sends some signals to the user, which attracts you to do something, which shows what it is connecting to and what you can make possible. (Fujihata, 2001, np.)

Fujihata depicts the 'transparent interface' as something that sends signals to the spectator, compelling them to act, revealing connectivity and possibility in the artistic content. Whereas HCI designers (see the earlier applications of Heidegger's theories by Dourish and Ihde) claim invisibility for technology, artists inventing interfaces argue for a non-invisible interface. Similar claims were characterised in Rokeby's (1995, p.133) conception of 'transforming mirrors', in which he argues that: '...the medium not only reflects back, but also refracts what it is given; what is returned is ourselves, transformed and processed'. The idea of the mirror as technological reflectivity is not new; one of the most influential concepts was raised in McLuhan's concept of 'extended man' (1964), in which, drawing on Freud, he builds an analogy with the Greek myth of Narcissus<sup>42</sup>, who was numbed by his mirror image and the technologically-generated effect.

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<sup>42</sup> Marshall McLuhan (1964) believed there was an analogous relationship between the mirrored self-image of the Greek mythological hero Narcissus and the technological devices of modern man. Narcissus embodied the well

McLuhan's concept recalls the notion of tool-usage that applies embodied knowledge (how effective the by spectator acts with their learned knowledge); the numbness Narcissus encounters can be understood as the not yet embodied knowledge and thus illustrates the amount of artistic innovation that is provided by the interface. This is what Rokeby (1995, p.133) sees as the artist's interest; to 'explore the meaning of the interface itself' as opposed to the engineer's interest in keeping the illusion of invisibility. Jay David Bolter and Diane Gromala (2003, p.27) take the 'mirror' concept further and claim that: 'If we only look through the interface, we cannot appreciate the way in which it shapes our experiences'. Their concept of 'windows and mirror'<sup>43</sup> allocates a similar dualistic characteristic to Fujihata's concept, in which the window describes a transparency (in the thesis' terminology this quality is understood as invisibility) and the mirror quality describes a reflection which, as Bolter and Gromala (2003, p.6) claim,

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known human nature of narcosis (numbness). The experience created a shock situation where numbness is turned into immunity to the world and exists just for his own reason. The characteristic is signified in the myth when Echo attempted to win Narcissus's love with his own speech, but the numb youth understands as an appearance of his lover (self-image). The mirror conveys the possibility of being extended. Narcissus was in the moment, numbed when he saw his mirror image. The fascination with this extension generated a new psychological condition whereby his awareness was transformed in his own repetition. While the organism tries to maintain equilibrium the entire being is in numbness. This is comparable to some mental disorders where the patient, after the sampled shock effect, is unable to develop evident behaviour pattern.

<sup>43</sup> Bolter and Grusin explain the window and mirror concept through the earlier established notion of remediation. In this application remediation (borrowing and refashioning previous media) is used as a conception to illuminate their other terminology of immediacy and hypermediacy in order to account for transparency and opacity. For Bolter and Grusin, remediation is a drive of immediacy or a way to produce the perfect medium of illusion. This is what is called the 'desire of disappearance' (in this thesis: invisibility). Bolter and Grusin argue that Western representationalism has a long term tradition of immediacy. The medium is a window through which the objects are represented. One example is the linear perspective which creates an illusion of a 3D world in VR. Leone Battista Alberti (1956, [1435]) described this perspective as a 'window of the world'. Immediacy evokes the need for hypermediacy. Hypermediacy is the medium mixing of various 'old media' together to make it visible. With the effect of remediation one becomes aware of the new characteristic of the medium, hence immediacy produces hypermediacy. The intense awareness towards the medium, by the WWW desktop interface, enables the user to control the usage of the medium. Hence hypermediacy generates and reflects not only the object of representation but the media themselves. Instead of trying to dissolve the technology/medium (being in the presence of the object) as immediacy, rather it emphasises the characteristic of the medium (being presence in the media). The 'window and mirror' concept is an artistic approach to the interface which describes the interplay between being aware and being immersed in the medium. This is what Bolter and Gromala (2003) call an oscillation between transparency and opacity.

oscillates between invisibility and opacity. They observe that technological approaches dictate that the interface will disappear, although the expectation is that awareness returns at the right time and in the right place. Bolter and Gromala claim that artistic interfaces choose a different application and avoid a full illusion in functionality, applying the 'mirror strategy', which they explain as:

When we watch a film, we can sometimes get so absorbed in the story that we may temporarily forget about everything else, even that we are watching a film at all. The film as an interface has become transparent for us. Sometimes however, we want to step back and appreciate how the film was made. This awareness enriches the experience of the film. (Bolter and Gromala, 2003, p.27)

The same claim emerges from Tiffany Holmes's (2002) notion of 'dynamic seeing', which explains the essence of the artwork not as the interface itself but rather the design of one's experience through the interface. Similar to Fujihata, she describes an oscillation between visibility and invisibility that occurs through the spectator's processes of mastering the tool and uses this ability to explore the content of the medium.

I would argue that the most engaging component of interactive works is not the actual action or gesture performed by the navigator but rather, the process of actively learning to self-direct one's own passage through a piece. The interactive art experience is one that blends together two individualized narratives. The first is the story of mastering the interface and the second is about uncovering the content that the artist brings to the work. (Holmes, 2002, p.90)

By taking these views into account, it can be proposed that artistic interfaces<sup>44</sup> claim a dualistic quality, which in a Heideggerian sense means being ready-to-hand (invisible) and present-at-hand (visible) at the same time. This particular capacity is the key claim for the artistic interfaces in this thesis, which so profoundly diverge from the tool application in art production. Therefore

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<sup>44</sup> Artistic interface means an interface which is part of the medium of the artwork. The thesis differentiates interfaces from screen-like technologies (which are often also considered as virtual interfaces, such as by Lev Manovich, 2001), therefore the medium constitutes interfaces and screens.



the argument suggests the terminology of ‘transparent medium’ which displays both ready-to-hand and present-at-hand. In this respect, the established notion of mastering the tool is a key term in this context, as it explains the difference between invisibility and transparency.

Mastering the tool, according to the earlier established Heideggerian application of embodied interaction, means an ability to recall the embodied knowledge which one has gained through experience. Importantly, in artistic interfaces, embodied knowledge builds upon these embodied experiences (attempting to recall learned actions) combined with the artistic novelty that seeks innovation. Whereas novelty in embodied interaction means an inefficient interface, in accounts of transparent media it is seen as an artistic quality of the meaning creation. Therefore, it can be noted that embodied interaction as functional invisibility (ready-to-hand) belongs to both the tool and medium. In the transparent medium the functional embodied process and wonderment (explained by Eco’s account of openness in chapter 2) generated by artistic novelty produces a constructive fusion in artistic interfaces, which the argument handles in a similar manner to the characteristic of present-at-hand. As such, the creative process characterises a fluctuation between artistic novelty and embodied processes, both adopting the artistic content, producing the artistic meaning. Through the ‘embodied novelty’ the spectator’s cognitive states are transformed into immersion.

The resituated invisible tool produces a characteristic of transparency by fluctuating between the functionally invisible and the artistically reflective states. Artistic reflectivity means that the interface provides innovation or a new function which is novel, but through an artistic guide (the artist’s anticipation of embodied knowledge in the spectator’s experience) reflectively is effortlessly learnable in the creative processes. These novel means of interaction, which are accommodated by the interplay between the processes of mastering the tool and uncovering the

content, generate a new layer of meaning, which is crucially reflected in the spectator's experience. The argument considers this layer as an extension or element of the artistic content. The task of artistic creation is to achieve a balance between the quality of the function and the artistic content which so determines the quality of the interaction and as such allocates the quality of the cognitive flow between the artist and spectator. Therefore, the transparent medium is a reflection of the process of art production, most profoundly characterised by its extra layer of meaning, which provides the interplay between artistic content and function.

Overall, this chapter acknowledged that the technological representation of the artwork-spectator interconnection exhibits dissimilar qualities from earlier applications of the invisible tool. An artistic application of Heidegger's invisible tool provides a crucial conception of technology, suggesting that artistic interaction requires a special treatment. The artistic interface and its qualities differentiate from that of typical human-computer interaction applications, as they carry an artistic layer of function and meaning. Applying this, it was pointed out that technology in the 'making art' process is invisible, and in the 'experiencing art' process is transparent. This diversion from invisible tool has been identified as a particular characteristic of artistic interfaces, expanding the functionality with an innovative aesthetic dimension. The key aspect of looking for novel forms in the medium is not only a creation of new content but also a functional improvement (making the medium in its technological quality more invisible), which suggested that not only the content changes but its carrier does as well. This insight offers a redefinition of the interrelationship between artistic tool and content by the means of constantly changing technology.

#### **iv. Characteristics of Transparent Medium: Immersion/Body Awareness**

In order to differentiate the materialist application of interaction from the artistic application of the invisible tool, the crucial characteristic of the transparent medium allocates a cognitive involvement of the spectator. To accommodate a meaningful approach, the concept of immersion will be discussed, as it enables a characterisation of cognitive processes in aesthetic experiences. Although numerous theories conceptualise the specific experience of interaction as immersion (Grau, 2003; Wolf and Perron; 2003; Bartle, 2004), it remains an ill-defined term. Therefore, in this section there is an intention to offer a more complete description of the notion, focusing on the particular quality of immateriality. As interactive technology in art, or more specifically the artistic interface, builds upon a model of interaction which uses a variety of bodily actions (for example, tangibility and full body movement), the discussion here suggests establishing the notion of 'body awareness'. This explains the cognitive quality of bodily states (which also means the quality of the body-mind nexus) and helps to unpack how immersion can be understood as a cognitive state.

Immersion can be broadly defined as: '...the experience of being physically immersed within a virtual environment experience', as Blade and Padgett (2002, p.20) suggest. It is understood as a cognitive state of humans, where every faculty of the person is fixed on one phenomenon. More closely, immersion is a contemporary notion of interactive media, especially VR. In this manner, Oliver Grau (2003, p.13) exemplifies this in the context of cognition: 'Immersion can be an intellectually stimulating process; however, in the present as in the past, in most cases immersion is mentally absorbing and a process, a change, a passage from one mental state to another.' Furthermore Grau (2003, p. 349) points out that: '...the principle of immersion is used to withdraw the apparatus of the medium of illusion from the perception of the observers

to maximise the intensity of the message being transported. The medium becomes invisible. As Grau refers to the Heideggerian invisible tool it is important to refer back to one of its significant applications in embodied interaction, which claimed immersion through the embodied knowledge of the interface. As such, mastering the tool means a capacity for immersion.<sup>45</sup> In the transparent medium this characteristic was described as being within the interplay with the artistic novelty; therefore, immersion means enabling the spectator access to the artistic content.

There is another significant concept that is revealed in the investigation of immersion, which helps to accommodate the notion of body awareness through a body-mind modality. 'Disembodiment' is a frequently used term which refers to a transformed bodily status of cognition such as the: '...transcendence of body limitations through electronic prosthesis' (Ajana, 2005, np.). This terminology here will be handled in a broader sense, describing it as a 'virtual embodiment' of a bodily status in the mind; as opposed to the earlier account of embodied interaction, it suggests a disembodied knowledge (not yet gained knowledge). Mark B. N. Hansen (2004) explains disembodiment as akin to the varying quality of body-brain (in this argument applied to the body-mind) interconnectivity:

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<sup>45</sup> In a similar vein, Marie-Laure Ryan (2003) describes an experience of reading a hyper narrative that, according to his claims, produced a 'dramatic performance'. This claim, similar to those described by Eco as openness, explains that the process of reading provides due creative thinking processes to the receiver of the structure of the texts to recreate it: this is known as mediumistic formulation. At the same time, the intruding demand of perception into the fiction (substantial formulation) occurs. Consequently there is more interaction in the mediumistic formulations producing less immersive experiences in the substantial formulation. However, the introduced notion of dramatic performance, whereby the user with their body immerses in the fiction and interacts through an instrumental creative process, represents an entry to a homogenous structure where immersion and interactivity replenish each other. As such, Ryan's example described the desired balance between the 'interface' (as Ryan puts it, the hypertextuality) and the content creating immersion.

The disembodiment characteristic of the visual image is thus synonymous with its dependence on the activity of the body-brain: lacking any material autonomy of its own, the image does not pre-exist its actualisation and can be given body only through this activity...The aesthetic experience solicited by these works juxtaposes as spectatorial synthesis that seamlessly fuses virtual and physical space with the background awareness, triggered by certain material elements, that the events thus fused belong to impossible space-times. In this way, attention is drawn to the capacity of the spectator's body-brain activity effortlessly to produce a virtual image out of heterogeneous material. (Hansen, 2004, p.64)

Hansen explains VR as a medium of 'body-brain achievement', which is an 'aesthetic experimentation' (2004, p.161) of the concept of perception through the body; or, as it is termed in this thesis, the concept of 'body awareness'. Correspondingly, Ajana proposes that the bodily awareness of the biological body transforms to a virtual body, which is not necessarily a body but a substance or better a state:

...virtual tools cease to be external objects and become part of our phenomenological corporality, just as the blind man's stick becomes an extension of his sensorial activity. Consequently, the construction of self in cyberspace follows an alternative mode of 'embodiment'...the mind and body become one in order to pursue a unified goal, and if either is missing, the result is the non-existence of the experience. So however we might say it, in cyberspace one is, in effect, embodied in one's disembodiment. The body in this context is no longer seen as the obsolete object or the inert container of the mind, but an integral entity, which is reassigned with an indispensable role, that of the medium. (Ajana, 2005, np.)

Through the concept of disembodiment, body awareness suggests a spectrum of cognitive levels which are linked to the qualities of bodily involvement, embodied interaction and the content of the artwork which includes the wonderment of the interface. Meaning creation in interactive artworks is based on the quality of the immersion, thus the transformation of body awareness constitutes one of the artistic decisions that manipulate the spectator's cognition as disembodiment.

A meaningful technological application, which illustrates how body stimuli produce a variety of body awareness, is provided by a project developed in the Institute of Neurology at University of Central London in 2007, where researchers attempted to simulate out-of-body

experiences (OBEs). In OBE people consider themselves awake but the experience itself is situated outside of the body. Unlike spiritual practices where the person's awareness is disembodied into immaterial sensation, OBE displays the quality of the experience as the subject seeing themselves in a physical representation (autoscopy), creating the disembodiment (the self perceived outside of the body) and the impression of seeing the world from different perspectives<sup>46</sup> (extracorporeal egocentric perspective) (Blanke and Arzy, 2005). One of the subjects reports the experience as:

Suddenly it was as if he saw himself in the bed in front of him. It was as if he were at the other end of the room, as if he were floating in space below the ceiling in the corner facing the bed from where he could observe his own body in the bed...he saw his own completely immobile body in the bed; eyes were closed. (Lunn, 1970, p.46)

The neuroscientist Henrik Ehrsson (2007) has reproduced the experience with head-mounted displays and two video cameras producing a stereoscopic real-time video located behind the user's head (Figure 4.03, 4.04).<sup>47</sup> The experiment shows that self-reflection as produced in VR forms a strong response in consciousness and produces a self-transformation. Consciousness relocates the body; the real body becomes disembodied. As such, body awareness through perceptual deformation produces a form in which human consciousness perceives the body and the stimulus in different locations.

By drawing on the concept of immersion through body awareness, the thesis suggests differentiating interactions by the type of body involvement, since they might produce diverse

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<sup>46</sup> OBEs most frequently occur through clinical conditions such as brain damage, epilepsy or drug abuse, however, it also occurs in 10% of the healthy population. (Blackmore, 1982)

<sup>47</sup> The participants saw their own back pictured from the perspective of someone sitting behind them, producing a phenomenon seen in OBEs. The participant's chest was stimulated with a rod and at the same time (outside of the camera view) the virtual chest was stimulated. Participants reported a 'bizarre experience' as they felt they sat behind their physical body, seeing themselves.



Figure 4.03 and 4.04 Henrik Ehrsson with a volunteer during the virtual OBE experiment (Ehrsson, 2007)

cognitive qualities in immersion. The argument lays out three different characteristics of spectator body involvement which emerge from a variety of proactive engagements with interfaces used in artistic production: passive, tactile (which is considered as a particular form of passive interaction) and active. Active interaction exhibits the highest level of body involvement, displaying full body actions; passive interaction is the lowest, displaying meditative states of cognition; tactile interaction displays subtle control that activates attention and concentration in cognitive processes. It is important to mention that all three categories display disembodied qualities, although within different cognitive characterisations.

Active interaction occurs when the body itself is used as a controlling mechanism, which is captured by wearable sensors or invisible equipment (such as motion tracking). This type of interaction is unique, as the movement of the body is already embodied knowledge of the users, although there is always a semiotic of control (artistic novelty) which has to be learned. Using the transparency of the interface (or medium) here means to learn the symbols of body movements according to the system, which can produce a sensation as if the body was dissolving: a so-called disembodied awareness. Comprehending this particular bodily status in virtual reality systems, Diana Gromala and Yacov Sharir describe the following subjective experience:

Yet as experience immersion in the simulation, I simultaneously lose the sense of being grounded in physical space, I experience the sensation of disembodiment. However, my body still remains in the physical realm, constrained by the apparatus and tracking range. The sensation of disembodiment cannot be disconnected from the sensation of embodiment, physicality, groundedness. I lose the sense of which environment my body exists in. It problematizes my experience, since the sense of being grounded is usually primary to a dancer's experience [dervish dancer who performs spiritual practice]. (1996, Gromala and Sharir, p.284)

Active interaction triggers, by high transparency of the interface, ecstatic states of body. The body awareness here is shifted by the body movement and transformed into an immersive state,



which Gromala and Sharir believe resembles the experience of spiritual practices (further outlined in the following chapter).

Tactile interaction means using symbolic interfaces which the spectator has to translate. Although the application builds upon active bodily involvement, there is a differentiation from the earlier classification, as it implements not the full body movement but other interactions to provide embodied knowledge. In this respect, mastering the interface (transparency) means understanding the interconnection of various symbols and actions. As the interaction is tangible, the interface is an object and the spectator usually uses their hands to interact. As the rate of body involvement is low, the immersion is based on the concentrated decision of the spectator, who through the complexity of a controlled chain of actions, is disembodied into the virtual world. Contradictory to active interaction, which describes subconscious states, here the attention and thus the conscious decisions lead to disembodiment. Therefore, tactile interaction remains much more as an experience of the 'tool-user' in the making process rather than as an artistic implementation of the medium.

Passive interaction is akin to a movie spectatorship, with the difference that the spectator controls the reactions through their bio-data (blood pressure, emotional analysis, EEG, galvanic response, physiognomic analysis, and behaviour analysis). The body involvement is very low as the spectator affects the system through representational states of cognition (for example, their emotions) but not through a motor involvement of the body. The disembodiment is created through more meditative mental states, where the flow of actions leads the spectator to the so-called disembodied state.

The thesis identifies a pattern of immersive experiences, which can be drawn into a systematic model, in order to establish a matrix displaying these dimensions (see Appendix 1.2).

This matrix is useful as it provides an abstraction for application, displaying qualities which have not yet been systematised. This immaterial conceptualisation of interaction is not based on scientific analysis but on the subjective experience of the spectator, measured by psychological modelling of self-reports. The matrix of the immersive qualities serves to fulfil claims which have been made by other practitioners, such as Rokeby:

...we need to expand the terms of interactive feedback loops from simply measuring functionality and effectiveness, to include an awareness of the impressions an interaction leaves on the user and the ways these impressions change the user's experience of the world. (Rokeby, 1998, np.)

Reflecting on this, the argument here points out that this matrix might fill a gap caused by a technology-oriented description that does not acknowledge immaterial qualities in the creative processes. In this matter, this chapter's discourse suggests applying the 'dimension scheme' used by Goertz' model earlier (discussed in chapter 2), as it already provides a comprehensive method of evaluation (see in Appendix 1.2). As such, this matrix of immersion sets up a scale from 0 to 4 (1 - No immersion, 2 - Fluctuation between immersion and embodiment, 3 - Controlled immersion, 4 - Illusion: disembodiment) referring to increasing immersion and subsequently a change in states of consciousness. These layers, which also refer to the activity of the spectator as 1-learning, 2-understanding, 3-effective interaction and 4-full immersion, describe the stages of the spectator's cognitive processes when confronting a novel interface. As the active, tactile and passive modalities describe diverse aspects of body awareness, this matrix differentiates between the levels of immersion they provide. Whereas an active interaction produces an ecstasy through a learning process of body semiotics, tactile interaction aims for a more particular information exchange, activating attentive qualities in perception that oppose active interactions, resulting in a heightened control of actions. Finally, the passive interaction aims for an inwardness of the spectator, without an everyday encounter of body states, which is more likened

to an ecstatic state (as seen in active interaction) in the way that the person might achieve an uncontrolled meditative state. Thus, full immersion can be produced by a variety of body awareness, resulting in diverse immersions and thus diverse states of consciousness in interactive media art. A heightened level of immersion means the accomplishment of a significant aspect for an aesthetic where it may be possible for the artist to achieve a balance between technological functionality and the acquired artistic knowledge.

This new matrix of immersion established in this chapter attempts to provide a model which describes degrees of cognitive quality in the spectator's creative process. The concept generates a new aesthetic evaluation for art, in which the quality of the immersion suggests a potentiality of artistic meaning, even if immersion does not ultimately qualify an aesthetic. The importance of the contribution lies in the new understanding of an 'experience measurement', in which the cognitive flow between the artist and spectator in its most crucial formulation (spectator's experience) is evaluated. In this respect, the matrix does not just evaluate the particular experience but also provides an assessment of the flow. This suggests that the artist, according to the characteristic of the interface (active, passive and tactile), consciously works with the spectrum of the potential spectator's body awareness, and aesthetically applies this spectrum to fulfil the established triangle. Therefore, the experience design of the artwork applies body awareness as a potential conception of interactive art, which produces the crucial immaterial layer of the artwork. Establishing this dimension of creation, the thesis hopes to build a meaningful implementation for artists when developing artistic interface.

Through the argument of this thesis it has been claimed that the recognition of the 'artist-artwork-spectator' triangle might produce a meaningful aesthetic model for art. This claim emerges from this chapter's philosophical investigation, aiming to fill the gap recognised in

Krueger's legacy. The most crucial philosophical contribution to a novel understanding of interactivity was provided by Martin Heidegger's invisible tool and his recognition of various cognitive states of the tool-user. Even though this experience-based approach produced a turning point in the concept of human-machine interaction, for a long time it was not acknowledged as a potential model of art. His idea that technology becomes invisible in the work process was more recently further developed by various theorists (Ihde, 1991; Rokeby, 1995; Fujihata, 2001) and extended to the artistic possibilities of interface. The invisible tool describes the quality between a user's intention and the occurrence of a produced outcome. The concept of the transparent interface which is introduced in this thesis suggests a level of new meaning which is still to be discovered. As such, the transparent medium is a pillar towards a cognitive-based creation which represents both novel layers of meaning and cognitive flows of interaction. Significantly, the cognitive interpretation of technology re-evaluates the general understanding of interactivity.

These old views, accommodated by Krueger's legacy ignored the mental affectation of technology and built upon concepts of participatory art and communication theory, providing materialistic accounts of interaction. Recognising the lack in these theories, this novel approach constructs a cognitive linkage in which artistic creation is situated. In this respect, Heidegger's concept of the invisible tool provides a primary scheme for the earlier examined and re-evaluated accounts of openness and responsiveness. Thus, technology and its interfaces, besides functionality and responsiveness, offer further layers of meaning and openness. These layers are most significant since they enable the interfaces not to be invisible (as claimed in the technological approach) but transparent like artistic interfaces. The transparent medium is the model of technology in art, which, alongside the content, ultimately shapes the artistic meaning. Through this, the conceptualisation of Heidegger's present-at-hand does not stand for a

functional error but rather an innovative layer that makes the tool visible. It is also proposed that the active, tactile and passive modalities refer to the spectator's body involvement, describing the various qualities of immersion in the creative experiences. The term immersion primarily conceptualised a practical model of the spectator's experience through the cognitive quality of body awareness. As such, this chapter suggested a matrix, based on self-report, providing a scheme and evaluation system for an artist, describing an immaterial quality of the spectator's act. The discussion on immersion concluded that this new cognitive quality also depicts the artist-spectator interconnection as, in the way it was argued earlier in chapter 2, the spectator's experience immediately linking to the artistic experience.

Through this, the thesis has arrived at an immaterial characterisation of creative processes, which signals a flow-like phenomenon producing the crucial dimension in experience. As it has been identified that flowing characteristics of the experience produce the recognised 'artist-artwork-spectator' triangle, the discourse will be situated in the contemporary psycho-philosophic concept of flow that supports an immaterial dimension explaining a crucial aspect of consciousness. Similar to the state of full immersion, the notion of flow, as described by the psychologist Mihaly Csikszentmihalyi, explains an optimal state of subjective experience, generating novel, or, in the way this thesis terms it, spiritual-like experiences. Mapping the invisible tool on Csikszentmihalyi's notion, it is possible to create an account of a transcendent level in the artwork which reveals the crucial immaterial dimension of the spectator's experience explained earlier. This quality, which Csikszentmihalyi describes as an ecstatic state, is the essential outcome of the transparent medium and will now be outlined in the following chapter.

## Chapter 5

### **Flow as Artist-Spectator Interconnectivity: The Potential of a Creative Ecstasy**

#### **i. Creative Processes as Flow in the ‘Artist-Artwork-Spectator’ Triangle**

Previously it has been noted that applications of artistic and technological accounts of interactivity have been miss-situated in artistic production and therefore maintained within a materialistic approach of art. The re-conceptualised accounts of ‘structural openness’ and ‘responsiveness’ have revealed a new understanding of art, which creates an aesthetic that is built upon the immaterial qualities of the artist-spectator relationship. An evidence-based solution of immateriality arose through Heidegger’s philosophical framework, which offered a new role for technology in art: the phenomenology of the interface (invisible tool/transparent interface). Through this, the division between tool and medium demonstrated that the artist and the spectator work towards a similar experience with different qualities of technology. As such, it has been anticipated that the ‘artist-artwork-spectator’ triangle can be seen as a cognitive flow in which the quality of the artistic creation is immediately manifested in the spectators’ experience. Comprehending the artistic experience as a flow-like phenomenon, this chapter suggests a comprehensive investigation into the notion of flow.

Flow is a contemporary psychological term used to describe human consciousness as being based on the phenomena of experience (Csikszentmihalyi, 1975); it has been discussed primarily as a cognitive and phenomenological investigation of experience by the psychologist Mihaly Csikszentmihalyi (1975). This investigation draws on his concept of flow to approach a fuller understanding of the ‘artist-artwork-spectator’ triangle and its role in the new aesthetic of interactive media art. Earlier accounts, for example William James (1890), Henri Bergson (1998,

[1907]) or Edmund Husserl (1964 [1928]) claimed that introspection generates a temporal sequence of consciousness or flow<sup>48</sup>. Similar to the recognition of the interconnection between artist and spectator with a flow like quality, Csikszentmihalyi (1965) based his positive psychological theory<sup>49</sup> on studies of artistic activities, through which he identified a specific quality of experience. Csikszentmihalyi (2002) based his theory on the observation that artists had an observable behavioural turn, having finished their activity when they lose interest in their work of art. Founded on this result, he explained the creative process as being outside of the moment, at the borders of consciousness. Csikszentmihalyi in particular studied artists during the creation of paintings and described this process as an optimal mental state associated with a total submersion in the artwork. He explained this quality as 'stand to side' (the translation of the Greek word *ekstasis*; The New Encyclopaedia Britannica, 1983, p.781) experiences or the ecstatic state, and argued that these states drive the artistic creation process. He further described that: how in this euphoric state, the artistic activity transforms into unconscious events with a strong emotional fusion between the artwork and artist, producing a new spectrum of cognition. Csikszentmihalyi (2002, p.40) has termed this as 'flow'<sup>50</sup>, as many of his subjects described the creative process as: 'It was like floating' or 'I was carried on by the flow'. Through this, it can be pointed out that the concept of flow explains similar qualities to those described as immersion in the technologically-mediated creative processes.

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<sup>48</sup> William James (1890, p.239) is one of the initial scholars who described consciousness as a flow. James (1890, p.239), in his book *The Stream of Thought*, characterizes it as flowing: 'Consciousness ... does not appear to itself chopped up in bits. Such words as 'chain' and 'train' do not describe it fitly as it presents itself in the first instance. It is nothing joined; it flows. A 'river' or a 'stream' are the metaphors by which it is most naturally described.'

Similarly to Csikszentmihalyi, James sees consciousness as adoptive and thus one can regulate it.  
<sup>49</sup> A positive psychological approach, instead of the traditional psychological interest of mental illnesses, examines the human condition with regard to mental 'wellness' (Seligman, 2002).

<sup>50</sup> The initial model of his concept was published in his book *Boredom and Anxiety* in 1975.

Csikszentmihalyi rejected the traditional view of art production which suggested a social interest by the artist rather than a cognitive-driven activity. Instead, he defined an immaterial approach, in which he saw experience as a cause of total amalgamation, in which the consciousness reached the particular level of ecstasy in some cases (Csikszentmihalyi, 1988, p.4). To comprehend this specific quality of the experience, Csikszentmihalyi studied people who did not get any external rewards for their activity, but had great motivation in their works (such as rock climbers, dancers and amateur sport players). He argued that flow is generated under certain conditions, primarily under an 'optimal challenge', when one's capabilities match the encounter. If the optimal challenge is too low (the activities are too easy) it would lead to boredom; or, the activities do not fit to one's capacity, generating anxiety which can be interpreted as noise in the flow<sup>51</sup>. Csikszentmihalyi termed this activity as an 'intrinsic motivation', an internal force without obvious external inducement recalling the 'autotelic experience'<sup>52</sup>. Csikszentmihalyi built upon the research on motivation from Abraham Maslow's (1968) theory of 'peak experience', which explained the phenomena as the wish of 'self-actualisation', even though Maslow could not provide a satisfactory scientific examination. He also used Richard deCharms's (1968, 1976) and Edward L. Deci's (1985) experimental studies which concluded that people who are externally rewarded for activities experience more a reduced quantity of intrinsic motivation than those without rewards. Based upon these concepts, Csikszentmihalyi (Csikszentmihalyi and Nakamura, 2002, p. 90) acknowledges one's duty to act

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<sup>51</sup> Csikszentmihalyi (2000, p. 381) provides the following matrix to capture the quality of the optimal experience: (a) a clear sense of what has to be done moment by moment; (b) immediate feedback as to how well one is doing; (c) an intense concentration of attention; (d) a balance between opportunities for action (challenges) and capacity to act (skills); (e) exclusion of irrelevant content from consciousness; (f) a sense of control over the activity; (g) a distortion of sense of time - usually hours pass by in minutes; and (h) a feeling that the activity is intrinsically rewarding, or worth doing for its own sake.

<sup>52</sup> The term refers to goals that is motivated intrinsically or inherit.



upon one's own condition by using the set of challenges and their accurate responses to gain unified experience of flow. He emphasised that man became a: '...self-regulating organism interacting with the environment' by setting out a dynamic system. Csikszentmihalyi (2002, p.2) concluded that: 'People who learn to control inner experience will be able to determine the quality of their lives, which is as close as any of us can come to being happy'. Csikszentmihalyi allocated 'control' as an intentional process, which this chapter applies as a novel interpretation of 'artistic control' regarding an active spectatorship. Essential to the optimal artistic control is a balance of the artist and spectator's intentional experience, based upon the recognised 'artist-artwork-spectator' triangle.

To establish Csikszentmihalyi's claim of an affective state of experience it is necessary to elaborate his understanding of consciousness<sup>53</sup>. Importantly, he pointed out that there are profound differences between his view and the way consciousness is understood in the field of behavioural science<sup>54</sup>. Csikszentmihalyi agreed with Smith's (1969) concept of 'introspective behaviourism', in which: '...conscious experience is an internal event about which one does directly, what one wants to do' (Smith 1969, p. 108). Csikszentmihalyi (2002, p.247), however, emphasised a phenomenological view and claims that consciousness is based upon the 'subjective dynamics of experience'. As noted earlier, he (2002, p.27) stressed the significance of intention, which he considered to be: '...the force that keeps information in consciousness ordered', and he (2002, p.6) further pointed out that: '...the optimal state of inner experience is

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<sup>53</sup> Csikszentmihalyi (2002, p.24) referred to the function of consciousness in this way: '...to present information about what is happening outside and inside the organism, such a way that it can be evaluated and acted upon by the body... With consciousness, we can deliberately weight what the senses tell us, and respond accordingly. And we can also invent information that did not exist before: it is because we have consciousness that we can day dream, make up lies, and write beautiful poems and scientific theories.'

<sup>54</sup> Behavioral science, as Csikszentmihalyi insisted, had ignored the existence of consciousness as no empirical knowledge was available to prove it. Also, the personal reports provided as descriptions of consciousness were held as being too subjective and not sufficient in rigorous scientific method.

one in which there is order in consciousness'. From this point of view he comprehended consciousness as a substance that, with human control, may enable improvement in the human condition. He acknowledged that human cognition is able to improve itself with conscious mental activity, which he comprehended as:

The opposite state from the condition of psychic entropy is optimal experience. When the information that keeps coming into awareness is congruent with the goals, psychic energy flows effortlessly. (Csikszentmihalyi, 2002, p.27)

Thus, flow stands in contrast to the phenomena of psychological entropy, bringing disorder to consciousness. The notion of flow is reminiscent of the invisible tool (see chapter 4), which reveals the degree of invisibility as a cognitive quality of the uninterrupted flow between the user and the interface<sup>55</sup>. Therefore, the concept of Csikszentmihalyi's flow can be applied to the artist-spectator interconnection; for example, when artists apply technology without conscious attention in creative processes (producing the invisible tool) or when the spectator is immersed in the artistic environment (mastering the tool). As such, the argument in this thesis characterises the noiseless experience in a similar way to Csikszentmihalyi's flow, which is described in the following way:

...intense and focused concentration on what one is doing in the present moment, merging of action and awareness, loss of reflective self-consciousness (i.e. loss of awareness of oneself as social actor) a sense that one can control one's actions; that is, a sense that one can in principle deal with the situation because one knows how to respond to whatever happens next, distortion of temporal experience (typically, a sense that time has passed faster than normal), experience of the activity as intrinsically re-warding, such that often the end goal is just an excuse for the process. (Csikszentmihalyi and Nakamura, 2002, p. 90)

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<sup>55</sup> If the interface is in the condition of readiness-to-hand, the interaction is noiseless (not distressed). The interface becomes immediately present-at-hand because it needs too much consideration or control from its user.

Csikszentmihalyi (2002, p.42) also declared that the result of this harmonious state is when: ‘... the self becomes complex as result of experiencing flow’<sup>56</sup>. This is a spectrum of novel levels of consciousness, which might produce the heightened quality of experience that he terms as ecstasy. Csikszentmihalyi (2002, p.42) insisted that flow is a controlled experience but there is a level of consciousness which is: ‘...beyond the determining forces that the person is seemingly controlled by’, which he explained as an ecstatic state. This can be identified as an essential concept for an addressing of the aesthetic experience in technology-based creation and suggests its application for a new aesthetic. In this respect, implementing the concept of flow and ecstasy in interactive art means that the spectator controls the ‘flow in the interaction’, which might turn into an ecstatic level of experience in which the spectator is overtaken by the control of the flow. Through this, it can be suggested that noiseless experience and its heightened quality of ecstasy can produce novel and unknown states of consciousness; an expanded spectrum which is crucial to technological art production and which might serve as an aesthetic drive for the new art form.

Csikszentmihalyi’s intervention of flow as a substance of consciousness and particularly his concept of ‘intrinsic motivation’ facilitate an interpretation of subjective experience as being the immediacy between artist and spectator, shaping an aesthetic solution for interactive media art. In the following, this chapter proposes an extended model of Csikszentmihalyi’s flow, which proposes that a flowing experience takes place not only in the artist-artefact processes, as Csikszentmihalyi claimed, but also in the artwork-spectator processes. In this respect, the ‘artist-artwork-spectator’ triangle exhibits a creative closed circulation of flow, in which artists and spectators drive each other in the reciprocal ecstatic state through flow (Figure 5.01). As this

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<sup>56</sup> Complexity here means to become further differentiated from the earlier or original self. Csikszentmihalyi sees that the experience of flow is able to change a person into a ‘more unique individual’. The self become integrated as a result of deep concentration in the consciousness.

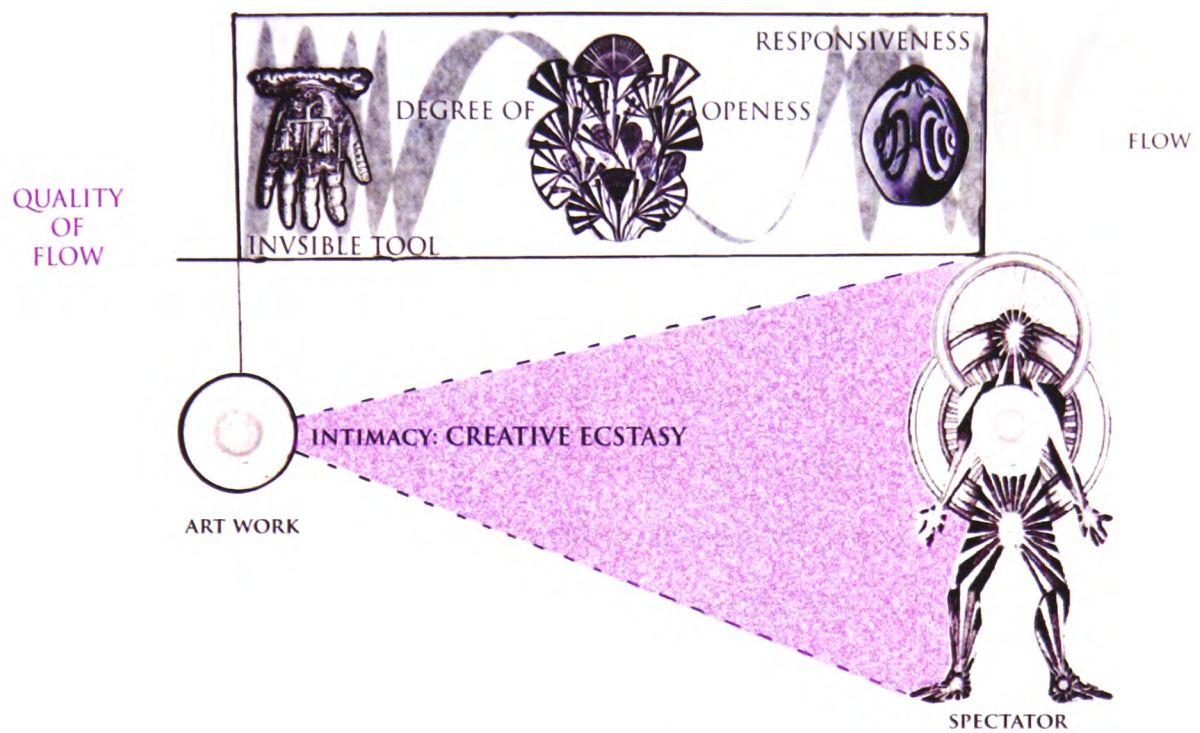


Figure 5.01 Conceptual draft: The creative ecstasy as the outcome of the flow production by the applications of invisible tool, degree of openness and responsiveness (Zics, 2007)

application suggests the application of Csikszentmihalyi's concept of ecstatic state in creative processes provides a meaningful approach for a creation of spectator experience. In this respect, being in the flow includes the psychological quality of the uninterrupted interactive experience (for both the creator and user of the artwork), which acknowledges a potential of technology-based art for expanding a spectrum of state of consciousness.

## **ii. Ecstatic State: Spiritual Practice as a Model for Artistic Interaction**

As flow is understood to be the substance of consciousness that produces qualitative states in the making and experiencing processes of art, it can be argued that the spectator experience is an extension of the artistic experience. This leads to a consideration that the artwork generates a dimension which is profoundly characterised by the spectator's unique experience. The subjective experience arises in the interaction of the artwork, generating new states of consciousness or even ecstatic states. Focusing on this subjective experience, and using Csikszentmihalyi's claim of flow experience in art and his particular examples of religious practices (Csikszentmihalyi, 2002, p.74), this chapter proposes a suitable analogy between 'creative ecstasies' and 'spiritual ecstasies'. The analogy serves to describe similar phenomena in flow experiences, which might allocate significant strategies and qualities for the artistic production of spectator experiences. As such, creative and spiritual ecstasies both relate to Csikszentmihalyi's optimal experiences, which, as it is argued here, occur instantly in a technology-triggered aesthetic experience. What artistic interaction might gain from religious practice is how an experience of flow can be produced through degrees of body involvement, stimulated by a variety of technologies and techniques (for example dance). Therefore, the thesis suggests that technology-based art does not recreate particular spiritual states of consciousness

but enriches the spectrum of consciousness that is similar to these experiences (which later will be referred to as spiritual-like experiences<sup>57</sup>).

Although Csikszentmihalyi's account identified religious rituals and practices as primary formulations of flow experience, it has to be noted that these claims are based on insufficient, undeveloped research<sup>58</sup>. Therefore the discussion here attempts to present findings, based on Csikszentmihalyi's conceptualisation between flow and spiritual experiences, in order to expand the potential applications of flow, by using an interest in technologically generated affection to produce a spiritual-like state of the consciousness. Elaborating on this claim, the argument establishes a significant resemblance between spiritual ecstatic states and flow-like experiences in the 'artist-artwork-spectator' triangle.

The term spiritual is here understood to be a cognitive human quality which often relates to scientifically non-describable phenomena<sup>59</sup>. As such, spiritual practices can be interpreted as methods of self-exploration or self-expansion. Csikszentmihalyi's proposal, which here is understood to be a body-mind interconnection through bodily states of cognition, is a crucial tool in interactive art production. In order to elaborate a spectrum of conceptions on how flow can be generated in interactive media artwork, this chapter suggests utilising the notions of qualities of

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<sup>57</sup> Spiritual-like experiences are comprehended here as activities that display a spectrum of body involvement aiming for a new state of consciousness. These practices produce states in the consciousness that is akin to spiritual experiences as opposed to normative everyday perceptions.

<sup>58</sup> Csikszentmihalyi and Nakamura (2002, p. 92) identified lacunae, on which this thesis builds that there is 'Relatively little research [that] has addressed the experience of flow when attention is trained on internal sources of information (e.g. in psychotherapy, life-planning, life-review, and other forms of existential reflection; fantasy; spiritual experiences).' Their discourse points out that the general interest of every-day life and its application of life improvement was much greater than the interest of understanding deep philosophical issues of religious activities, leading to the poor application of the concept.

<sup>59</sup> To formulate a clear analogy between artistic and spiritual experience, it is necessary to first unpack how the expression of the 'spiritual' is understood here. The term 'spiritus' originated from the Latin word of 'breath' (Shorter Oxford English Dictionary on Historical Principles, Fifth Edition, 2002, p.2) which immediately refers to a quality that has a characteristic of continuum. In the context of spiritual practices, breathing serves as a medium, which through bodily actions (breathing) transforms cognitive states to non-common body awareness.

body involvement and body awareness (discussed in chapter 4) with reference to an immersive aesthetic experience.

The ecstatic state here is understood to be referring to its earlier described meaning of ‘stand to the outside’, as one steps out of the reality of space and time (Lingis, 1998) and transcends the implicit limit of personality (Stutley, 2003). Franklin Merrell-Wolff (1994, p.29), mathematician and philosopher, described these states, in a similar way to Csikszentmihalyi, as: ‘...[a] fluid-like substance, which brings the sense of well-being [Merrell-Wolff terms it as ‘Current’]... Along with it, a more that earthy Joy suffuses the whole nature’. He also described his personal experiences of a spectrum of crucial levels of consciousness, which might serve as a significant example of how flow can be characterised in the spectator experience:

One day, after the evening meal and while still sitting at the table, I found that, by gradual transition, I had passed into a very delightful state of contemplation... I made careful note of the state I was in and submitted it to close scrutiny, the quality of the state well impressed upon memory. My breath had changed...just a little slower than normal. The notable change was in a subtle quality associated with the air breathed. Over and above the physical gases of the air there seemed to be an impalpable substance of indescribable sweetness that, in turn, was associated with a general sense of well being, embracing even the physical man. It was like happiness or joy, but these words are inadequate. It was of a very gentle quality yet far transcended the value of the form of any of the more familiar forms of happiness. (Merrell-Wolff, 1994, pp.3-4)

Merrell-Wolff’s ecstatic sensation, which was immediately linked to his spiritually developed practice of ‘mathematical yoga’, exhibits a close analogy to Csikszentmihalyi’s optimal experience and the heightened state of ecstasy. Correspondingly, Margaret Stutley (2003, p. 28) has treated ecstasy as an altered state of consciousness<sup>60</sup>, which is: ‘...a psychogenic reaction according to the dictates of the visionary’s mind so experiencing the conscious and unconscious

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<sup>60</sup> Altered state of consciousness was introduced by Charles Tart (1969, p. 2) who defined it as where one ‘...clearly feels a qualitative shift in his pattern of mental functioning.’ It explains states that are greatly different from the normal beta state. The terminology is often linked to the condition of trance.

desires of the ecstatic shaman'<sup>61</sup>. In a similar manner to the way Csikszentmihalyi referred to a potentiality for a new quality in consciousness as flow experiences, shamanistic rituals, according to Stutley (2003, p. 28), generate an ecstasy through which to gain 'new knowledge', which she characterised as a state of alteration of consciousness rather than a loss of consciousness. Gilbert Rouget (1985) proposed accordingly that the state of ecstasy is a process in which specific techniques are performed to achieve altered states. Besides the bodily involvement of the shaman he describes aids of the spiritual act that can be identified as being similar to aesthetic experiences in technology assisted artwork:

...the shaman, to sing and play the drum (or rattle), is to stimulate himself to dance...this dance takes on the proportions of the exhausting exercise, responsible, beyond doubt, for certain losses of consciousness. To shamanize, in other words to sing and dance, is as much a corporeal technique as a spiritual exercise. (Rouget, 1985, p.319)

In a similar way Christina Pratt (2007) acknowledged the importance of techniques such as dance which represent a spectrum of consciousness through their embodiment:

The dance, which connects the dancer to the inherited spirit, is improvisational. These dances often begin with familiar, formalized movements that imitate the behaviour of the helping spirit. As the dance progresses, the dancer moves deeper into an altered state of consciousness and the embodiment of the helping spirit deepens. In the embodiment trance, the initially improvised movement gives over to the spontaneous movement of the embodied helping spirit. (Pratt, 2007, p. 132)

In this she has portrayed the significance of movement that becomes internal by the driven act of impulsive actions. Thus, shamanistic rituals perform an established choreography of actions that step into the flow experience in order to achieve ecstatic states. It can be summarised that spiritual practices frequently use various technologies as acts of repetition, such as speech

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<sup>61</sup> Stutley (2003) exemplified this as 'flight', 'riding' or 'speed'.



(mantra in meditation), music (drum in shamanistic rituals) or body movement (Islamic prayers), which are highly similar to artistic interfaces that also aim for a body-mind affection in the aesthetic experience.

Elaborating on this crucial concept of ecstasy, the chapter here suggests applying the already introduced notions of embodiment and disembodiment (introduced in chapter 4), concepts which occur in technological- and, as Shore (1996, p. 145) has claimed, also in spiritual-driven experiences. As it has been suggested in chapter 4, these notions refer to the quality of experience in VR, which: ‘...is a kind of total immersion in computer time and space’ (Shore, 1996, p. 145), or they refer to spiritual practice as a phenomenon which provides: ‘...symbolic resources for the construction of alternative realities and promotes actions directed at breaking through to those realities’ (Yamine and Polzer, 1994, p.11). In this respect, the particular interconnection between bodily and mental actions is the major perspective of a potential application for art. Applying Csikszentmihalyi’s concept of flow, embodiment and disembodiment can be understood to be phenomenological evaluations<sup>62</sup> where embodiment is: ‘...an existential condition in which the body is the subjective source of inter-subjective ground of experience’ (Csordas, 1999, p.181). In Heidegger’s understanding, as elaborated on in chapter 4, using the tool is an embodied action which leads to a disembodied cognitive state of the tool. Thus, body awareness produces the phenomenon, similar to VR experiences, in which the tool becomes part of the body. In this respect, embodiment stands for a quality of human experience, which through particular bodily acts, triggers particular states of consciousness thus changing the characteristic of body awareness.

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<sup>62</sup> Phenomenological understanding, such as in Csikszentmihalyi’s flow theory, provides a situation where body and consciousness are in unity. As such, the embodied consciousness means interconnectivity between the bodily states and states of consciousness.

As such, the body awareness of the person is immediately linked to the physical reality and how the body is in this world. The argument here understands disembodiment as a state of consciousness in which body awareness produces a novel articulation, such as drawing away of the common sense of the body or the phenomenon when the entity of the body (body awareness) is allocated outside of the body<sup>63</sup>. As such, disembodiment is a state that is not placed in the laws of the physical external world but a virtual word of imagination that may be technologically induced. According to the model of VR as introduced earlier, the two major qualities of interaction regarding body awareness have been characterised as ‘active’ (‘tactile’ is considered as an active bodily involvement) and ‘passive’. As Csikszentmihalyi’s theory of flow departed from a unity of body and consciousness, the passive and active characteristics do not stand for a division, but a means through which the unique experience is generated.

In order to apply this to spiritual experiences it has to be pointed out that the active and passive terminology relates to diverse schemes of interaction; whereas active interaction uses the body for interaction, passive interaction is produced only through technological methods (such as reading bio-data). However, although the stimuli of interaction are technologically induced, the control of the flow is, instead, based on the individual decision making, which Csikszentmihalyi described as one’s intentional drive. In this sense, technology, similar to a drum in a religious practice, is only a trigger of the flow; the experience is individually diverse.

Active interaction in technology can seemingly be linked to spiritual practices that use bodily involvement in their rituals; they produce disembodiment of the consciousness through body performance. Zeljko Jokic (1996, p. 19) described the disembodied state in spiritual

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<sup>63</sup> In Virtual Realities this entity is termed an ‘avatar’, which is a ‘virtual body’ through which a person acts. Disembodiment is often characterized as an embodiment into virtuality that produces a disembodied state. This view, however, is not shared by scholars of embodied interaction (such as Paul Dourish, discussed earlier) as they interpret virtual entities as manipulative, as they are not linked to physical presence (see chapter 3).

practice (particular in shamanism<sup>64</sup>) as an experience where: ‘...unity of the body and ego-consciousness become fragmented, whereby the ego-dissolution contains the experience of body dismemberment’. He depicted consciousness as highly ‘fragmented’ with regards to a spectacular state; that the real body is in action but the consciousness only fragmentarily aware of it. Thus, a particular action of the body produces new states of consciousness shifting awareness and, along with it, creates the crucial knowledge.

The form of passive interaction produces more challenging application of art, as only the technology provokes the interaction that is described to: ‘...manipulate sensory stimuli to focus their participants concentration’ (Neitz and Spickard, 1990, p. 22.), which is comparable to spiritual practices where disembodiment is produced by inner changes of consciousness as forms of meditation (O'Connor and Robb and Heil, 2003). According to the featured characteristics of creative or spiritual ecstasies, which are based on active bodily involvement and passive bodily involvement of interaction, it can be claimed that, similarly, both acts produce a perception alteration and inwardness in the participant. In spiritual experiences, besides the external technological stimuli, an internal aspiration might drive the person towards new states of consciousness coupling with learned techniques. In aesthetic experiences, similar phenomena may occur when the interactor, using the learned rules of interaction (mastering the tool), achieves new knowledge. It also has to be also noted that there is an overlap between active and passive formulations, although the division produces a useful analogy to art for application in artistic context. Both modalities of active and passive are able to generate a shift in body awareness in a form that does not exist in the every day encounters of life. Understanding

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<sup>64</sup> Piers Vitebsky (1995) describes shamanistic rituals as a metamorphosis of the human body into a cosmic body, or what the thesis terms the 'corporeal cosmo-genesis'.

aesthetic interaction as an immaterial encounter means to applying technologies for a production of ecstasy.

### **iii. Application of Active and Passive Modalities of Flow: Potential Application for Artistic Experience**

As practices of flow were acknowledged as potential schemes for an artistic tool accommodating the novel layer of the spectator's experience, in the following, particular examples will be examined, based on the established matrix of disembodiment and body awareness. The active and passive modalities are presented in order to display patterns of interconnectivity between states of body and mind through the use of technology; in other words how creative ecstasy can be produced through an aesthetic flow experience. Two potential practices are presented, both claimed by Csikszentmihalyi as ecstatic experiences. These are Sufi and Yoga. The former stands for an 'active disembodiment' created through bodily actions. In the latter, more passive, practice, a limited bodily action produces meticulous states of consciousness.

An active bodily involvement will be exemplified in this chapter's discourse through Csikszentmihalyi's (2002) example of Sufi practice. In his view, the Sufi 'whirling dervishes' (Figure 5.02, 5.03) are one of the most unique religious practices which, through bodily and mutual repetition, produce a flow-like experience. He claimed that their practice is based on the bodily involvement of turning in circles, resulting in states of ecstasy.

Lynne Hume (2007) explained that Dervish means 'doorway', which in Sufi philosophy refers to the transfer from material to spiritual. She argues that the whirling dervishes are a ritual; a constantly repeated spin around one's own axis, accompanied by repetition of words in order to experience expanded awareness:



Figure 5.02 and 5.03 *Turkish whirling dervishes* (Wright, 2007)

Ordinary consciousness, with its thoughts, emotions, sensation and memories, is swept aside in order to experience transcendental states of awareness... a direct experience of the Reality or Truth, al haqq, or Allah. Whirling enables the participants to focus their attention through one –pointed concentration on the one reality, and to lose themselves in it. (Hume, 2007, p. 67)

The Sufi practice of ‘body involvement’<sup>65</sup> produces an experience of flow through conscious control of the interconnection between body and consciousness. The phenomenon is characterised as the unity of body and consciousness which becomes fragmented by the body awareness, producing an interim quality between being controlled and forgotten (being immersed). The particular choreography and its symbolic meaning in the ritual aim for a transformation of consciousness, which explains Sufi practice as a profound scheme of body-mind interconnectivity and, therefore, displaying great similarity to experiences of VR. As such, the active modality provides an important application for disembodiment and body awareness and suggests that the artist is a choreographer of the spectator’s movements through the interface. Thus, the artist designs the interface so that the created feedback and affection of the spectator transform their perception towards a disembodied engagement and immersion. This means that the spectator produces an immersive state through the symbolic means of bodily interpretation, in which (the same as in a spiritual ritual) the interconnection between consciousness and body become fragmented. Thus, the body is still in control of the action but

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<sup>65</sup> Lynne Hume (2007) described the physical act through which the unity of body, heart and mind produces the immersion into divinity. As was pointed out earlier this spiritual act has an exact choreography as well and all elements have symbolic considerations. It starts with a eulogy to the Prophet of love followed by the drumbeat of the ‘kudum’, which stands for the divine command of ‘Be’. The dance begins with ‘Suktan Valed Walk’, the circulation three times in the space where they bow to each other to symbolise the salutation of soul to soul. It follows four various dances (‘selams’) using various rhythms to represent the journey of man into spiritual validity. The stages of ‘selam’ include the one entering into the truth, one’s rapture of God, one’s fusion of love, and condescension from the journey. The journey symbolises the interaction with God which prepares the worshiper for the knowledge of truth (Hume, 2007). The bodily involvement has an exact procedure; the right hand is raised up to the ‘heavens’ to connect with God and the left situated towards to earth to conduct the knowledge of truth. The movements are structured and controlled. The ritual’s aim is to produce a disembodiment that produces the most effective level of consciousness for fusion with God.

consciousness has already started to build up novel states. The modality of the Sufi practice, which shapes knowledge through the alteration of perception by body actions, is a significant scheme which artists can apply in experience design for the spectator.

The other characteristic of interaction, which was described as passive, is non-bodily immersion. This modality is more akin to a non-interactive technological experience, such as the cinema, in which the bodily status stays passive and so produces a mental involvement of the spectator. In interactive systems this scheme is often formulated by reduced spectator activity and limited tactile interaction, or more specifically the interaction produced by the reaction measurement of the spectator, such as face analysis, pulse or galvanic skin response. Through technological applications (for example, cameras or sensors), the system collects data from the person's behaviour or properties, and through the analysis of this data the system affects the spectators' perception (for example, systems working with cognitive feedback loop, see later in chapter 7). By this particular means of interaction, the artistic production relies on the spectator's cognitive action-reaction measurement, suggesting a cognitive-based interaction. Throughout, the artist's task is to produce inwardness via technology, which usually occurs intentionally in spiritual techniques which drive the spectator (or worshiper) to ecstatic states. As this modality suggests a higher integration of cognitive processes of interaction, and, therefore, may produce more effective means of interaction, the thesis has chosen to explore this passive body-mind form in its practice (see the artwork of the *Mind Cupola* outlined in chapter 7).

One of the examples of how passive immersion works is the stimulation of one's perception where the processes of inwardness produce a meditative state in the participant. The intention of the worshiper, through limited bodily actions (such as breathing and eye-movement: 'makyo' in Zen meditation; Austin, 1999), is to enter into altered states of consciousness. In this

type of interaction the body and consciousness is not fragmented but unified (consciousness and body are fused), which is formulated through the desire to turn off every stimulus of the body, generating a focused state of body awareness. In a similar manner, Theodule Ribot (1890) insisted that ecstasy occurs by a full fusion of body and consciousness, which is a very rare phenomenon:

Do there really exist cases of absolute monoideism, in which consciousness is reduced to a sole and single state entirely occupying it, and in which the mechanism of association is totally arrested? In our opinion, this we meet in only a few, very rare cases of ecstasy... (Ribot, 1890, p.10)

Edward Maupin (1969, p. 180) described meditation as: ‘...a deep passivity combined with awareness’. The passivity describes a bodily condition in which the awareness of the body is transformed as a virtual phenomenon of consciousness serving inwardness. Nigro Sansonese (1994) described this ‘outside of the body’ experience in the following way:

In yoga, ecstatic trance has been distilled into enstasy (sublime trance), a trance needing no fetishes - objects in which a desired power inheres – a trance from which an entire shamanistic jargon, for instance, ‘leaving the body’ or ‘magical flight’ has been jettisoned. The transition is a consequence of the realization, over time, at once obvious and mysterious, that all experience occurs solely within the body. (Sansonese, 1994, p. 26)

Similar to this, Csikszentmihalyi (2002) has asserted that (Sanskrit) Yoga endeavours to achieve a unity of body and consciousness through the actions of the body. His interest focused on one of the great resonances between flow and this meditative practice as: ‘...both try to achieve a joyous, self-forgetful involvement through concentration, which in turn is made possible by a discipline of the body’. Through this, Csikszentmihalyi acknowledged that the body has to be under order of the consciousness. Contradictory to active interaction, where the body is the tool to control consciousness, in meditation, beyond the bodily preparation, the inward focus or self-



actualisation is what produces transcendence. The self-transformation in meditation as a process of disembodiment is described vividly by Eugen Herrigel through the example of archery:

...the contest consist of the archer aiming at himself- and yet not at himself, in hitting himself- and yet not himself, and thus becoming simultaneously the aimer and the aim, the hitter and the hit. (Herrigel, 1971 [1953], p. 20)

Thus, passive experience is a constant change and fluctuation in which the body, the consciousness and its part of body awareness inter-reflect each other in producing a crucial quality of ecstasy. Even though the body can never be detached from mental processing, in this practice the bodily awareness is transformed into a lower degree of 'body recognition' and therefore it does not have control over bodily actions. In this particular method the perception is blocked out.

Through the establishment of passive and active interaction this chapter's argument suggests a new treatment of interactivity. It has been proposed that particular techniques of body movement and choreography in religious practices provide a meaningful application for an external and internal body-mind interconnection, as it displays strategies for the production of subjective experiences. As it was shown, bodily participation displays a spectrum of body awareness based on the fragmentation of the body-consciousness relationship. The quality of this relationship relies on how far the person is aware of his or her body actions, how automatic the action is and how far one is in charge of control of the particular body involvement. Drawing on these various methods, this chapter suggests that active interaction works within symbolic means of bodily movement with the artistic consideration of how active body awareness may influence the received affection and meaning. Passive interaction of technology is cognitively reflective as it captures the triggered perception alteration of the affection. The modality of meditation, which

represents inwardness, is applied on the technology in the way that it produces external stimuli in the artistic system that can then produce inwardness. In this respect, it attempts to collect data of automatic response and biological data, which, based on intentional formulations, reflect a controlled cognitive level of the spectator. In this sense, passive interaction produces a different body awareness; the artist might, for example, create a scene, where in a similar way to meditation practice, the self-realisation produces an inwardness. This interface could be designed to trigger affection towards an inward experience. In this way, the artist aims to create perceptual alterations of the spectator producing meditative states; thus, the disembodied state is created not by the body awareness that produces a 'virtual body', as seen in active modality, but by an imaginative and meditative quality of the consciousness. From a phenomenological perspective, in passive interaction, the body and consciousness are indivisible, as they produce a similar bodily response to that which every externalisation of consciousness produces. The displayed variety of body awareness in the immersive experience explains various methodologies of ecstatic experience in VR, which provide a spectrum of artistic implementations for interaction.

#### **iv. The Creative Ecstasy in Interactive Media Art**

Corresponding to the previous models of spiritual practices, Diana Gromala's and Yacov Sharir's (1994-99) virtual environment of *Dancing with the virtual dervish: virtual bodies* (Figure 5.04, 5.05) displays an interactive environment which attempts to produce experiences akin to spiritual practices. This artwork provides a significant example, as it exhibits a concept which applies the established modalities of spiritual practices emphasising a body-mind interconnection. The discourse here builds upon this acknowledgment and discusses this early work of interactive art that underpins an ecstatic dimension in the spectator's experience.



Figure 5.04 *Diana Gromala's and Yacov Sharir's virtual environment of 'Dancing with the virtual dervish: virtual bodies' (1994-99) with interactor* (Hansen, 2004)

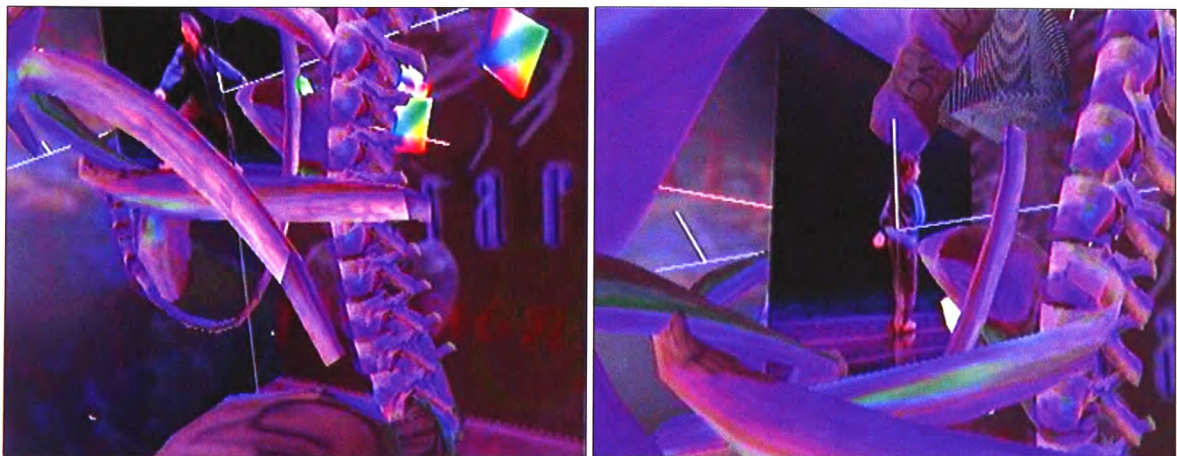


Figure 5.05 *Screen shots of the visualisation of 'Dancing with the virtual dervish: virtual bodies' (1994-99)* (Gromala, 1994)

The media artist Diana Gromala (1996) applied the method of self-reporting, previously mentioned as vital to subjective experiences (see in chapter 4), to create the primary concept of this work. Emerging from her personal experience she observed a perception alteration by the special bodily state of pain, which she evaluated as a spiritual-like experience. Her phenomenological investigation of pain led her to create an artwork which reproduces these experiences resembling the ecstasies of dervish dancers. She used the technological potential of VR to produce an audiovisual environment with virtual 3D visualisations of particular representations of the body. Her aim was to generate a unique interconnection between the aesthetic of the virtual bodies and the moving physical body. The body pain causing the consciousness alteration was articulated by medical technologies (X-rays, MRI, sonograms, fibber-optic, and micro-camera) which were transformed into virtual bodies. The particular aesthetic of the body and its textual layers of sensual meaning attempted to convert the mental representation of pain into an ecstatic pleasure. Gromala depicted the conceptualisation of the user's experience in the following way:

...I instead (of Western medical practices) draw on certain Eastern traditions, where meditative states can lead to a sense of inward expansiveness and a newly informed connectedness to our bodies. VR seemed to offer quite similar sensations...the extreme pleasure associated with open-ended textuality, the loss of bodily boundaries and a diffused or fragmentary subjectivity. (Gromala, 1996, np.)

A similar characterisation of the disembodied experience is described by the co-creator of the artwork; Sharir refers to the transformation of body awareness caused by the mirrored-body of the virtual environment:

...I move through and within the organic space of an enormous torso [virtual 3D body]. Within the architecture of this torso, I also find digitalised images of myself dancing, again distributing and multiplying my own body and experience. This mirror effect, this dancing a duet with myself, provokes a sense of heightened anxiety, caused by the doubling of my own body image. Further, my actions initiate caused-effect relationship in all worlds; (Gromala and Sharir, 1996, p. 284)

Both creators described an experience which, through a transformation of body awareness and disembodiment, led to an ecstatic experience. In the way that consciousness alteration was described earlier as out-of-body experiences (in chapter 4), when one loses feeling through the reproduction of their own body, in this case also one loses feeling and creates the sensation of being outside of the body. Gromala applied VR as an essential part of consciousness-altering bodily responses based on its immersive and subjective qualities.

Drawing on similarities between technological and spiritual interaction the discussion provided insight into a means of generating a spiritual-like experience. In this respect it was pointed out that technological and spiritual interaction produces a subjective experience as both enter a 'virtual reality' within a variety of cognitive schemes regarding bodily involvement and its reflection in body awareness. Csikszentmihalyi's notion of flow has characterised an important account towards a phenomenological understanding of action, producing a conceptualisation of immersive experience and its qualities regarding consciousness. As flow is a crucial state of consciousness that emerges in special noiseless conditions of man, Csikszentmihalyi determined this as inner states in full harmony (an optimal state). He argued that religion was one of the primary approaches of flow, producing crucial experiences with a potentiality for ecstasy. Based on this observation, the thesis identified the ecstatic state as a heightened quality of flow, which in accounts of spiritual rituals, is often described as the state of pure knowledge.

Proceeding from this proposal, this chapter situated Csikszentmihalyi's notion of flow in a framework of artistic cognitive processes and argued that experiencing flow occurs not only between artist and artwork but also in the processes of spectator experience in the artwork. The argument emerged from a novel quality of technology-based art that allows for the production of experience based creation, which may therefore enable the production of a flow between the processes of artist-artwork and artwork-spectator. This model helps to account for the aesthetic quality of interaction, as the artist not only focuses on the production of the artwork but also on its affection on the spectator. In a similar manner, the spectator is not only experiencing the artwork but rather reflecting the artist's experience through the artwork. Thus, Csikszentmihalyi's controlled experience is, in this interpretation, a creative formulation of the artistic control which leads the spectator to an altered state of consciousness.

To achieve this, the artist's implementation of various schemes of spectator involvement through the particular technology of VR, produces an immaterial level of the artwork. The similar qualities between the experiences produced by interactive technology and those produced by religious rituals identified a shared aspiration of immersion into a 'virtual reality', which extends human sensation with the possibility of entering novel states of consciousness. The discussion also displayed that flow emerges through a unity between body and consciousness which, in the artistic context, signifies the quality of the technological affection or control through an artistic intention. Depending on whether the flow happens through active or passive bodily involvement, various qualities of 'self-realisation' in VR might be produced, which can help the artist to build a model for particular content. Although a phenomenological division between body and consciousness is not possible, it is argued that various degrees of body involvement might help the recognition of various artistic strategies.

Overall, Csikszentmihalyi's positive psychological model produced a novel and contemporary approach to describing subjective experience. The concept is important to the argument, as it builds an evidence-based model upon a non-materialistic conceptualisation<sup>66</sup> of cognitive processes. Significantly, this chapter introduced equivalence between the concepts of flow, aesthetic experiences and spiritual experiences, concluding that technology-based artwork produces spiritual-like experiences. The idea of artistic flow was also revisited for technologically-mediated creation and experience, supporting the aesthetic interconnection between artist and spectator. Through this the argument of this thesis has characterised an immaterial model of art.

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<sup>66</sup> Csikszentmihalyi's critics (such as Marr, 2000) have targeted the lack of empirical methodology as his theory relies on a phenomenological model within metaphoric understanding. Primarily, criticism is formulated on the fact that flow does not provide a somatic representation in the nervous system and its claims are not set to a pragmatic logic. Marr's investigation is extensive and sets the empirical single process model of learning against the contemporary multiple models, assuming a proof of Csikszentmihalyi's insufficiency towards a psychological model of flow: 'The decomposition of flow into mere lists of real and hypothetical processes underlines its weaknesses as a scientific construct. Primarily, the theoretical explanation for flow has poor syntactical structure because of the uncertain way its defining terms are related to each other. Flow is generally described as a loosely integrated collection of mental or motivational states or processes that are validated primarily by self reports' and more specific: 'Ironically, Csikszentmihalyi was correct with his identification of flow with focused attention. His error was in defining attention in literary metaphor rather than grounding it in actual neural processes. The flow response is a discrete event because its metaphors are discrete (psychic energy, order in consciousness). But as defined as an actual neural process, flow becomes an indiscrete event, and becomes more pleasurable or intense as the relative salience and number of cognitive precepts increase in time.' (Marr, 2000, np.) These criticisms do not affect the manner in which flow is handled within this thesis.

## Chapter 6

### **The Transparent Act: Towards a New Aesthetic of Art**

#### **i. The Aestheticisation of the ‘Artist-Artwork-Spectator’ Triangle: Transparency**

As the ‘artist-artwork-spectator’ triangle is a crucial cognitive interconnectivity that produces the backbone of new immaterial understanding to interactive art, this chapter suggests examining what impact this has on aesthetic and whether it validates a new artistic approach. An aestheticisation of the ‘artist-artwork-spectator’ interconnectivity in this argument means producing a philosophical account of art production and evaluation, which determines an aesthetical framework for emerging and interactive technology. In this respect, instead of an aesthetic study of materialistic approaches of art, the thesis attempts to establish new aesthetic understanding, based on phenomenological claims, which here are detached from any aesthetic claims of earlier art production. Importantly, this chapter points out that this is a rediscovery of a lost dimension in art that had been forgotten through the materialistic approach of aesthetic. The re-discovery of this dimension in this thesis’ core intervention suggests that it is not only the artistic/technological implementations (invisible tool, transparent medium) that bear a cognitive quality but that the aesthetic itself can be comprehended through the phenomenology of interaction. This is what is termed in this thesis as the transcendental layer of the artwork.

This key intervention of the thesis draws on the concept of ‘dematerialisation’, which emerges through a new conception of immateriality. Dematerialisation is closely related to the processes which occur through the application of technology in artistic creations, producing a cognitive-driven understanding. Numerous accounts of dematerialisation (which will be discussed later) have previously only focused on physical disappearance, whilst others have



looked at the phenomenal aspects of communication as for example in teleportation and wireless interaction. Both of these approaches remained within a materialistic conceptualisation; they delivered undeveloped claims of immateriality, which therefore were not able to reveal their potential for an aesthetic model for art and technology. This chapter is intended to fill the gap left by an ill-considered contextualisation of immateriality and to suggest ways in which dematerialisation produces a new aesthetic approach for technology-based art.

The notion of dematerialisation has been broadly considered to be an affect of technology, as initially determined by El Lissitzky, thus something that is triggered by 'digitalisation' (Lillemose, 2005). In a similar manner to the way in which Krueger claimed it, disappearance of the physical occurred not through the craftwork in art production but through technological implementation in the artwork itself. Some accounts of the invisible tool were applied to these claims, which saw technology embedded in the environment and disappearing in physical objectivity (see chapter 2). Although this conception argued for immaterial qualities, it stayed within a materialistic framework, which tended to apply an invisible physicality instead of a cognitive quality.

Dematerialisation in art was re-introduced by the theorist Oscar Matta (1976), who contextualised it as a creative means of communication. Building upon Matta's claim, Lippard and Chandler noted an 'obsolete objectivity' in art aesthetic which emerged from craft-like productivity:

As more and more work is designed in the studio but executed elsewhere by professional craftsmen, as the object becomes merely the end product, a number of artists are losing interest in the physical evolution of the work of art. The studio is once again becoming a study. Such a trend is provoking a profound dematerialization of art, and if it continues to prevail, it may result in the object's becoming wholly obsolete. (Lippard and Chandler, 1968, pp. 31-32)

Lippard and Chandler argued that aesthetic questions of art reside not in material but immaterial formulations<sup>67</sup> and instead of a formal implementation of materiality it uses a conceptual understanding of new materiality. Jacob Lillemose (2005), in particular, has taken the materialistic view of immateriality, viewing it as a material condition. For Lillemose, the aesthetic of immateriality was the socio-sensitivity of technology, which created the critical approach and contemporary view of digitalism formulated in art. He argued that technology-based art should address a lack of understanding of technology that he saw as an immaterial dimension of the artwork. Lillemose's aesthetic of interactive media art rejected spiritual-like or cognitive approaches to new media, pointing out that:

The aesthetic of immateriality I suggest opposes the aesthetic of various kinds of techno cults and techno transcendentalisms where immateriality represents an otherworldly ideal created by the great computer God. A materialistic understanding of immateriality in new media art on the other hand, sees immateriality as an actual material and thus also politically charged reality predisposed to continuous reproduction – socially, culturally and economically. (Lillemose, 2005, np.)

Lillemose argued for a 'conceptual aesthetic', which proposes an art not through fixed visual properties but through 'abstract actualisations' that are constituted by the cognitive processes of novel meaning creation. He suggested that meaning arises through the aesthetic quality of materiality, which does not characterise physical properties but rather communicative relations and the means of information exchange. He (Lillemose, 2005, np.) argued that technology-based art creates an ultra-conceptual approach that: '...emphasises the thinking process almost exclusively', with which art forms are able to return to a 'non-reducible multiplicity'. In this

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<sup>67</sup> In 1973, Lucy R. Lippard's *Six Years: The dematerialisation of the Art Object, 1966-1972* explains dematerialisation as a shift of the art as a value of object to its political-aesthetic contextualisation, which is the immaterial level of art. She concludes this from the fact that the creative process itself is mechanised and that it is the concept that generates the artistic meaning and not how the artist chooses their motives or techniques.

respect, Lillemose treated immateriality as a new material condition produced by aesthetical processes:

This aesthetics suggests a new interdependent and open exchange between the conceptual and material dimension of art: In setting materiality free from the object – and the philosophical discourse, power structures and aesthetic paradigms of pure visibility surrounding it – the notion allows us to comprehend materiality as a potential predisposed for continuous conceptual coding, organization, distribution, contextualization and interpretation. Instead of attaching materiality to specific and finite forms, media or institutions, conceptual art conceives materiality as virtuality and places it in a broad aesthetic – multi-, inter- and post-media – field of continuous abstract actualizations.... In other words, conceptual art questions materiality – the material condition – by subjecting it to abstract actualizations in the mental and not the visual sense; questions in the sense of opening it to new expressions and meanings. (Lillemose, 2005, np.)

He pointed out that immateriality is one of the formulations which can break down the technologically focused aesthetic in technology-based art. Lillemose's approach is particularly important to the thesis as it comprehends a critical approach to technology-based art. However, his approach is only based on the critique of fetishism and 'technological attraction', which has been identified in Krueger's work, providing no solution to how immateriality might be used as an artistic conception in creation. Lillemose established an aesthetic where immateriality emerges only in evaluation processes, justifying art creation based on conceptual contents. The thesis suggests that Lillemose's model is a significant modality of dematerialisation of aesthetic but it is still contained in a materialistic framework, which ignores experience as being crucial to the aesthetic. In this respect, Lillemose's concept bares a similarity with Eco's original concept of openness (see chapter 2, discussed as semiotic openness), where meaning creation did not, crucially, account for interaction, but produced the essential quality of the experience through the meaning creation. Whereas Lillemose's approach argued for an immateriality in the creation of a balance between technology and art in artistic creation, immateriality in this thesis question: what is the affective impact of this potential aesthetic on the spectator. Lillemose situated his

view of immateriality in the old dualistic model of artist-artwork and artwork-spectator, in which he conceptualised the artistic creation in terms of concrete artistic intent.

What Lillemose ignored (ie. the process of art creation and experience as an aesthetic dimension) Jean-François Lyotard (1985) - the creator of the *Les Immatériaux*<sup>68</sup> (in English: The Immaterials) (Figure 6.01) – described as a flow-like process. Lyotard, however, discussed artworks in general (not implicitly with reference to technology), which he did not see linked to a material object but to a time-based stream of immaterial sensation. More explicitly and unambiguously resembling Csikszentmihalyi's psychological account of flow, David Ryan (2002) described this non-physicality of human cognition as the extension of flow in the system:

In virtual reality, where technologies splice human subject into a cybernetic circuit by putting the human sensorium in a direct feedback loop with computer data banks, flow becomes the operative concept: 'the flow of information within systems is more determinative of identity than the materiality of physical structure. Lunging into the river of information implies recognizing that you are the river'. (Ryan, 2002, p.44)

As such, the flow as a cognitive quality (Csikszentmihalyi, 1975) is the agency of interconnectivity, which in art is the fulfilment of dematerialisation.

Through this, the flow can be understood as immateriality in art which uses the metaphor of the circulation of blood flow in the human body serving as a regulator of interconnection and generator of more complex phenomenon. In this analogy the centre of the creation is the artwork, which functions as an organ creating a meta-level in the system. The heart of this system is the generator of the flow, which creates, through other agencies, consciousness, while the flow itself

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<sup>68</sup> *Les Immatériaux* was an emblematic exhibition in the Pompidou Centre in Paris in 1985. Jean-François Lyotard and Thierry Chaput co-organized the event, which proposed a new approach to art, bringing science and high-technological aspects into consideration. The intention of the exhibition was to explore how technology might change aspects between human and materials and how the information society might have an impact on human perception.



Figure 6.01 *The poster of the exhibition of 'Les Immatériaux' in Centre Georges Pompidou*  
(Ed. Lyotard and Chaput, Editions du Centre Georges, Pompidou, 1985)

is not productive but indispensable for the organism. The intensity of flow is regulated by the 'heart' (in this context the artwork) controlling the quality of generated phenomenon. To be aware of the body means to be able to regulate the blood flow. This is how spiritual techniques create meta-levels in the body. In a similar manner, creative processes focusing on the conception of the flow might create a meta-level in the artwork.

Dematerialisation has previously been acknowledged in technology-based creation; however, its articulation has either stayed within a materialistic conception of immateriality or it was not applied as an aesthetic modality. Also, the investigation has revealed that there have already been conceptions of immateriality as flow-like qualities in art; however, they did not acknowledge its potential for a new aesthetic in interactive media art. In order to produce the immaterial model for art, the thesis' argument suggests an aestheticisation of the flow as the cognitive quality of the 'artist-artwork-spectator' triangle. Working towards an immaterial aesthetic quality means that the artists create their artwork to produce immediacy to the spectator, manifested in a meta-layer of the artwork that is produced through the effective application of invisible tool and transparent medium.

The notion of transparency was earlier implemented, declaring a quality of technology that is both artistically reflective and functionally invisible. To accommodate the quality of interconnectivity between artist and spectator, this chapter suggests applying the previously discussed terminology of transparency (see chapter 4). It is proposed that, as transparency is considered a cognitive quality of technology, in the same manner it can be applied to the entire creative process between artist and spectator. This emerges from investigations in earlier chapters, which concluded that the artist creates experiences and not representative attributes through technologically-mediated collaboration and, as such, the artistic vision of the chain of

events (the design of experience) ideally needs to match the spectator's cognitive processes. Thus, the qualities of the creative flow in artistic creation are analogous to the qualities in the creative process of the experience. This is how the artist and spectator interconnection is assembled in high intimacy, as both creative processes ('making art' and 'experiencing art') work towards cognitive models within the interactive process. Recognising collaborative processes – interaction with generative tools, interaction with organic tools (programmers) and interaction with artistic interface – as the main objective of creation and experience, it will be proposed that the cognitive flow between 'artist-artwork-spectator' is the framework through which technology creates the quality of transparency. It links two subjective experiences (artist and spectator) together and suggests an epistemological phenomenon in artistic processes. The heightened quality of flow between artist and spectator makes their relationship intimate as it creates a meta-cognition by seeking new knowledge; they have similar cognitive qualities in the interactive processes of creation through artistic intention and the interactive processes of experience through shaping consciousness. The crucial interest in mapping these two processes onto each other, or better to draw an instant link between the cognitive processes of artist and spectator, is the generation of a model for artistic practice, which, through implementation, sets up a 'direct' access to the audience's cognitive modification. It is argued that to achieve this, not only the qualities of spectator consciousness need to be considered, but also the qualities of how the artist produces transparency with the applications of the invisible tool/transparent medium and the collective collaborative processes.

The matching of the 'making art' and 'experiencing art' processes has been demonstrated by contemporary art research. For example by Lizzie Muller and Ernest Edmonds' project entitled *Beta\_space*. In this project the artistic creation was immediately tested by the spectators;

they claimed (Muller and Edmonds, 2006, p. 149): ‘It is in such cases, where the public meets the interdisciplinary creation of the artwork, that production and presentation are drawn together’. With their concept of ‘living laboratories’ they elaborated on an experimental model in which artist and spectator work closely together to produce an affective modality for interactive art production.<sup>69</sup> This conception is particularly important as it emphasises an immaterial-based creation process in which interconnectivity, and not physical qualities, determines art creation. With this, Muller and Edmonds introduced an artist-spectator immediacy in which the audiences’ experiences could be immediately tested and as such the artistic experience was embedded in the creation process.

## **ii. Degree of Transparency**

Numerous accounts described in this thesis suggests cognitive model of technologically-mediated art, claiming an uninterrupted experience (openness, immersion, flow). Most significantly, the philosophical examination in chapter 4 brought forward the crucial concept of Heidegger’s readiness-to-hand, which described an embodied property of the human with regard to a cognitive continuum. Through the established concept of transparency this design of experience can be formulated as a desire for an undisturbed flow between the artist and spectator. As the flow is mainly based on the artistic formulation of technology, errors occur when artists do not efficiently apply technology as invisible tool and transparent medium. Applying the experience-based account of transparency, which provides an aesthetic dimension of technology-

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<sup>69</sup>This entanglement between the immediate responses by the audiences with the artist’s performance has already been exemplified in Jackson Pollock’s action paintings (Friedman, 1995).



based art, the errors can be reduced through the aesthetic aim of producing immediacy. The aim is a transparent experience at the highest level of responsiveness. The factor of deficiencies can be called noise, referring to the earlier examination of information theory in art where the distorted signal was declared to be an undesired element of exchange.

A 'transparent experience' means that the artist affects the spectator with the technology, by transmitting a new, cognitive quality. As the artworks: '...are somewhat akin to portraits, reflecting aspects of the interactors, transformed so as to express the artist's point' (Rokeby, 1995, p.153), the quality of the flow serves to describe the immediacy mediated by the artwork. As such, the notion of transparency stands for a quality of the flow, which includes the implementation of invisible tool (making art), the quality of transparent medium (experiencing art) and at the end the novel layer formulated in the spectator's consciousness. Rokeby has outlined the task of artistic production as reducing the probability of distortion, which here is called cognitive transparency:

The less distortion there is, the easier it is for the interactor to identify with the responses the interactive system is making. The interactive artist must strike a balance between the interactor's sense of the control, which enforces identification, and the richness of the response system's behaviour, which keep the system from becoming closed. (Rokeby, 1995, p.148)

The quality of the transparency shows how successfully the artist has produced an experience that is crucially reflected in the spectator's cognition. Noise is a cognitive property which arises through the faults of the aesthetic implementation in the artwork. Noise in the cognitive flow refers to that the work of art cannot bring the artistic intention into presence. This error would mostly lie in the quality and combination of artistic conceptions in the artwork, which are openness, responsiveness, invisible tool and transparent medium. As shown earlier, openness describes the artistic notion of meaning creation, responsiveness describes the quality of

interaction within the artistic system, and the notion of invisible tool draws out a crucial phenomenological understanding of an interface. The artistic system is a collaboration of these concepts. Openness has shown that, for the creation of effective meaning, the notions of multiplicity and spectator involvement should be considered. That is to say that the balance (through the elements of the artwork) between the provided knowledge (artwork) and the acquired knowledge (spectator) generate the effective meaning of art. To achieve this, the applied technology has to be re-evaluated in the context of meaning and its relationship to the spectator experience. In this respect, noise occurs through a high amount of information or through reduced quality of involvement. As such, the low degree of openness produces noise; thus, the artist is not able to exhibit their intention through the artwork. The invisible tool, or more specifically the revision of this idea of transparent interface and the notion of responsiveness, describes the quality of the interaction. Noise is created when the interface is not transparent but visible. Visibility means that the person interacting is not able to see through the interface, thus the artistic content and the meaning creation is blocked.

Goertz' investigation (as discussed in chapter 3) evaluates interactivity (the degrees of choice, modifiability, the available selections and modifications and linearity/non-linearity) in terms of the abundance or scarcity (invisibility) of those applications that do not offer continuous translation between the spectator's intention and the acquired content. Immersion is a significant contribution to this as it describes the cognitive quality that the system produces. It was suggested earlier that immersion is a quality that enables a continuous flow; hence, the lack of immersion means noise. Yet there are other, more specific, domains, like artistic content itself, which can produce noise. A common misinterpretation is the meaning creation through metaphors of interface, which leads to the visibility of the technology. Common misapplication

appears in interactive artworks when the emerging characteristic of technology becomes the artwork itself, only providing novelty without mapping out an aesthetic. As such, noise in the system means disturbance in the flow between the artistic intention and the spectator's experience; hence the meta-level of cognition cannot be created. As such, the notion of 'degree of transparency' will be established in the following section of this chapter, depicting the level of noise in the artwork. Noiseless flow means the highest degree of transparency.

The way in which noise occurs in the artistic system is enormously complex, as it emerges not only through the elements of the system but also in their collaboration. Suggesting the notion of noise as a negative form of transparency, it can be pointed out that meaning creation is the noiseless flow between invisible tool and transparent medium. The quality of noise creates the degree of transparency, which describes the quality of interconnectivity between artist and spectator.

### **iii. The Lost Dimension of Art: Transcendent Experience – The Poetic Level**

It is argued in this thesis that an immaterial quality of the artwork can be evaluated by the degree of transparency (Figure 6.02). An uninterrupted flow between the artist and spectator produces a heightened transparency which is most crucially formulated in the spectator experience. Through the acknowledgement of the flow-like capacity of creative processes, which might produce ecstatic states of consciousness, it can be shown that this meta-cognition of the spectator can produce a transcendental layer. This transcendental layer of the artwork is the outcome of an aestheticisation of the artist-spectator relationship producing a spiritual-like dimension in the perception, which is constituted by the uninterrupted cognitive processes and transparency. This

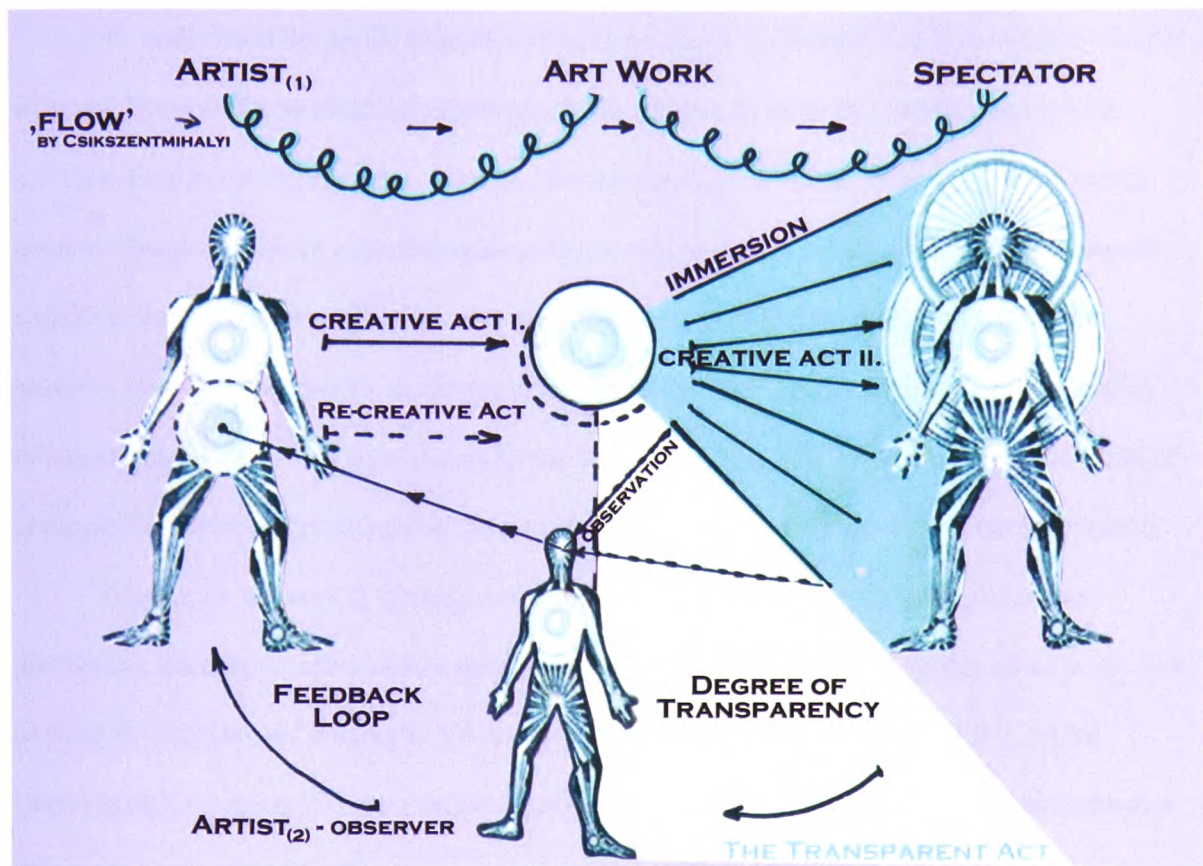


Figure 6.02 Conceptual draft: The 'artist-artwork-spectator' triangle: 'making art' and 'experiencing art' processes in the Transparent Act and their evaluation through the degree of transparency (Zics, 2007)

unique quality, as it is argued in this thesis, produces a new, poetic knowledge through the spectator's aesthetic experience.

To understand the application of a transcendent layer in interactive media art, this chapter will now characterise its meaning in this particular context. In order to establish a cognitive noiseless flow between artist and spectator, the terminology of 'transcendent' is treated here as a unique outcome which, in a similar manner to spiritual practices, which might produce unusual cognitive qualities of consciousness, described earlier as ecstasies. In this sense, the thesis allocates transcendence not as an external indescribable force<sup>70</sup> but as a possible unique quality of human cognition, which is produced by the aesthetic experience; it is a transcendental level of consciousness which is produced by the noiseless flow and achieves a new knowledge creation.

Illustrating the way in which this unique quality can occur in technology-based art production, the chapter introduces accounts which claim a transcendental quality of artwork. One of these is Char Davies' enigmatic VR-based artwork *Osmose* (1995) (Figure 6.03), which Laurie McRobert referred to as a unique spatial experience that would evoke transcendent states of consciousness through affection:

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<sup>70</sup> Numerous philosophical accounts explained transcendent qualities with an agency of supernatural forces. The word transcendent (-al) was described initially by Greek philosopher Plato and can be defined as meaning 'beyond sense experience'. With this term Plato affirmed an indescribable phenomenon that is known only by intuition. Plato's terminology was applied in many religious tenets (Judaism, Christianity, and Islam) to describe a spiritual characteristic of the reality. The most known account of transcendence is from Kant who introduced the dual semiotics dividing 'transcendental' from 'transcendent'. Kant (1855 [1781], p.16) described the more commonly used transcendental as : 'I apply the term transcendental to all knowledge which is not so much occupied with objects as with the mode of our cognition of these objects, so far as this mode of cognition is possible *a priori*.' Whereas transcendental is more linked to a phenomenon of knowledge that does not appear instantly from the experience itself, 'transcendent' means beyond the limits of human experience (not immanent).



Figure 6.03 Screen shot of the 'Subterranean Earth' in 'Osmose'  
(Davies, 1995)

Why does the experience of transcendence occur at all? The most obvious reason is that we float in a novel sense of spatiality, an experience that differs from the three-dimensional spatiality we live in. Another reason is that in *Osmose/Ephe'm'ere*, the translucent, semi-transparent art forms appear to be dressed in a skeletal essentiality, a framework which gives them a formal, unearthly air. (McRobert, 2007, p. 64)

He pointed out (2007, p. 64) that this emerged not through: '...an encounter of magically represented nature' but rather as an artistic process of altering perception. Similar to the thesis' argument, McRobert further built an analogy to spiritual experiences, pointing out that iconic paintings which represented a faith evoked similar experiences to those seen in Davies' special spatial experiences:

Still, the icon's [painting] dynamics, coupled with belief, with faith, can also evoke transcendent feelings in the worshipper, making her feel as though she had travelled to some heavenly spatiality. In this respect, both the icon and Davies virtual art, do, indeed, tempt the worshiper or immersing to embrace God or nature as an Ideal form. (McRobert, 1997, p.65)

McRobert's notion of 'heavenly spatiality' referred to a cognitive introspective experience more like an extraordinary perception of an unknown world. In this respect a revisit of Gromala and Sharir's (1994-99) technology-based dance performance *Dancing with the Virtual Dervish: Virtual Bodies* is inevitable (see earlier in chapter 5), as it also aimed to provide a spiritual-like experience. In this sense, it immediately draws out a potential of transcendent qualities which Sharir (1996, np.), the dancer of the performance, formulates as follows: 'Could the transcendent state of a dervish be at all expressed or alluded to? Was the experience of so-called disembodiment in any way related to other transcendent states?' In a VR environment, as it was described in chapter 5, the artist-choreographer collaboration intends to generate an experience in which they recall various states of body awareness combined with sacred meanings of text. Johannes H. Birringer (1998) also described a vivid sensation of transcendence in Gromala and Sharir's work through the fluctuation between consciousness and body:

The notion of 'disembodiment' in technological immersion is resisted here for its perpetuation of the transcendent metaphysics of mind space over body intelligence. Indeed, the thinking and sensing body empowered by technology offers up, in reverse, visceral languages of bones, organs, fluids, and even of seeing inside a movement. (Birringer, 1998, p. 127)

With the various layers of perception of the dancer and spectator their work attempted to build an analogy to the spiritual practice of whirling dervishes. The extraordinary perception, evoked through the formulation of body transformation and flying into an inner-self, is analogous to the repeated actions of the dervish worshiper, who transformed his body awareness into an ecstatic state. As such, the characteristics of transcendent layers are immediately linkable to the earlier established notion of immersions, disembodiment and most crucially to spiritual flow experiences. Whereas in spiritual experiences a particular intentional 'body-mind ritual' leads to a transcendence, in technology-based art the characterisation of the spiritual does not link to an unsubstantiated phenomenon (for example seeking supernatural entity); it rather aspires to awaken knowledge towards a spiritual layer of reality. Although art does not produce holistic practice models as spiritual means, it illuminates qualities and phenomena which might change or underpin ideas towards the nature of man. The spiritual level emerges from the aesthetic, therefore it serves the artistic intention and not vice versa.

Through the analogy of the transcendent layer to a spiritual-like experience, the thesis suggests that the transcendence produced by the flow is not only a crucial process in the spectator perception but the producer of a new knowledge with regards to Csikszentmihalyi's claim. Similarly, Imants Brauša described the entering into an inner knowledge which carries a potential to characterise new knowledge:



In the mystical experience [transcendent experience] that I had, I spontaneously entered a transcendent state of consciousness in which I had the sense that I knew everything that I ordinarily knew, but saw that it all fit together in a harmonious pattern with everything else in the universe. Coincident with that noetic realization I had a deep sense of emotional well-being that was not characterized by excitement, but rather by profound groundedness. (Brauša, 2007, pp. 122-123)

Brauša's notion of self-transformation (which relates to the earlier discussed flow experience) emphasises a 'noetic' experience, is an indescribable phenomenon but also emphasises the produced knowledge, which makes visible not-yet-known qualities. Brauša argued that this rediscovered knowledge is the greatest challenge of science and probably the greatest potentiality of technology-based art. In this respect, the knowledge-seeking in artwork emerges through a transparency which is produced by the artistic meaning creation of interaction. Meaning creation, as introduced by the concept of openness, produces the aesthetic layer of the transcendental experience. The argument here describes this significant layer as a poetic level of the artwork, which is significant as it allocates the artistic characteristics of the transcendental experiences. The notion of a poetic level in the context of this argument does not suggest a poetic knowledge but rather a sensory-emotional experience of the artwork. Poetic means an experience through senses which, however, might exhibit the same metaphoric sense as poetry does. It can be said it is conflicting with a scientific knowledge. Taylor (1998) expresses the poetic matter as in the following way:

Poetic experience indicates an encounter with reality that is non-analytical, something that is perceived as beautiful, awful (awe-full), spontaneous, mysterious...poetic knowledge is not strictly speaking a knowledge of poems, but a spontaneous act of the external and internal senses with the intellect, integrated and whole, rather than an act associated with the powers of analytic reasoning felt... It is, we might say, knowledge from the inside out, radically different from knowledge about things. In other words, it is the opposite of scientific knowledge. (Taylor, 1998, pp. 5-6)

The transcendence of the poetic level is what in artwork generates novel knowledge and immediacy, which is here defined as the degree of transparency in the artwork. In a similar manner, Whalen (2000, np.) describes the poetic level as triggering new knowledge which emerges in the transcendence: 'Poetic Knowledge skilfully excavates an essential mode of human knowledge. It is a mode as proper to our intelligence as it is redolent of man's transcendence and the value of knowledge for its own sake'. As such, the thesis explains the poetic level as a meta-layer of the artwork which is necessary to a transcendent experience.

The argument of this thesis now arrives at one of its most crucial declarations, which claims a re-discovery of knowledge that was already existent in modalities of art but had disappeared due to a materialistic development. This novel knowledge works towards a non-materialistic artist-spectator immediacy in art creation but has shifted into a hidden dimension of aesthetic preservation. This forgotten aesthetic principal was the result of scientific knowledge impacting on creative processes, which focused on the improvement of object-based properties, rather than on the original intentions of art, to produce an intimate communication between the artist and spectator. The lack of conceptualisation of this metaphysical quality arose from the increased scientific-based application of techniques in art (for example linear perspective). Implementing mechanical methods served representalist doctrines, which can be considered as a key turning point in the development of art practices.

It follows that the 'immaterial act' can be characterised as latent knowledge and it can be claimed that technology not only displays scientific knowledge but also produces transcendental qualities. Immateriality in the creation processes focuses on cognitive processes which engage with non-replicable phenomena that are not measurable. As such, the lost dimension of the

artwork can be seen as the rediscovery of a novel spiritual-like process, which through the potential of technology might reproduce forgotten cognitive qualities of art. As such, the immaterial approach of art reverses the dualistic understanding back to ancient aspirations that the artist builds an intimacy through a spiritually-driven creation. It is argued in this thesis that the *Transparent Act* might return this lost dimension of art, providing a sophisticated framework for technology-based art.

#### **iv. The Transparent Act**

By focusing on a philosophical investigation of interactive media art, a new model has been determined, termed the *Transparent Act*, which is an immaterial encounter offering a transparency in cognitive processes. The *Transparent Act* is a process of flow between the artist and spectator in which interactive technology enables a new immediacy between them. This immediacy is the crucial meta-layer of the artwork, which is characterised in the spectator's transcendent experience. The poetic knowledge produced through these immaterial interactions suggests a rediscovery of a lost dimension in art, breaking down the legacy of materialistic approaches to aesthetic. As such, the *Transparent Act* might provide a novel aesthetic approach to technology-based art for practitioners and critics, and also an educative model as well.

Until now the process of artistic creation and the process of 'experiencing art' have been approached as isolated activities and their impact on the interconnectivity of creative processes was ignored. It has been argued in this thesis that interactive technology requires an active spectatorship through which both the artist and spectator have the same generative role in the artistic creation. The artists create the work not based on physical properties but as a chain of sequenced events. This generative act is the spectator's experience design; thus the artist creates

the work as if they would experience it themselves. From another point of view, the spectators experience a cognitive quality based upon the artists' act. As such, the spectators' experiences reflect the artistic intention distributed by the generative act. Therefore, the *Transparent Act* is a two way action of creative processes because not only does the artwork affect the spectator, but the spectator's action also affects the artwork.

Based on these claims, the 'artist-artwork-spectator' triangle has been substantiated, which suggests that the cognitive quality of the artistic creation and the spectator's experience can be mapped onto each other, which leads, to the aestheticisation of the artist-spectator interrelationship. From this perspective, the novel aesthetic driver of the creation is, instead of an object-oriented creation, a cognitive-based design of the experience. Through this, the intimate processes between artist and spectator are declared as a main objective of art creation, seeking a noiseless flow between them. The quality of this cognitive flow relies on the cognitive immediacy of the artist and spectator, which is a collaborative application between the meaning creation of the artwork (openness) and technological potential of the interaction (responsiveness). The transparent application of these concepts means seeking a transparent medium in creation that produces the flow that characterises not only the artwork-spectator interaction but also the artist's cognitive application.

A productive application of the transparent medium is a balance between the artistic novelty and technological functionality, which is also the equilibrium between the artistic content and mastering the tool. This produces the transparency in the creative processes and the noiseless flow between artist and spectator. Therefore, whereas the quality of transparent medium describes the success of the artistic conception of technology, the degree of transparency describes the cognitive quality of interaction which is how far the process can be considered as

noiseless. The 'transparent experience' is a heightened degree of transparency which arises when the artistic formulation stimulates affection in the spectator's consciousness, enriching it with a novel knowledge. This perceptual knowledge is grounded in the conception of the cognitive flow, which is akin to spiritual experiences and characterised by similar cognitive outcomes. Seeking transparency frequently generates meta-cognition, the crucial experience produced in the spectator's perception. This transcendental layer is the ecstatic state of consciousness where the flow between the creator and spectator is noiseless.

As such, in the *Transparent Act* there are two qualities of transparency: one as the quality of interface, the other as the process or act that is presented as a flow in the triangular interconnection of 'artist-artwork-spectator'. As classified earlier, transparency is a powerful attribute of creativity, which provides subtle layers of meaning in the artistic interface. Transparency as a cognitive quality (the act) of the entire process of 'artist-artwork-spectator' is based on the aim of the artistic act, which implements tool and medium in such a way that the spectator might experience the artist's intention. Transparency is not invisible since it reflects back the artistic message of the medium, which technology in an artistic context carries as a layer of meaning. Therefore, the *Transparent Act* is a creative flow between artist and spectator through the artistic reflections of the work of art.

In this respect, through the thesis argument, significant notions of interactive art production have been elaborated on (such as openness, responsiveness, invisible tool, transparent medium, body-awareness - immersion, ecstatic state, transcendent dimension and poetic layer), which can be seen as the pillars of the *Transparent Act*. The earlier revision of numerous theories, which had been applied in diverse contexts, served as a potential tool in a new aesthetic. The argument provided a network of significant conceptualisations offering a holistic

understanding towards a new aesthetic. The quality of the application of these concepts was provided by the notion of transparency, which depicts how all these attributes work together and what qualities they can provide in order to create a noiseless flow. As the artist is the producer of the chain of events in the spectator's cognition, they have to apply these modalities so that it produces an optimal experience. In this respect, all of the pillars have their original contribution in the *Transparent Act*, interconnected through the immaterial approach of Heidegger's invisible tool. It has been argued that technology in art has two different applications according to the quality of how cognitive flow is produced. Through Heidegger's notion of readiness-to-hand it was claimed that technology should be invisible in the artistic creation process, which is similar to technology-driven design processes. Technology as artistic medium, however, should be reflective and create a fluctuation between ready-to-hand (invisible) and present-at-hand (visible), which in this thesis is termed as transparent medium. The visibility or reflectivity of the transparent medium in creation means not an error in functionality (as it would be comprehended by design applications) but an artistic layer of novelty. Therefore, in the transparent medium the technology itself becomes the content and with its emerging character contributes to meaning creation. Interactive technology becomes a transparent medium through the meaning which is attached to its quality of responsiveness and the artistic interaction produces the quality of transparency, which is an aesthetic formulation of the invisible tool.

Through artistic cognitive modelling, the artist aims to produce a unique experience termed immersion, which means a perceptual fusion between the artwork and spectator. Immersion in the *Transparent Act* is the basis of transparency; it determines openness through the body awareness and its role in the artistic interaction. Body awareness is the powerful tool of art production that supports artistic decisions of meaning creation, describing the cognitive status

of the body in the experience. As this thesis provided a classification based on particular bodily activity of interaction, the passive and active characteristics afford a spectrum of body-mind interconnection as artistic meaning creation. In this respect, the involvement of the spectator immediately determines the type of transparent medium and also the type of immersion. The thesis laid down that full bodily immersion is likely to create a different disembodiment than bodily involvement, which relies more on the symbolic comprehension of interaction. Through understanding the interactive act as a body-mind application, the argument draws out a crucial resonance to spiritual practices, describing immersion as a possible state of ecstasy. The ecstasy is the result of optimal cognitive qualities according to Csikszentmihalyi's definition, which in creative processes are the success of the invisible tool and the transparent medium, by means of body awareness and immersion. Comprehending the concept of flow is significant for the *Transparent Act*, as it not only describes the immersion and an ecstatic state in the transparent medium but also the effectiveness of the invisible tool in the 'making art' process, which so determines the 'artist-artwork-spectator' triangle as the poetic layer of the artwork. What was recognised in the analogy between spiritual practices and creative processes is a transcendence of the experience that most crucially produces a new state of consciousness. In this respect, the poetic level of the artwork provides an aesthetic meaning of the cognitive flow and so produces the essential knowledge of the interactive artwork. Thus, a philosophical framework of revisited conceptions produces a new form for aesthetic which provides the model of the *Transparent Act*.

The emerging concept of the transparent medium provides a novel perspective on technology, representing both a cognitive-based modularity and an aesthetic meaning. Technology in this respect is not a mechanistic application of a scientific approach but a radical concept of transcendence. Its essentiality lies not especially on the cognitive qualities which were

already recognised in interaction design (see Dourish's account in chapter 3) but rather in the cognitive quality that produces a poetic quality generating an aesthetic meta-cognition of the artwork. The technology in creative processes is used as an instrument of affection to human consciousness; the artistic system is a collection of elements for affection to the spectator. As such, technology is not an object in the *Transparent Act* but a cognitive affection in the experience which, with its particular characteristics, is able to shape consciousness with a potential for new knowledge creation. This transparent medium reconciles the lacunae through which technology was, for a long time, seen as only an application of scientifically describable knowledge.

This suggests that artists, in this way, state their artistic intention in a novel experience by means of technology, which is formulated in the spectator perception, generating a new transcendent knowledge. Therefore, the new essence of the creation means being focused on human purpose and drive. Consequently, in interactive media art, artistic representations are considered to be human-centred rather than object-centred. This is a significant shift from the classical model of art where the work itself was in the centre and not the spectator's perception. The artist's task is to understand human cognition and the human itself. The new conception, now, is to gather profound information about humans using high-end technological achievements; this data, after analysis, then serves to influence humans (the spectator) in a crucial way. The human being experiences novel knowledge in a unique artificial environment (such as VR) which is the new scene for artistic expression. These responsive environments, or transparent media, are crucial artistic formulations of technology, exhibiting a cognitively sensitive surface of physical interfaces. Through these visible and invisible surfaces a creative flow is established through which the artist attempts to produce an affective experience, as it sets



up an encounter of human perception and behaviour. The effectiveness of this experience design is based upon the transparency that determines the degree to which the spectator can influence the work, whilst still being provided with comprehensible and comprehensive artistic knowledge that demonstrates the artist's integrity in the execution of the artwork; how far the proceedings (spectator's experience) reflect the intentions of the artist (art production). Thus, the *Transparent Act* is a cognitively responsive system in which the 'artist-artwork-spectator' triangle reflects upon their experiences in the creative flow and in doing so produces transcendence.

As such, the model of the *Transparent Act* formulates a revolutionary understanding towards artistic creation and evaluation. It breaks with former beliefs that technology is a product and an accomplishment of a mechanistic view. The *Transparent Act* claims that technology has materialistic boundaries but its affection on human cognition might amplify unique spiritual-like content. As such, this emerging model of art resituates mechanistic encounters of interactive technology that focused on the power of responsiveness, providing a phenomenology-based understanding towards science. At the same time, it suggests a novel aesthetic interpretation of technology, which might transform the old dualistic model of art. In this respect, science brought a powerful tool to art which enabled a rediscovery of an immaterial dimension that is rooted in the acknowledgment of artist and spectator interconnection. The new model is essential as it produces an abstraction for practical and theoretical application. The model does not claim to provide a universal solution of an aesthetic in interactive media art but rather establish a model which might produce a more effective application towards a technologically-mediated aesthetic. Importantly, it describes the paradigmatic change in art making and provides new methodologies for the creation process. The *Transparent Act* claims a rediscovery of lost knowledge of art that

was always there as an immaterial encounter but was rarely recognised as an ultimate solution to aesthetic.

Proceeding from the claim, above characterised, the *Transparent Act* makes an innovative step towards immaterial art. Linking the previous dualistic models of artist-artwork and artwork-spectator, the potential of cognitive interconnection between artist and spectator has been established, which in this way determines the art production. In this respect, art plays a crucial role in the identification of a lack within traditional mechanistic models of interaction, which understood art as a changing manifestation of the work and ignored the aesthetic value itself. The aestheticisation of interactivity allows access to a novel, transcendental layer; the affects which are embedded in the spectator's experience. From the intimate communication of artist-spectator emerges a transcendental knowledge as a result of a rediscovered dimension of art. This is the potential application to contemporary interactive media art.

## Chapter 7

### The Practical Application of the Transparent Act: The Affective Environment of the *Mind Cupola*

#### **i. Application of the Transparent Act: The Fractal Structure of the *Mind Cupola***

In the previous chapter, this thesis established the new concept of the *Transparent Act* that moves towards a new aesthetic of interactive media art. In this chapter the thesis will outline a practice-based application for the model built upon the previously established interdisciplinary framework. This particular artistic application is based on the conception of passive interaction, which emerged from a critical investigation of interactivity and produces a further development of the earlier artworks of the author. The new artwork attempts to provide a proof of the philosophical model of interaction outlined in the thesis and exemplifies one possible approach applying it in practice. This chosen practical application of the *Transparent Act* aims to produce a technologically-mediated artwork that has a potential to display a cognitive transparency between the artist and spectator.

One key characteristic of a possible application to fulfil this aim is the concept of cognitive feedback loops, which is here defined as fractal structure. Following the outline of the fractal structure, this chapter will introduce an affective environment termed the *Mind Cupola* that aims for a technology-generated unique experience of the spectator. An affective environment is as Pask (1971) suggested an ‘aesthetically potent environments’ (see in chapter 2) which instead being only ‘responsive environment’ (Krueger, 1977) attempts to produce meaningful interactions based on cognitive analysis and responses of the spectator. The artistic challenge of an affective environment is the experience design which is identified in the

determination of potential technologies of responsiveness, which, through the artistic conception, creates an aesthetic meaning, shaping the spectator's consciousness.

By applying the model of the *Transparent Act* in practice, as in the Mind Cupola, there is an exemplification of the cognitive modelling of the spectator's experience that creates a transparent medium. The transparent medium is the unique conceptualisation of technology that produces an interactive system of affection. It applies the significant conception of meaning creation, which provides the poetic layer of the cognitive chain of responses. The chain of the actions suggests both a cognitive development of the spectator and a new state of the system, since every response follows on from another. The feedback suggests that both parties, the system and the spectator, produce a new state after the action-reaction chain. The step-by-step actions of the experience describe how an artist builds upon an aesthetic of action-reaction capacity as every new meaning relies on the earlier created meaning. As such, the repeated actions<sup>71</sup> of meaning creation produce a feedback loop, which is a chain reaction of responsiveness (feedback) – meaning creation – flow. The outcome is an immersion that, with its aesthetic 'wonderment', leads its spectator to a spiritual-like experience. In this respect, scientific concepts implemented in the artistic creation process are potential tools that amplify an aesthetic experience independently of their function in their scientific concept. In this way the artwork is an interactive system, which has the potential to produce the *Transparent Act*. This model elaborates on a repeated action in a closed up circulation that can be compared with the mathematical formulations of fractals, which the thesis terms as a 'fractal structure'. A fractal

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<sup>71</sup> The repeated actions here describe the embodied knowledge or mastering the tool, which implements the same learned action to produce the desired outcome. Previously, it has also been characterised as spiritual experiences applying agency of repeated action through which they produce the flow experience and transcendental level. As it was argued earlier in the thesis, this method can serve as a meaningful application for technology-based art.

(Latin word: fractus<sup>72</sup>) is a pattern that repeats the same design and constituency at a range of scales. The recurrence generates a pattern of smaller elements which results in a complexity. Fractals are representative forms of mathematical feedback loops, which may be best exemplified in the effect of the broadcast of a camera directed at a television (as exemplified in Peter Weibel's artworks later). The fractal structure, sometimes referred as a 'world within world', is expected to appear in irregular repetition in the *Transparent Act* or more specifically in the artwork and its triggered experience. The recurrence of similar characteristics makes the outcome complex, which may serve the study of unpredicted patterns in the generated experience.

Mandelbrot's (1982) recognition that fractal geometry gives a fundamental insight to the phenomenon of nature (contrast to Euclid's geometry) brought revolutionary concepts to science. One of the most widely known patterns of fractal geometry is the 'apple-man'. The structure displays a complexity of infinite repetition of a particular form of apple, which is a repeated pattern on different scales. By zooming into the border of this pattern, new structures come into presence until the structure of the apple-man itself emerges. Since this, Mandelbrot and other scientists have noted that fractal structures can be observed in many phenomena of nature – such as clouds, river systems, mountains, plants – and are also represented in various experiments on growth - such as crystallisation, electro deposition of zinc, and viscous fingering (Vicsek, 1989). The claim that cognitive qualities might involve similar characteristics (Goldberger et al., 1990) can set up a meaningful artistic conception towards the established transcendent dimension. To underpin the artistic approach to fractal structure, it should be noted that scientists recognised

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<sup>72</sup> The word 'fractal' is rooted in the Latin word of 'fractus', meaning 'break into irregular fragment'. However, the mathematical form of fractals existed from long ago, whilst the inventor of the graphical fractal is Benoit B. Mandelbrot (1977).

analogous patterns in human bio-data as neural structures (Goldberger et al. 1990), in for example Electroencephalogram (EEG) (Gordon and Alexander 1996, Watters 1998), rapid involuntary eye movements and the range of timing in the heart beat represents fractal laws (Woods and Grant, 2003)(Figure 7.01, 7.02). As such, the notion of fractal structure attempts to describe the quality of being in a feedback loop, a repeated affection of the technology that occurs in spectator's consciousness.

The fractal-like characteristic of the repetitive interaction is not only meaningful to picturing the repetition that the interaction might represent but also the complexity that emerges in the process, which is explained by Ning Lu as follows:

Fractals challenged the assumption of rectifiability with the hypothesis of self-similarity. It declares that instead of assuming zero complexity, it is much better to approach the magnified world with the same complexity as the current world we have known. This is where fractal, as new philosophy and methodology, differs from other, conventional technologies. (Lu, 1997, p.52)

Considering Lu's approach in artistic conceptions, his notion of self-similarity might be applied on the pattern of action and reaction (cognitive feedback loop), which minimally modifies the next pattern (in the same way as by the fractals) and over time will develop a complexity of phenomena in the spectator's consciousness. In this respect, the *Transparent Act* applies the fractal as a possible method producing novel levels of consciousness. The *Transparent Act* builds upon the claim that evolution of a simple dynamical system over a long period of time produces complexity, which means the repetition of simple affection generating novel experiences through the artistic system (Forrester, 1968; Lorenz, 2000 [1972]). Applying the 'fractures' (Mandelbrot terms them patterns) in technology-based art, the act declares that artworks can be understood as

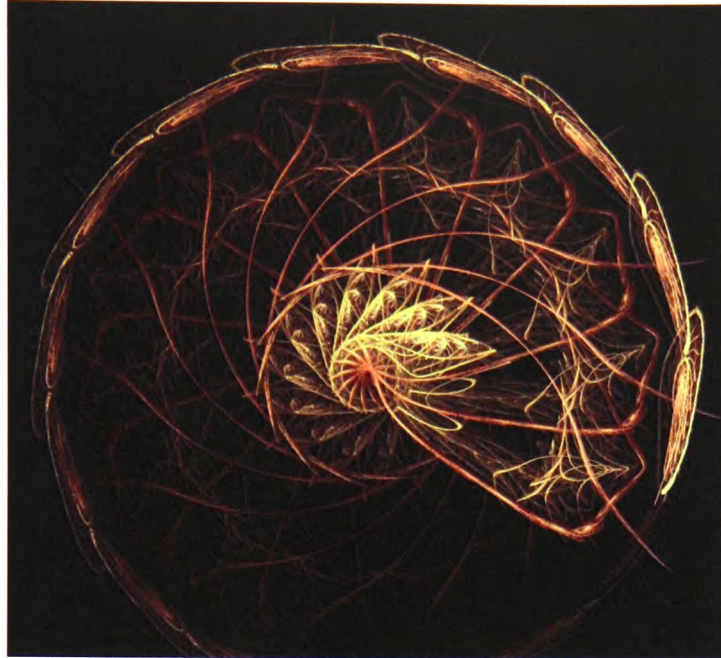


Figure 7.01 *Fractal produced by the software application of 'Apophysis 2007' (Zics, 2007)*



Figure 7.02 *Fractal-like tree fern fronds, 2006 (Morgan, 2006)*

time-based (non linear) systems that generate complexity within dynamicity (Crutchfield, Farmer, Packard and Shaw, 1986).

Proceeding from this, the notion of fractal structure stands for an artistic technique of the feedback loop that is designed in order to generate a complex phenomenon of cognition, producing spiritual-like experiences for the spectator. Thus, the fractal structure provides a potential artistic application of responsiveness with the affective quality of a dynamic system. Previously, interaction in technology-based artworks have mostly been characterised with responsiveness as technological effectiveness and every interactive artwork exhibits a certain amount of feedback loop through a continuous circulation between input and output data<sup>73</sup>. From this perspective it has been discussed Goertz' model which evaluated a technological quality of feedback. Instead, this thesis suggests creating a 'cognitive feedback loop' that produces a fractal structure in the spectator's perception. This model describes a particular method of feedback creation, which, instead of using common interfaces that only provide limited data of the spectator's cognitive states, suggests implementing affective technology that cognitively monitors the spectator's responses. This new model, one of the core interventions of the thesis, is based on methods of 'affective computing'<sup>74</sup>, which has been utilised in experimental psychology under the conception of 'third force' (Popper, Wandersman and Riks, 1976) for evaluating human judgment by analysing emotional representations in action. As such, in this context the cognitive feedback loop stands for an artistic conception based upon cognitive

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<sup>73</sup> In terms of technological function, feedback loops have the ability to account for the spectator's actions (responsiveness). When the spectators enter into an interactive environment they operate through the technological response which produces a cognitive feedback. The system tasks offer cues (navigation or metaphors as control) to communicate to the spectator which actions are required, which kind of interaction is appropriate and what impact the interaction has on the system. As such the spectator is able to embody the system smoothly, generating an effective interaction.

<sup>74</sup> Affective computing attempts to capture and process cognitive phenomena; more particularly attempts to record and analyse emotional states of humans (Picard, 1997).



analysis where the artistic system is analysing the real-time actions of a spectator for the creation of an experience. The artistic meaning emerges from the analysis of the spectator's feedback based on methods that attempt to capture behavioural, emotional and other unique personal data (eye movement analysis, head tracking, etc.), which are useful for capturing cognitive changes. The artwork uses the potential of technological feedback to produce a cognitive feedback that results in a fractal structure constituting the crucial transcendent layer of the experience. The created phenomenon can be comprehended as a system, which through the feedback loop between the participatory agency of the spectator (who is there as the 'reflector') and the interactive technology, creates a novel phenomenon in the spectator's cognitive faculty. The research also applies the fractal structure as an aesthetic methodology for visualisation (see later in this chapter the description of the *Mind Cupola*). The visual language of fractals attempts to explore the potential of this mathematical pattern for the affection of the spectator's perception.

Comparable to the model of fractal structure introduced above is the pioneering work of artist Peter Weibel, which focused upon the conception of feedback loops in the artwork-spectator interrelationship. In the same period of time as when Krueger had started to consider a feedback system that was enabling an active spectatorship, Weibel introduced a conception that focused more on questioning the role of spectatorship, through which he aimed for an immediate affection of the spectator's consciousness. Through his work it can be interpreted that he suggests that the mirroring experience of video feedback might produce a phenomenon of a reflected consciousness. In his initial work on this concept, Weibel broadcasted, through a television, the phenomenon of 'world within the world' (briefly mentioned earlier), which endlessly repeated a picture of a spectator. In the *Endless Sandwich* (1969) he represented a phenomenon of a closed-circuit system in which the chain of replication produced a

representational feedback loop of 'observer [spectator] observation' (Figure 7.03). As such, the chain of multi-universes ended in a 'real reality', with the TV spectator creating immediacy between real and technological repetition. A feedback of the spectator was triggered when the replicated realities do not reflect the real reality back anymore; namely errors occur at the end of the spiral that has effects on the other modalities of reality as a chain reaction, until the action steps out into the reality. Weibel depicted this as follows:

An error happens in the first Universe. The person has to get up to correct the error, and while he does so, it jumps to the next Universe. In the end, each Austrian TV viewer had to get up to readjust his own TV. So this is one of the first model of Multi-universes and how the information exchange and transformation works. You can see very clearly that the TV is treated as a kind of interface. (Weibel, 2001, p.272)

Following on from the concept of fractal structure, Weibel's work impacts through a representational fractal structure of the spectator's reflected picture produced by video technology, using a television as the interface. For Weibel, the fractal loop is a conceptualisation of self-observation that, as he suggested, can never be totally fulfilled (Weibel, 2001). With the self-representational loop he describes the distortion that occurs through every interface but also, most crucially, in the spectator consciousness. As such, the installation of *Endless Sandwich* attempts to model a self-consciousness that is able to experience only itself, since no one else can enter this vision. Therefore, all of the other 'selves' are interpretations of the first 'self' (the spectator's consciousness), replicas that draw out patterns of feedback in forms of fractal structure. In this respect, Weibel's primary artistic conception profoundly characterises an affection of the spectator's consciousness through a feedback loop, which, in every single fragment, produces a different distortion of the self. Other works of Weibel further developed the idea of feedback loops as an interface by using similar self-representations to produce a distortion in the receiver's consciousness. The closed-circuit video installation called



Figure 7.03 Screen shots of Peter Weibel's TV performance of 'Endless Sandwich' (Weibel, 1969)

*Observation of Observation - Uncertainty* (1973) produced a self-image of the spectator that mirrored them from a different point of view but never through the laws of physical mirroring (Figure 7.04, 7.05). In a similar manner to his previous work the 'distortion of the self' through the self-representation, or more particularly the diverse expectation and novel observation of the self, generated a shifted self-consciousness. Overall, Weibel's work provides crucial examples of a primarily artistic conceptualisation of fractal structures, which through their affection aim to alter the spectator's self-knowledge by suggesting that consciousness might itself be an endless repetition of self-perception.

## **ii. Affective Environment: The Unique Interface of the *Mind Cupola***

This section of the chapter introduces an interactive artwork called the *Mind Cupola*, which is based upon a passive modality of interaction (see chapter 4). This artwork creates an affective-interactive environment where the devices directed at the spectator generate mental transformations in its spectator (Figure 7.06). The aim of the *Mind Cupola* bio-feedback device (Figure 7.07) is to produce the flow experience of the spectator for a potential state of creative ecstasy. Modelling new means of interaction, this device attempts to generate a cognitive feedback loop in the spectator's experience. Its intention is to apply special technologies that are unique in the affection of human perception and effective in capturing behavioural changes in the human condition.

As the fractal structure is one of the suggested applications of the modality of passive bodily interaction, the *Mind Cupola* applies this method in order to generate the spectator's subjective experience. As discussed in chapter 4, this modality of interaction produces an artistic meaning not by the symbolic interconnectivity of bodily activity and content but rather by means



Figure 7.04 *'Observation of Observation – Uncertainty'* in Künstlerhaus, Graz, 1973 (Ed. Weibel, 2005)

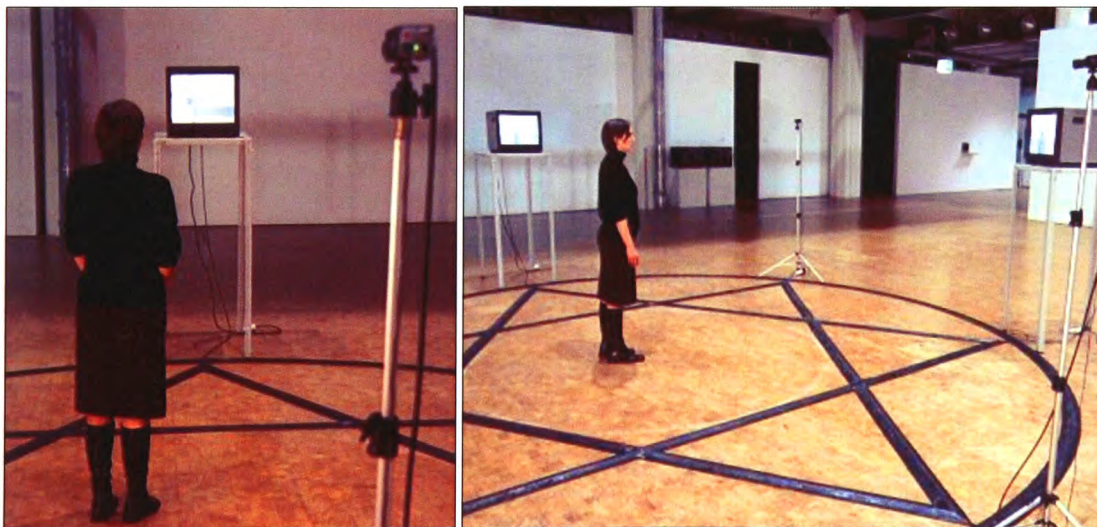


Figure 7.05 Reconstruction of the *'Observation of Observation – Uncertainty'* (1973) in the framework of *'ctrl[space]'* exhibition at ZKM, Center for Art and Media, Karlsruhe (Weibel, 2001)



Figure 7.06 *Conceptual representation of the 'Mind Cupola's' affective environment (Zics, 2007)*





Figure 7.07 Conceptual representation of the 'Mind Cupola' (Zics, 2007)

of behavioural-emotional states. The investigation through art practice attempted to find particular technologies, that on the one side, are unique in the affection of spectator's perception termed in the thesis as 'instant affection technologies', and, on the other side, are effective at capturing behavioural changes in the human condition, referred to in the thesis as applications of affective computing. This has resulted in a focus by the project on the characteristics of the human face as it displays most evidently the changes of human cognition. Therefore, the practice-based research was divided into these two fields; technologies which directly affect human cognition (audiovisual, mechanical) and technologies which monitor and analyse affective states of the spectator. The feedback loop is generated when the two technologies of affecting and monitoring are coupled; thus the analysis of the monitored data influences the chain of affections of the spectator (Figure 7.08). The visualisation, which is considered as an affection technology, has a unique role in the feedback process, as it most profoundly reflects a feedback to the spectator, and therefore will be handled as one of the main aspects of the interface. In this respect, the technological feedback loop is the basis for producing the cognitive feedback loop, which this chapter referred to earlier as the fractal structure of the spectator's perception. Modelling new means of interaction, the spectator's role is not only a reactor to the technologically triggered affection but also a generative contributor who controls the experience. Therefore this chapter notes that the spectator in this cognitive feedback loop is not analogous to cinema spectatorship, where the spectators receive affections but are not able to influence the structure of the medium. In the passive bodily interface the interaction is produced by cognitively representative bodily states through an intentional communication between artwork-spectator and, so the artist. In retrospect, it can be said that whereas in Weibel's work a fractal structure was established through the technological repetition of the self-image, the *Mind Cupola*



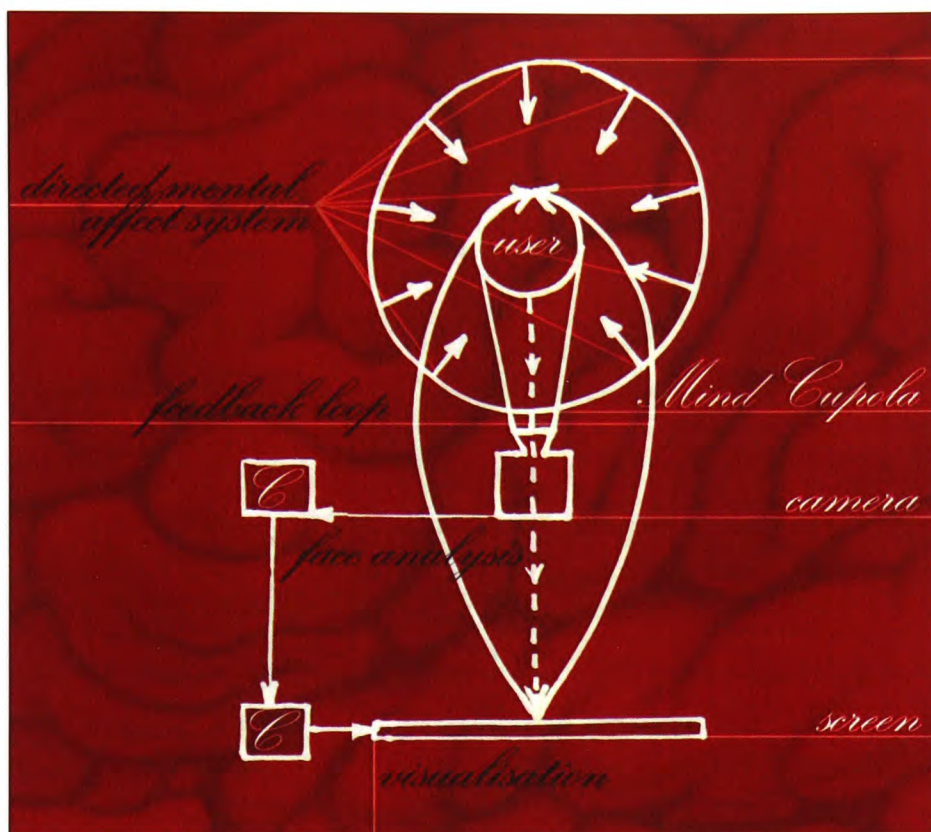


Figure 7.08 Conceptual draft of the 'Mind Cupola's' feedback system (Zics, 2007)

consists of a feedback system, which incorporates certain cognitive readings of the spectator into its affects. This specific application aims to affect the spectator's states of consciousness and impacts on the intentional decision making.

Reflecting on this, the artistic challenge was to produce a surface for these technologies, the artistic interface in which the aesthetic decision-making would produce the link between the technological functionality and artistic meaning. As the interaction would not demand any bodily movement of the spectator and the selected technologies were based on a condition of stable spectator, the artistic approach to the interface development was to design a special environment that is representational, underpinning a passive aesthetic experience of the spectator. As such, the interface here is a device which not only generates the spectator's experience but also carries the layer of artistic meaning creation, the balance between artistic content seeking and technological knowledge transfer (see chapter 3). The aesthetic form of the interface as an artistic object serves the transparency of the experience.

The *Mind Cupola* is placed in a dark environment that invites the spectator to enter into the illuminated area under the cupola (Figure 7.09, 7.10, 7.11; see also earlier: Figure 1.05, 1.06, 1.07). The aesthetic surface of the cupola was inspired by the dome-shaped religious golden lantern (such as that found within Islamic, Byzantine, Orthodox Christian or Indian architecture) (Figure 7.12), which provides an expressive metaphor for a sacral and also immersive place (Bloch, 2000 [1915/16], p. 14), whilst its shape and look act not only as a functional gadget but also as a science fiction tool. As the cupola produces an immersive quality of encircling, generating a perceptual sense of being in the centre, the *Mind Cupola* is a novel interpretation of this meaning, which, in this case, is the mind that is embraced by its apparatus. The *Mind Cupola* aims to create instant affection of the spectators through its particular aesthetic to prepare them

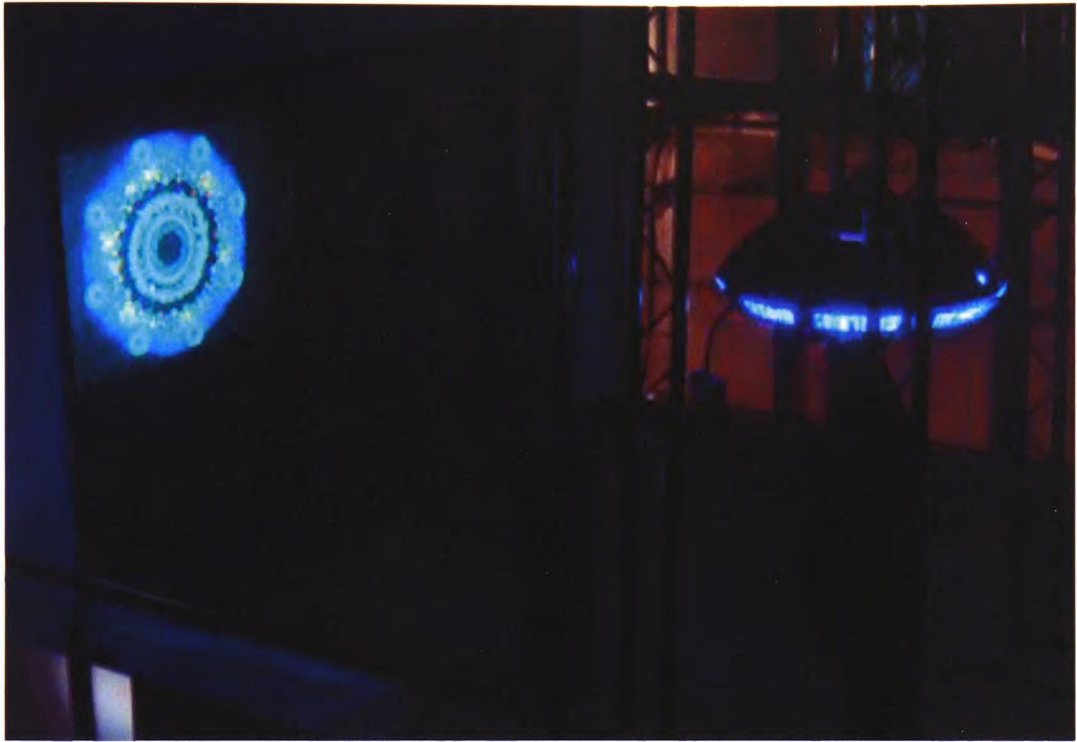


Figure 7.09 *The 'Mind Cupola's' illuminated environment* (Zics, 2008)



Figure 7.10 *Spectator in the 'Mind Cupola' (Zics, 2008)*



Figure 7.11 *The activated thermal stream in the 'Mind Cupola'*  
(Zics, 2008)



Figure 7.12 The 'Mind Cupola's' copper lantern in the test environment at the University of Plymouth (Zics, 2008)



for the unique experience. In this sense, the appearance of the *Mind Cupola* is the first step in the chain of events that the artist has prepared for the spectator in a journey of immersion. Another meaningful inspiration derives from an exclusively produced machine called 'Psychograph'<sup>75</sup> (1931), which used a cupola-like device to measure qualities of the human head to process a psychoanalysis of the person (Risse, 1976) (Figure 7.13, 7.14). The machine built upon the pseudoscientific conception of phrenology<sup>76</sup>, which is based on the belief that the brain, as an organ, characterises the potential of the mind and therefore the 'bumps' in the head can characterise the person. The artistic conception of the *Mind Cupola* also emphasises a unique approach of measuring qualities of the mind, so the Psychograph provides an inspiration of how to construct a device that aims to interact with the consciousness and subsequently the brain. In this matter, the phrenology machine is ultimately a reference for a device that surrounds the person's head and not for its functionality.

In the *Mind Cupola*'s sensory deprived environment the spectator is subjected to audiovisual and mechanical affects for several minutes until a cognitive transformation occurs (Figure 7.15, 7.16; see also earlier: 1.7, 1.8). During the stream of novel events the spectator's face is analysed and this new information will be used again to affect them visually (by real-time visualisation). The spectator is advised to stand in a particular position in front of the camera.

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<sup>75</sup> The phrenological cupola was used to read the contour of the skull and generate a profile. Henry C. Lavery, developed a machine called the 'Psychograph' (patented 1905), which has three main parts. The base units are the chair, the printer machine and the holder of the cupola. The metal helmet is the main part of the machine that, with the help 32 metal filters, locates the user's skull contours. The last part is the recording box which mechanically scans and prints out the results based on the position of the skull filters. The box includes a cylinder-driven hammer that reacts (stamps) if the electrical circuit is full, signifying that the user has been measured.

<sup>76</sup> The Austrian physician Franz Joseph Gall's theory created the 'phrenological map', which distinguishes 26 psychological departments on the surface of the skull. Every department describes a character (e.g. 'amateness', 'combateness', 'constructiveness', 'idealist', 'imitation' etc.) and its shape determines the entire personality. Gall believed that departments that are in use represent a bigger effect than others. Therefore, he claimed to reveal intelligence or even murderous propensity from the shape of the bone skull (Heeschen, 1994).



Figure 7.13 The 'Psychograph' machine (1931) developed by Henry C. Lavery (Risse, 1975)

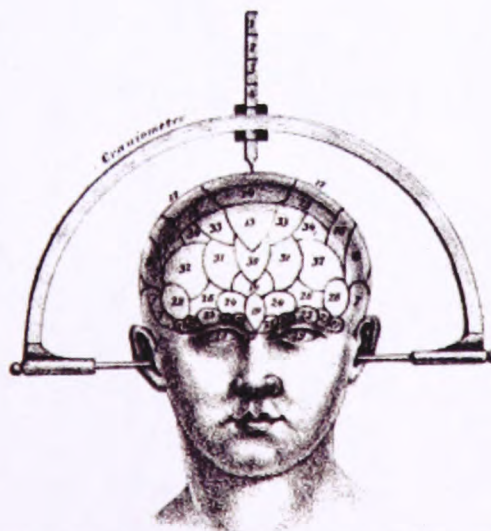


Figure 7.14 Illustration of an initial concept of 'Psychograph' from Thomas Sewall's lectures showing the use of the 'craniometer cupola' (Sewall, 1838)





Figure 7.15 *The sensory deprived environment of the 'Mind Cupola' (Zics, 2008)*

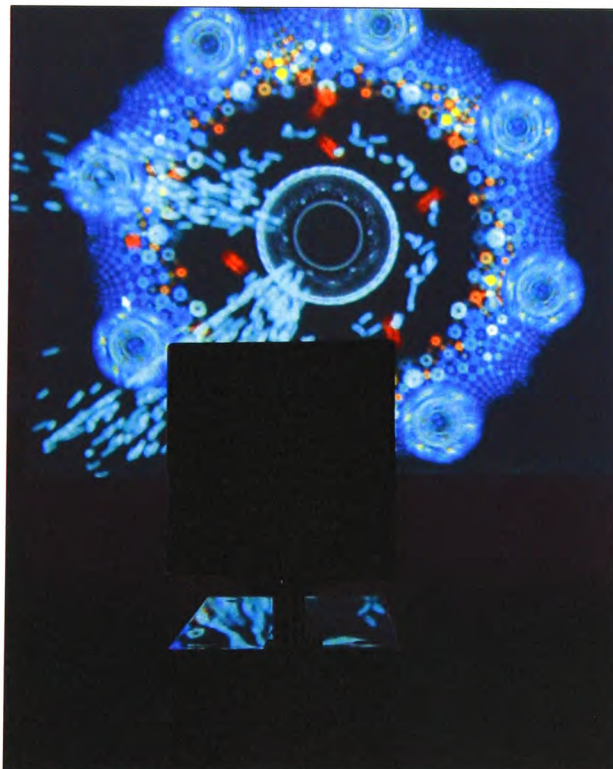


Figure 7.16 *The spectator's point of view in the 'Mind Cupola' with the audiovisual system and camera-mover interface (Zics, 2008)*

Moving to the right position, the cupola and the camera-mover (see earlier: Figure 1.8, 7.16) start to locate the top of the head and the face, which, after positioning the spectators, stops the operation. Once, the capture position has been fixed, the spectator expected (through prior briefing) to be relaxed and to be focused on the events on the visualisation, which will take at least 3 minutes. The chain of affection starts with the frequency generators that produce a pattern of affections based on the initial signal of the face analysis, determining the first impression of the person's cognitive state. This immediately starts the visualisation, which so produces an endless feedback of frequency generators -face analysis - visualisation - frequency generators, and so on. The spectator can stop the events at any time during the experience by moving out of the cupola-covered area. A full immersion of the spectator is aimed for a minimum period of five minutes of time. Through the whole process, the spectators are advised to relax and produce an effortless experience that intends to feed the system with efficient data captured through the face analysis technology.

The practical creative process of the *Mind Cupola* implemented the methodology of 'evolutionary collaborative process' (Fischer and Nakakoji, 1997), which suggests a co-operative process between artists, scientist and programmers.<sup>77</sup> The artistic process of production involves the whole team and applies this new strategy of creative work. Thus, all of the processes aim towards a fulfilment of the artistic concept through cooperative processes, where the artist is finalising collective decisions rather than drawing on hierarchal production. This collaborative

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<sup>77</sup> The project behind *Mind Cupola* was set up through collaboration between various universities and individual programmers to complete tasks based on specific programming skills. The projects main collaborators are the University of Wales, Newport, the School of Computing, Communications and Electronics at the University of Plymouth. The framework for the face analysis software, experiments on thermal imaging and the software of visualisation were completed with the help of Dr. Phil Culverhouse. The main collaborator on the cupola's hardware and controlling software was Andor Gaudia, a robotic specialist based in Hungary. Dr. David Cristinacce provided the face detection software developed at the University of Manchester for the Toyota Car Company, and Dr. Julian Tilbury customised this software for thermal imaging technology.

form provides an effective strategy for working on complex, technology-based projects, as it also allows the team members to bring up and integrate their innovative, discipline-driven ideas into the project. Thus the team work allowed a much higher complexity of technologies, which would not have been possible by a single production process, because of the interdisciplinary nature of the project.

### iii. The System of the *Mind Cupola*

<b>A</b>	<b>Mind Cupola Interface: Frequency Generators</b>
A1	LED lights
A2	Binaural sound
A3	Thermo stream
A4	Air stream
A5	Vibration
<b>B</b>	<b>Face Analysis</b>
<b>B1</b>	<b>Hybrid Face Analysis Software</b>
B1.1	Thermal Imaging
B1.1.1	Temperature Analysis Forehead
B1.1.2	Temperature Analysis Brain Tunnel
B.1.2	Standard Image Analysis
B1.2.1	Eye tracking
B1.2.2	Mouth position: open/closed
B1.2.3	Head movement
<b>B2</b>	<b>Camera-Mover Interface</b>
<b>C</b>	<b>Real-time Visualisation</b>

The system of the *Mind Cupola* constitutes three main interfaces: 1, frequency generators (which are also referred to as the A series of technologies: A1, A2, A3, A4, A5), 2, the real-time visualisation (C series technologies) system based on facial analysis and 3, facial and emotional evaluation and thermal imaging by a camera-mover interface (B series technologies: B1.1.1, B1.1.2, B1.2.1, B1.2.2, B1.2.3, B2). This three-part system, of which parts 1 and 2 form the instant affection system of the *Mind Cupola*, is interlinked together and each port communicates

to each other in order to produce the cognitive feedback loop. Chronologically, the affection of the frequency generators is measured by the face analysis, which feeds back to the visualisation and, thus, again to the frequency generators.

For an application of the instant affection system the concept of the *Mind Cupola* has incorporated technologies that attempt to influence not only by means of perception but also by human biological factors observable in human cognition. As the affection of human consciousness has remained in sciences as an unexplored field (mostly due a lack of scientific analysis of investigations), the investigation took on board concepts that are not or not yet scientifically proven, but most importantly provide the potential for an aesthetic experience. This chapter points out that studies on the threshold of scientific and ‘non-scientific’ methods<sup>78</sup> might provide new perspectives for artistic production. The methods that are embedded in technological devices produce both concrete results as well as less definitive ones. Underlying this, the discourse here emphasises that hybrid (scientific and non scientific) conceptual applications can serve as a potential approach for examining the scientifically indefinable characteristics of cognitive processes. Therefore, the research discussed here is not committed to proving scientific data but rather to representing findings that can build an artistic interface concept. Suggesting that this hybrid methodology could provide a more complex or different comprehension of human cognition by applying the model of the *Transparent Act*, this artistic framework establishes an effective tool for a unique experience.

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<sup>78</sup> The non-scientific methods in the thesis refer to technologies which can be claimed to have a specific impact on the human condition and consciousness but whose quality of triggered-affect is not scientifically proven. One example the *Mind Machines* that are claimed to produce meditative states by electronic affections (which will be discussed later).

As such, the main part of the instant affection system is the ‘frequency generators’ (temperature, visual, binaural-auditory, tactile) (Figure 7.17) that are embedded in the physical form of the cupola and are specifically developed small gadgets that produce a spectrum of affection in the spectator. The term of frequency generators refers to the artistic conception of the *Mind Cupola* that produces affection through electromagnetic phenomena (Figure 7.18). The development of the frequency generator interface was a response to the demand for a device that instantly (and mainly mechanically) could influence the spectator’s perception. Since the thesis’ artistic interest identified that there are no comprehensive scientific descriptions of an interconnectivity of bodily cognitive states and mental states that could be applied for artistic systems, it includes non-scientific conceptions that might provide meaningful approaches for an aesthetic experience. From this perspective, the major objective of the investigation is to allocate technologies that are able to produce an essential impact on a human being according to the modality of body-mind interconnection. Consequently, five different methodologies and technologies based on non-sensory stimuli have been allocated in order to create the instant affection system of the cupola interface. These frequency generator devices are built in the cupola interface and are formed of LED lights (A1), binaural sound (A2), thermo stream (A3), air stream (A4), and vibration (A5) (Figure 7.19, 7.20). The frequency generators always work together and their affection is united. The generated patterns, which determine the particular timing, how long and with which specification (frequency, speed) the frequency generators are activated, are based on the measurement of the face analysis. The generative pattern attempts to affect the person in order to achieve the optimal state<sup>79</sup>.

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<sup>79</sup> Technological details and documentation of the Mind Cupola’s interface development see in Appendix 2.1.

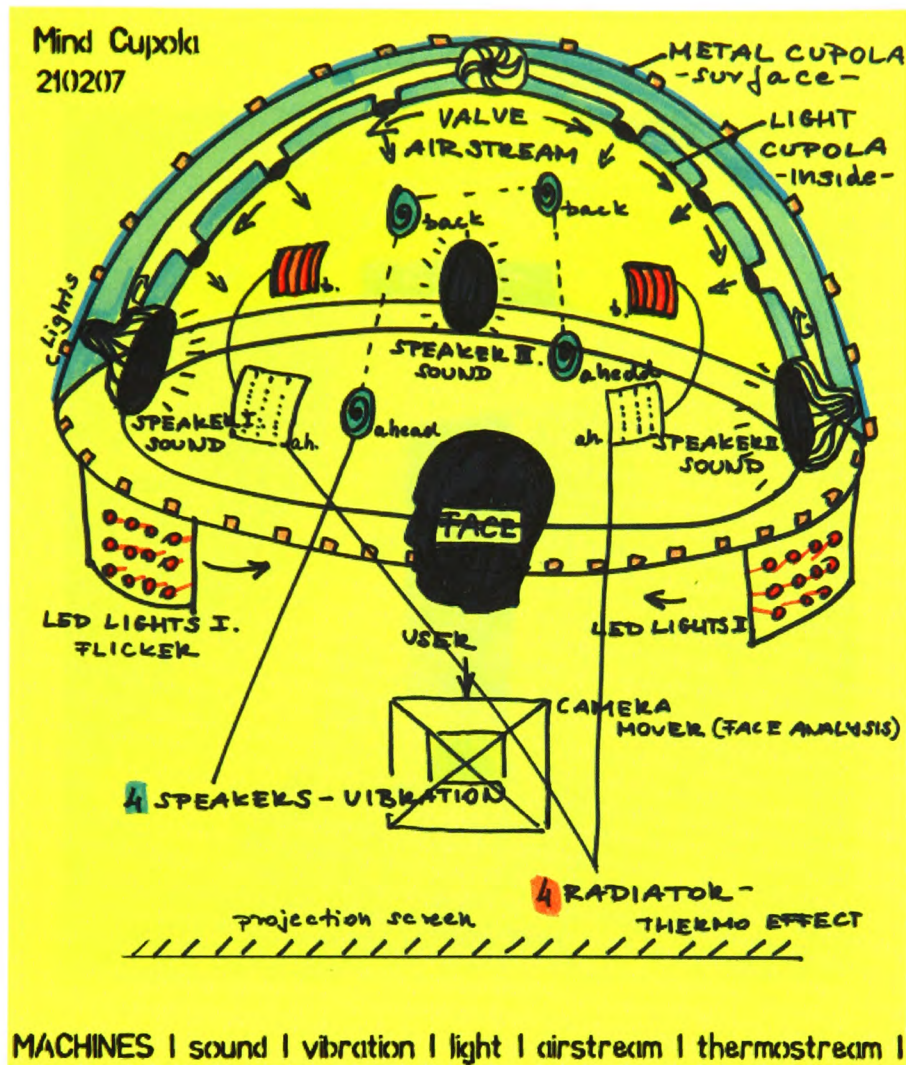


Figure 7.17 The functional draft of the 'frequency generators' in the 'Mind Cupola'  
(Zics, 2007)



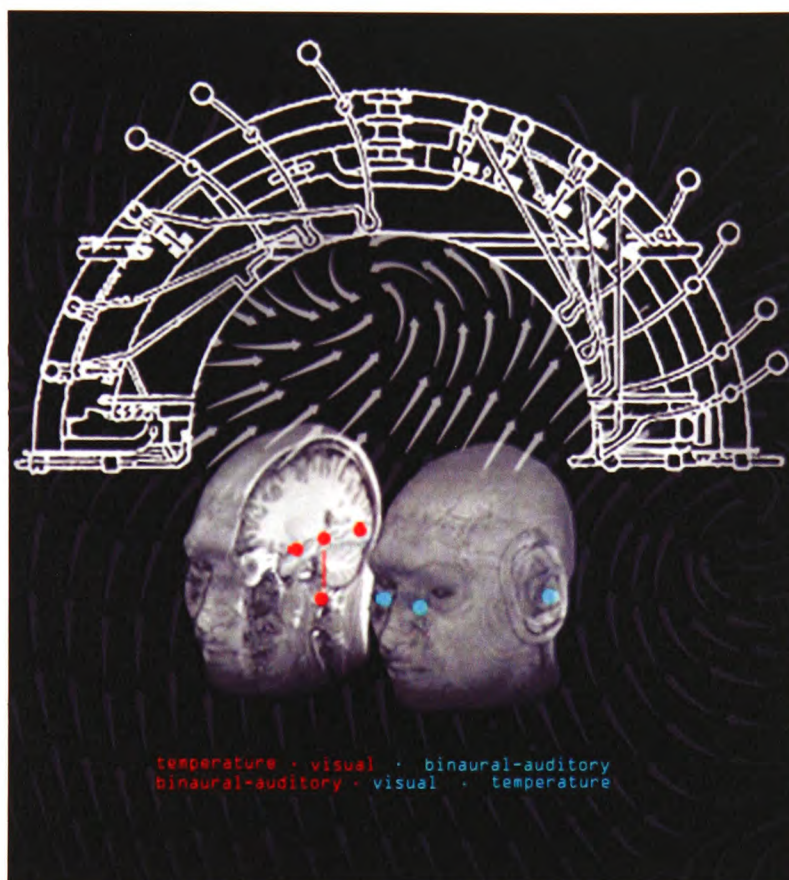


Figure 7.18 *Conceptual representation of the 'Mind Cupola's' affective environment (Zics, 2007)*



Figure 7.19 and 7.20 Details of the 'Mind Cupola's' interior: LED matrix (A1), coolers (A3) and an infrared bulb (A4) (the so-called frequency generators) (Zics, 2008)



The LED lights (A1) and binaural sounds (A2) are applications that use external physical waves to instantly influence brain waves in order to produce an alteration of consciousness. The lights and sounds are based on the principal of ‘frequency following effect’<sup>80</sup> (Walter, 1953). This is based upon an observation that the brain tends to follow the external light flashes on alpha and theta frequencies, mimicking inward extraordinary visual patterns and generating states of relaxation or even meditative states (Smith, Marsh and Brown, 1975). In a similar manner, sound produces a frequency following effect through the method of binaural sound<sup>81</sup> (Rumsey, 2001). The binaural beats use ‘sine tones’ that send diverse signals of frequencies into each ear, producing theta and beta frequencies in the brain through the process of re-balancing the frequencies from the ears. Although there are headset and spectacle-like devices such as Mind Machines<sup>82</sup> that are used for the generation of meditative states, these methods could not be scientifically proven. As such, in the *Mind Cupola*, the various patterns of light and sound serve to drive the person into inwardness, which is part of the aesthetic experience.

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<sup>80</sup> William Gray Walter (1953) was the first researcher who, in the 1940s with a new version of EEG machine, recognised that the theta (4-8 Hz) and delta (1-3 Hz) waves of the brain are usually only observable in states of deep relaxation, meditation and deep dreamless sleep. During his exploration he lays down the principle of ‘frequency following effect’.

<sup>81</sup> The sonic concept of binaural sound aims to alter mental states. This method allows sound enter the left and right ears on different frequencies (normally it is on the same frequency), which will then be balanced by the brains ‘superior olivary nuclei’. The slightly different frequencies, through brain processes, will be consolidated and generate a third frequency. If the right ear is 360Hz and the left ear 370Hz, the distinction is 10 Hz (the third frequency) that generates a binaural sound in the brain. The phenomenon is based on dissimilar sensitivity between the brain and the ears. Whereas the ear is not able to analyse any waves under 20 Hz, the brain senses very small differences and this is why the binaural beats are identified not as apparatus of the ear but of the brain. The binaural sound appears on the frequency of the brain’s alpha waves, which produces a relaxed, meditative, but still conscious, state of mind.

<sup>82</sup> Mind Machines utilise eyeglasses with small lights and a head set for sound impulses. Their process of affection is described as follows: first, the personal sub-consciousness is developed (individual memories, wishes) and then the collective sub-consciousness (significant collective experiences). Finally, the essential elements of consciousness are developed. This process follows as: 1. Low stimulation, hardly noticeable. 2. Light and sound effects separated by stereo phone. The attention is directed from the outer effects to the inner effects. 3. Rhythmical impulses are played, which suppress all impulses. Only an ‘inner spectator’ position remains. With this basic pattern comes the individual experience under influence, which thus can reach the different layers and depths of attention (Kapellner, 1990).

The third application of frequency generators is thermo convection (A3) and cooling mechanisms (A4), which heat up or cool down particular parts of the head causing thermodynamic alteration to the brain. The concept of the *Mind Cupola* takes interest in the thermodynamic concept of brain<sup>83</sup> as it is proposed, based on both scientific and unproven ideas, that there is a cause and effect relationship between emotional/behavioural changes and brain temperature changes and vice-versa<sup>84</sup>. Experimental science-produced outcomes examining brain temperature changes by synthetic drugs and their produced consciousness alteration have determined a relationship between consciousness and temperature changes<sup>85</sup> (Smith, 2006).

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<sup>83</sup>To understand the brain's thermodynamic characteristics and how this might effect mental states, the best example to provide is the sleeping state which dispalys a decrese of almost 2 degrees ( to app. 35 degrees C). This suggests that the activity of the brain is observable by temperature changes. There are various stimulators and drugs that can achieve the same changes. Drugs such as caffeine and synthetic drugs like Ecstasy are commonly known as 'uppers'; these agents raise attentiveness or consciousness and increase brain temperature. The opposing class of drugs, 'downers' such as heroin, morphine, opiates or even alcohol, decrease the temperature of the brain (Smith, 2006). In the brain the thyroid gland controls the temperature, based on the feedback from the circadian rhythm centre of the hypothalamus. The brain's set temperature determines the body's thermobalance as well. The thyroid gland is located in the throat behind the 'Adam's apple'. This organ measures enviromental temperature via the bronchial tube and compares blood temperature through the carotid arteries that lead from the heart to the brain. A rise in temperature causes the thyroid gland to produce hormones, making the lining of the lungs more porous for the water in the blood. The water passing through the lungs secures the cooling of the system. If the outside temperature changes, the gland acts upon the skin and opens blood vessels to reduce heat, the sweat glands are activated taking water from the blood and excreting it, while breath rate increases to evaporate heat. Cooling down the environment will have the opposite effect on the body. The thyroid stops the water supply to the lungs, constricting all the blood vessels on the skin and producing heat by muscle work. All these mechanisms control and protect brain temperature as its temperature changes are more sensitive than the body's.

<sup>84</sup> It is interesting to note that persons who exhibit fast emotional changes are considered 'hot heads' and persons who are more able to control their thoughts are 'cool heads'. This old observation of personalities and emotional attributes might be supported in the usage of Mind Cupola.

<sup>85</sup> Marshall Smith (2006) began experimenting with ways to artificially alter the thyroid gland and shift circadian rhythm. Smith used his own body, modifying the circaian rhythm by taking Synthroid, a synthetic drug. Measuring brain temperature changes he was able to capture the chemical effect of the drugs. Smith's experience showed that synthetic drugs cannot change the actual rhythm of the body, just frequently modify it. As such, he concludes that holistic rhythms of metabolism have to be controlled from a higher gland, probably in the hypothalamus. This is the reason why local modification cannot achieve long term effect. From an artistic point of view, Smith's idea was crucial, as it proved that chemical and temperature modification are connected to consciousness. Smith (2006, np.) points out: 'Since I am the first person to notice the relationship between consciousness and brain temperature, nobody has done any research in this area.' Contradictory medical-scientific research, which is mostly based on investigation of brain injury patients, has been unable to build a clear correlation between brain temperature and the level of the consciousness (Mellergard, 1995). Although clinical methods ususal focus on

Further research claimed that, by stimulation of various parts of the brain, such as the visual cortex, it produces local temperature changes through the brain's oxygen consumption<sup>86</sup> (Yablonskiy, Ackerman and Raichle; 2000). The cooling of the brain is often used for medical purposes to activate biological functions producing new mental states, such as to raise the production of testosterone<sup>87</sup> or in using the brain cooler device<sup>88</sup> (2005) that helps trauma patients in recovery. Based on these observations, the *Mind Cupola* applies the thermodynamic capacities of the brain to affect the biological functions of the spectator by environmental changes. Short-term temperature change puts the body into distress, whereas long-term change has an impact on the speed of mental functions; these conditions stimulate mental activities and emotions. The long-term influence may be too subtle to cause discomfort or conscious affect but may be perceptible in unconscious emotional expressions. Through this, the concept of the *Mind Cupola* suggests that this method might be a way to direct the spectator to an optimal experience. The *Mind Cupola* does this by generative means, thus it captures both behavioural patterns and the heat of the spectator's head and according to the determined artistic methodology heats or

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physical changes of consciousness such as awokeness and activeness, they have generated no results into subtle quality changes in consciousness.

<sup>86</sup> The heat is produced by oxygen consumption; however, local brain activity and metabolic functions automatically respond by cooling off the whole brain, which means an increased blood flow. This proved that the brain could undergo a temperature lowering as well. The intention was a prolonged passive stimulation of the visual cortex with a data valuation of Magnetic Resonance (MR) analysis, with the visual stimuli source being light-emitting diodes mounted in specifically designed goggles. The method was a four-minute subjection to an 8Hz visualisation, a four-minute rest time and then repeats. The test found modifications up to two degrees centigrade in temperature, which were evaluated as follows: 'Hence, our data suggest that a substantial role in maintaining tissue temperature belongs to heat transfer within the tissue between the area(s) of high activity and surrounding areas of low activity. For long periods of stimulation, local perturbations in the temperature can trigger temperature changes in remote areas of the brain because of high heat diffusivity and heat transfer with blood flow. Such 'heat waves' were previously observed on the brain surface during functional activation in a rat model by infrared mapping (Yablonskiy, Ackerman and Raichle; 2000, p.7605). It concludes that brain temperature can be effectively modified by directed visual, auditory and somatic stimulation. The stimuli trigger is not just mental, but physical, links to thermodynamic processes.

<sup>87</sup> For example, male pattern baldness is often treated by cooling brain temperature to raise the production of testosterone.

<sup>88</sup> The brain cooler device (2005) developed at Rensselaer Polytechnic Institute Troy helps head trauma patients in recovery. The cooling serves to reduce heat caused by the great quantity of blood flow that perfuses brain tissue.

cools the person down. Thus, these frequency generators (A3, A4) instantly operate and interconnect with the thermo imaging face analysis through the spectator's responses.

The last application of frequency generators is the vibration generator (A5), which was created for a mechanical effect on the skin. The phenomenon of vibration is a well known clinical application for the relief of pain, increasing blood flow or generating relaxation (Ryan, 1981) and also considered as an agent for undoing damage to stress hormones (Benson and Klipper, 1976), whilst vibration also has short term affects more akin to touch sensorial events. Vibration as a touch like effect can stimulate real-world sensory experiences and is therefore able to generate emotional changes. Both relaxation and touch sensory outcomes are able to rouse mental changes.

The second part of the system is the face analysis constituting the software (B1: B1.1.1, B1.1.2, B1.2, B1.2.1, B1.2.2, B1.2.3) and the hardware (B2) that is located outside of the cupola. The camera-mover<sup>89</sup> (Figure 7.21) is a motor-driven device that fulfils the function of locating the spectator's face for a comprehensive facial analysis. The face analysis software is activated when the frequency generators initially affect the spectator. It has a major role as it feeds data back to the frequency generators and then to the visualisation, enabling the cognitive feedback loop. The face analysis in the *Mind Cupola* is an application of affective computing; an emerging concept in computing that focuses on cognitive responses of humans with an attempt to display that activity (Pickard, 2002). The face analysis' functional demand is to produce efficient data of the emotional and behavioural characteristics of the spectator in real-time. Based on this demand, functions were selected that can be measured in real-time and produce a sufficient data with the aim collecting the emotional and behavioural changes of the person. To monitor the complex

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<sup>89</sup> For further technical details of the camera-mover see Appendix.2.2.



Figure 7.21 *The camera-mover has been designed to be assimilated into its dark environment (Zics, 2008)*

patterns of affection on the face, it was aimed to use a flexible and stable face analysis technology that serves as an effective function in order to monitor basic changes in facial information. During the investigation of potential technologies for facial emotion analysis it was revealed that a technology had not yet been produced that was robust and simply applicable in its method. As a result of this, the *Mind Cupola* face analysis technology implements already existing face detection software developed for the automobile industry<sup>90</sup> (Figure 7.22) that is specifically customised to the features according to the *Mind Cupola*'s artistic system, so as to provide sufficient feedback but not to be overly complex in its application.

The methodology for analysing the emotion and behaviour data applies a hybrid system that blends standard image processing with face detection and analysis and thermal imaging technology, which measures temperature changes of particular parts of the face. The technology of thermal imaging<sup>91</sup> is based on infrared technology<sup>92</sup>, which enables the capturing of the

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<sup>90</sup> Developed by School of Medicine, University of Manchester and later implemented in different high-definition software, such as that developed for the Toyota car company to capture driver's behaviour.

<sup>91</sup> Thermal imaging is a scientific technique that uses infrared radiation (900-14.000 MHz of electromagnetic spectrum) of objects to produce a thermo-graphical picture. The infrared radiation is proportional to the subject's temperature on the surface, which is why it is possible to display the object's thermal map. The radiation furthermore is influenced by the emission of the object and its absorption of the environment or reflected radiation. Consequently, an object's thermal image captures not just the characteristic of the objects but other influences as well, which could be seen later as a methodological issue to facilitate distinctions (object's qualities – environment's qualities). Viewing by the special thermal camera enables the infrared wavelength to be transformed into visible light waves. The camera can generate an image with or without visible light on the object. The obvious character of the recorded picture is that warm-blooded humans and animals stand out from their cold environment. As such, the high-end thermal imaging is likely to be used for security purposes, military surveillance, by building construction to monitor thermal insulations or by fire fighters in locating survivors. Infrared satellite imaging is used to measure ocean temperatures, recording climate changes and observing signs of destructive storms. This technique is not only used in airborne and space systems where they are tracking life patterns of vegetation, rocks, and minerals but also in archaeology to capture footpaths or roads of ancient cultures. The most crucial implementation of thermal imaging is the special data collection by thermal technology of the human body. The special infrared electromagnetic wavelength is able to provide a human body and face 'somatoinfra map'. The thermal camera detects signs of infrared invisible radiation from body, which through analysis is able to capture biological processes and information.

<sup>92</sup> The technology was built upon the discovery of Sir William Herschel in 1800 (Smith, Jones and Chasmar, 1957). The invisible infrared radiation was discovered accidentally when he wanted to capture the heat of the separate colours of a prism splitting sunlight into a rainbow. The first machine was named the Pyroscan to capture arthritic

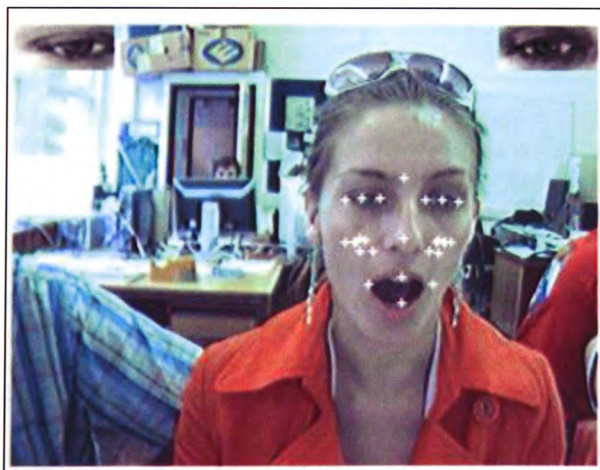
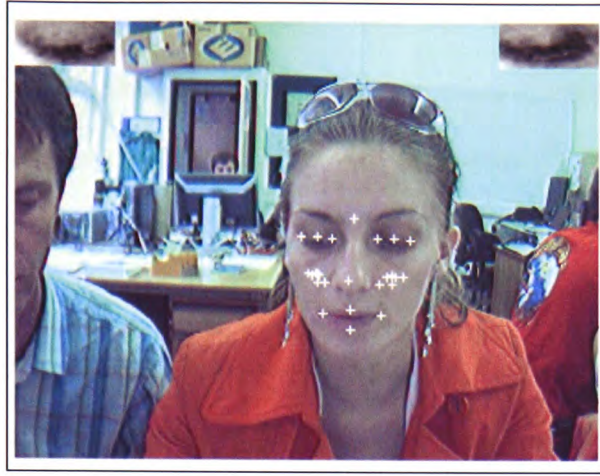


Figure 7.22 Screen shots of the face detection software developed at the University of Manchester (Zics, 2007)

thermo-dynamic changes of the human body as it radiates various wavelengths of infrared according to its condition<sup>93</sup> (Figure 7.23, 7.24 and Appendix 2.6). Current scientific technologies using thermal imaging, such as CHERM<sup>94</sup> or Somatoinfra systems<sup>95</sup>, provide high resolution imaging with heightened speed that greatly increases the affectivity of thermal imaging in bio data analysis. Whereas thermal imaging as a method of diagnosis produces very effective data, it has shown low efficiency in real-time face applications. The great diversity of outcomes based on methods from medical data analysis require highly sophisticated techniques formed from the 'body atlas', full records of a patient's circumstances and human decision making<sup>96</sup>, which for a real-time artistic application is impossible. Although the investigation acknowledges this

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joints. For many years the technology could only be used as a supplement to radiology as the grey tones based measurement was not able to give a sufficiently sensitive imaging. In the 1960s and 1970s there was significant improvement in the thermal technology. The oscilloscope display and the electronic isotherm technology enabled finer results. With the appearance of colour multiple photography, digital image analysis and digital storage the technology finally could be used more broadly (Ring, 2004). The technology has also been used for inflammatory analysis, rheumatology, forensic medicine and drug therapy.

<sup>93</sup> A collection of thermal pictures can be seen in Appendix 2.6.

<sup>94</sup> Francis Ring, currently the Head of Medical Imaging Research Group at the University of Glamorgan, and his research group have developed software called CHERM, which supplies a mask of every region of the body. The software is part of a study that aims to generate an on-line reference system of thermal imaging. The technology has recently been used for treatment of inflammation.

<sup>95</sup> A research group was started in 1984 working on special thermal technology at the Thermo-dynamical Laboratory, Faculty of Natural Sciences, Technical University of Budapest (Hungary). After more than 20 years research it has developed a Somatoinfra system that claims to be a world leader in complex systems in human infrared diagnosis. Dr. Szacsky Mihály, leading scientist of the patented technology, established that the system has been recently developed to a level where it may be broadly implemented by hospitals.

<sup>96</sup> To be able decode the image of alteration, the Somatoinfra system has launched a huge data base called the 'Body Atlas' (similar to the CHERM technology been used to develop an online reference system) that was made by 260,000 individual investigations. According to Dr. Mihály Szacsky (2007), the system requires long term experience and knowledge and thus without human control it cannot be operated. Therefore, it is not a comprehensive method of diagnosis and the result needs to be confirmed by further tests and specialists. The following steps have to be undertaken for an efficient thermal analysis: the sufficient psychophysical preparation of the patient, suitable examination room to support the preparation process, standardised environment, technical calibration and an entire test of the system, measurement of the investigated body part and a data archive. Furthermore, Szacsky pointed out that the somatologist (the investigator: at the Technical University of Budapest there are established courses in somatology in which investigators are qualified specialists for implementing thermal imaging in medical use) has to record all of the circumstances of the patient, including a detailed description of psychological influences and medical influences.



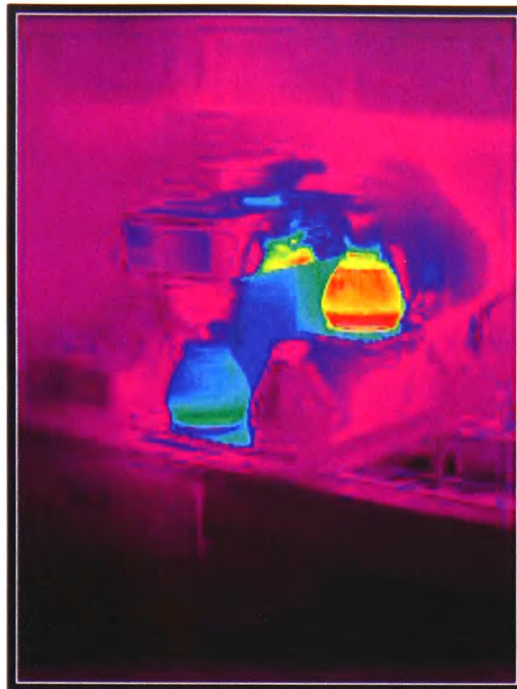


Figure 7.23 Thermal image showing the variety of temperature in the kitchen environment (Vogel, 2007)

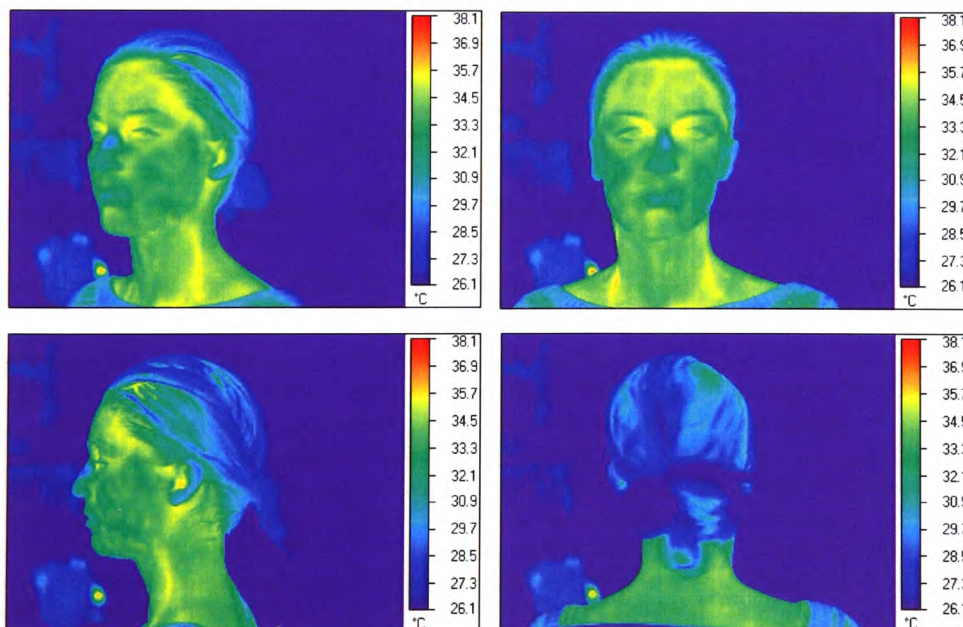


Figure 7.24 The thermal-map of the human face with temperature scale (Zics, 2006)

restricted quality when compared to medical applications, it also suggests a great potential for the technique to unveil previously unknown, not yet implemented data of the human condition.

In order to find the most effective application for affective capturing in the *Mind Cupola* this chapter has examined a variety of scientific concepts and the success of their application that produced the particular method of thermal imaging for artistic application. The discourse here has identified that, although a limited amount of scientific research has been undertaken that claimed infrared and thermal imaging can be used for capturing emotional changes, there is also a great potential for assisting applications of face detection, recognition and tracking (Eveland et al., 2003; Kurse, 2001; Mcgimpsey, 2000; Ogasawara et al., 2001; Sugimoto et al., 2000; Yoshitomi, 2000). Some of the applications indicated that musculature movement of facial expression, according to the thermodynamic of blood flow, generates recognisable changes in temperature. However, this requires much more extensive research<sup>97</sup> (Khan, Ingleby and Ward, 2006). Another research interest of thermal face analysis was identified that produced more effective applications of polygraph testing, attempting to capture emotional changes in people who lie (Levine and Pavlidis, 2002, p. 35). The concept, similar to the earlier accounts, is based on the idea that if the subject tells a lie then the flow of blood in veins increases. In 1999 James Levine, a researcher at the Mayo Institute In Rochester, and Ioannis Pavlidis of Honeywell

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<sup>97</sup> Masood M. Khan (American University of Sharjah), Michael Ingleby and Robert D. Ward (University of Huddersfield) have been using infrared technology for 'automated facial expression classification' (AFEC) and 'affect interpretation' (AAI) to evaluate emotional alterations. The concept built upon thermo-musculature activity, and the blood flow generated thermodynamically. There were facial points recognised (Facial Thermal Feature Points; FTFPs) that show significant changes dependent on facial expression. The experimentation with intentional facial expression has shown recognizable changes in temperature when using thermal images. It was a logical link to connect the thermogram's result with a musculature movement. The Thermal Intensity Values were measured with different facial expressions and compared based on the FTFP grid generated thermo pattern. However, the system could not generate adequate classifications with the application of the thermogram as it was based on special circumstances and how the system was trained. The system was tested with simulated facial expressions and conversantly it cannot be guaranteed that the same operation would work in natural conditions. It can be concluded that skin temperature can be evaluated based upon affective states and emotional changes; however, the methodology requires further examination, improvement and data collection.

Laboratories<sup>98</sup> demonstrated, with a thermal camera, that a person is influenced by their environment, displaying measurable changes in face temperature maps while blood was rushing to the periorbital area. Importantly, these latter observations and those of the polygraph test show that measurable stress factors could be tracked by thermal imaging. It can be concluded that there is a requirement for further research investigating the potential use of the technology; however, this may rely on the further development of thermal imaging with an aim at developing more detailed data and providing greater accessibility to this costly technology.

Contemporary approaches to thermal imaging suggest that a person's thermo map is based on multiple circumstances and that, for an effective application of this technology, it is necessary to understand the pre-knowledge of the analysed person. However, it can also be suggested that emotional analysis does, not need such a level of adequate information as medical analysis does, as it focuses on changes and not states, in a similar manner to that which the artistic system of the *Mind Cupola* will suggest. Therefore, in order to gather useful data that serves the real-time based artistic concept, the investigation suggests capturing changes of emotional-mental states that analyse a particular condition as seen in medical applications. As such, this investigation suggests applying a hybrid face analysis system (B1) that uses both thermal imaging (B1.1) as well as standard image analysis (B1.2). The hybrid face software is based upon standard face detection and analysis of changes on the face, the results of which are enriched with the unique thermal imaging analysis; thus the thermal imaging serves as an additional source of gathering data for face analysis, enabling the capture of novel cognitive data of the person. Thus, the system of the *Mind Cupola* suggests a design solution that is efficient for a real-time environment but still provides novel information of the spectator's experience. In

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<sup>98</sup> Ioannis Pavlidis is currently residing at the University of Houston, Computer Science Department in Texas.

practice, face analysis implements the face detection software, which enables the capture of face physiology. The particular way of implementing thermal imaging in the face analysis of the *Mind Cupola* suggests applying it similarly to Levine and Pavlidis' manner in their application called Stress Cam<sup>99</sup> (Puri, Olson, Pavlidis, Levine, Starren; 2005) (B1.1.1) (Figure 7.25, 7.26). The application of Stress Cam uses the frontal vasculature of the forehead and corrugators<sup>100</sup> (frowning muscle), rather than the method of studying the periorbital area that was discussed earlier, which is the same method of thermal analysis utilised in the *Mind Cupola*. Through the measurement of this particular area the face analysis attempts to capture temperature changes during the spectator's experience, using the data as a reference for the production of a mental profile of the spectator.

The *Mind Cupola*'s thermal imaging measurements also implement the 'Brain Temperature Tunnel' concept (BTT, 2003) (B1.1.2) developed by Marc Abreu, a scientist of Yale University (Figure 7.27). He claims that it is possible to measure brain temperature instantly on the skin. The application is meaningful to the concept of the *Mind Cupola* as it is an instant affection device built upon thermodynamic theories of human consciousness. It was suggested earlier that brain temperature might provide information on the state of a person's consciousness; therefore, this measurement might be used as supportive information to capture the spectator's quality of cognition. According to Abreu, BBT is placed near to the eyes and

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<sup>99</sup> Stress cam investigated 12 subjects and compared the results with the established method of real-time measurements of Energy Expenditure (EE). The investigation outcomes have shown that Stress cam greatly correlated to the laborious EE technology.

<sup>100</sup> The selected area is named as the 'Region of Interest' (ROI) as only this section is investigated. With this methodology the 10% hottest pixel is selected and this generates a temperature signal from the forehead. The results are calculated with the bioheat model (Levine and Pavlidis, 2002), which evaluated the blood flow. To assess the results of the bioheat model the Strop Color Word Conflict Test is used, (a stress generator concept) in which a user's response is represented through color and text content. The indicated stress was measured by the metabolic analyser of EE as an adequate data system and compared with the outcomes of thermal imaging.

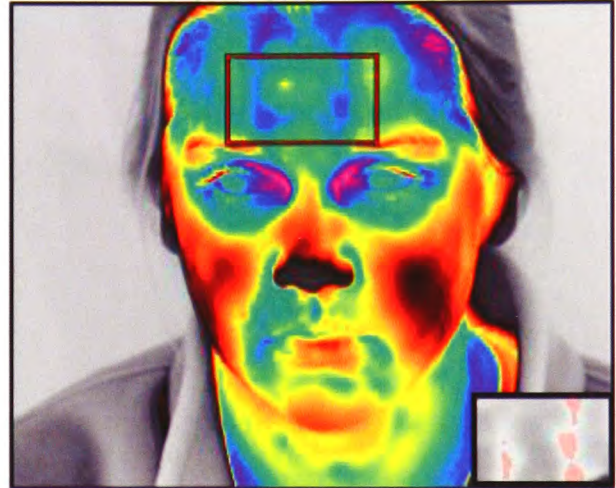
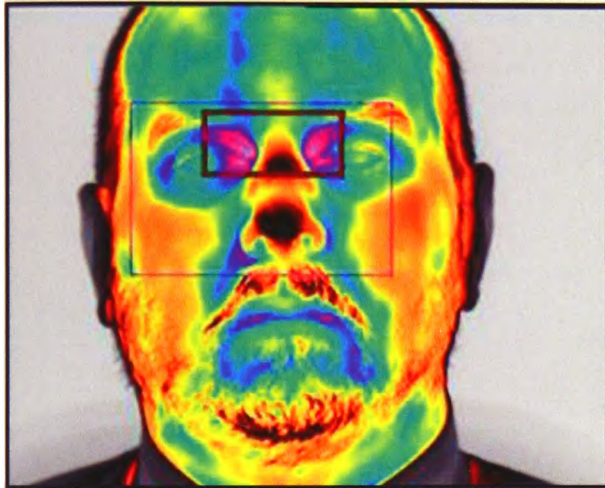


Figure 7.25 Left: *The initial approach of thermal face analysis which measures the perfusion levels in the periorbital area.* (Levine and Pavlidis, 2002) Figure 7.26 Right: *The later concept of 'Stress Cam' focused on the frontal vasculature of forehead.* (Puri, Olson, Pavlidis, Levine and Starren, 2005)



Figure 7.27 *Brain temperature tunnel and the developed glasses which enable athletes to measure brain temperature during their activity (Abreu, 2003)*

nose, where the skin is very thin and contains high light energy. He claims that this area is connected to the brain's 'thermal storage centre' (Abreu, 2003, np.). Abreu sees his tool as a significant step for temperature monitoring that can be used not just for determining illnesses but also improving human capability and safety, such as using it for military or sports purposes, providing a permanent response about the condition of the body. It measures the temperature on that particular area of skin ('Brain Temperature Tunnel') and compares it with a normal state temperature. Similar to the Stress cam, the implementation will note temperature changes during the process and evaluate these for a certain level of cognitive state. The system analyses the Cupola's affection, which might cool down or heat up the person's head and thus so the brain, and in doing so will be transformed into a possible emotional change. This suggests that affections on the body produce certain reflections in cognition.

Another part of the face analysis is regular image processing (B1.2), which is developed within a framework of established methodologies. As it was mentioned earlier, the face analysis software attempted to apply methodologies that are efficient and provide obvious feedback of one's behaviour. Therefore, it has been decided that measurements such as eye-tracking (B1.2.1), position of mouth (open or closed – happiness or sadness) (B1.2.2), and the amplitude and intensity of head movement (nose tracking) (B1.2.3) were to be used. The measurements will all be linked to behaviour and emotional analysis, which, through the system, produces the visualisation and influences the patterns of the frequency generators.

In totality, the face analysis functionalities of the temperature analysis on the forehead (B1.1.1), temperature analysis of BBT (B1.1.2), eye tracking (B1.2.1), mouth position (B1.2.2), head position (B1.2.3) and movement analysis, and have a particular task in the *Mind Cupola's* processing. The data of (B1.1.1) (B1.1.2) are fed back to the frequency generators and influence

that processing. The data of (B1.1.1) (B1.1.2) (B1.2.1) (B1.2.2) (B1.2.3) generates the changes in the visualisation. The interconnection between analysed data and its representation in the applied system is a crucial concept that generates not just the technological feedback but also conceptually serves to achieve the cognitive feedback loop. Therefore, it should be noted that the adequacy of the analysis, the efficient application of the information and a technological stability is essential for a successful aesthetic application. The application of eye tracking (B1.2.1) creates the most obvious feedback for the spectator as it interlinks the spectator's quality of attention / awareness / concentration with a visual response. This application is used to formulate the 'attention play' that was described earlier, in which words, in the visualisation, follow the eye movement of the spectator and, at a particular moment, disappear to draw the spectator's attention to other visual affection. The BBT (B1.1.2) measurement and its constant monitoring activate the cooling and heating system in the *Mind Cupola*. Other temperature measurements (B1.1.1) are used to capture the changes (in the forehead) and the evaluation of happiness/sadness, whilst B1.2.2 is responsible for an emotional evaluation of the spectator that affects the quality of the visualisation. The head tracking (B1.2.3) produces a simple behavioural pattern of the spectator and is used to determine the type and speed of the animation of the visualisation. The applications and its feedback loops produce a collaborative affection on the spectator, which is conceptualised as the fractal structure of the experience.

The final element of the artistic system is the visualisation<sup>101</sup> (C), which belongs to the instant affective technologies and has the same functionality as the frequency generators but has a crucial role in producing an obvious feedback to the spectator's action. It is a 2D animation system that is built upon the visual language of fractals (Figure 7.28, 7.29). The visualisation

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<sup>101</sup> For further technological details and documentation see in Appendix 2.4.



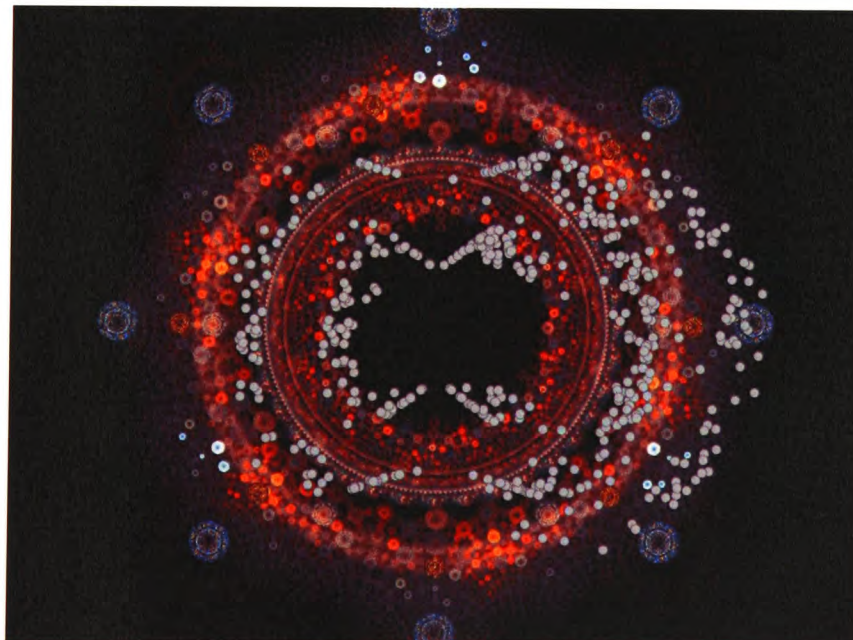
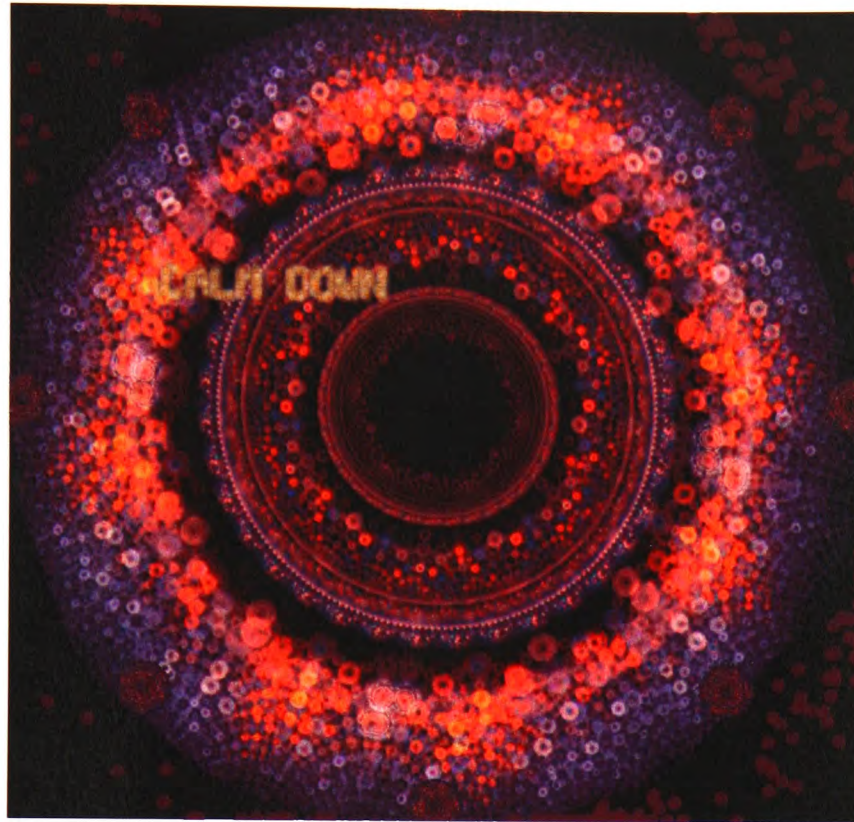


Figure 7.28 Screen shots of the 'Mind Cupola's' visualisation;  
Equilibrium and Meditative states (Zics, 2008)

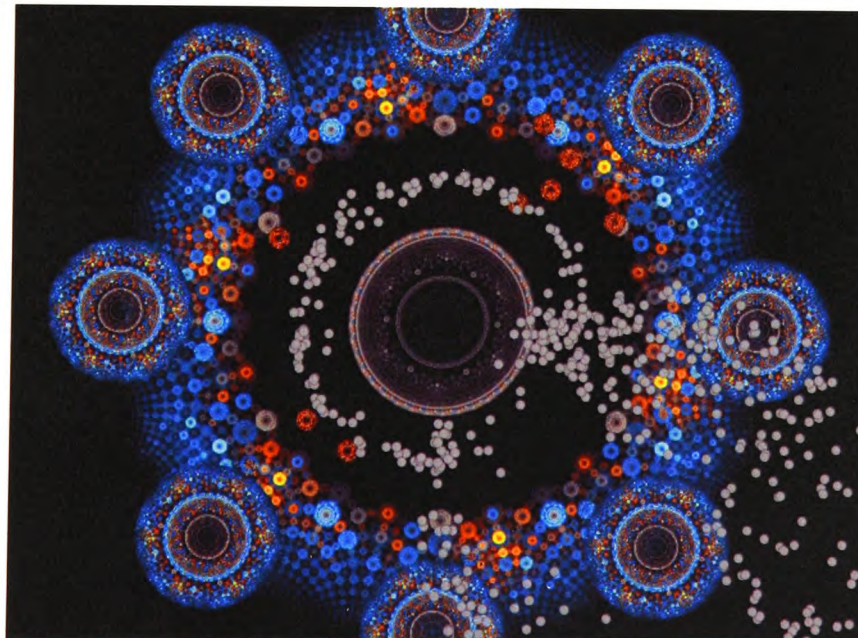


Figure 7.29 Screen shots of the 'Mind Cupola's' visualisation;  
Chaos and Equilibrium states (Zics, 2008)

follows a demand, set within the conception of the *Mind Cupola's* affection system, that it must influence the spectator through perceptual means. The fractal, as mentioned earlier, is a representation of the feedback loop, which, in a visual form, is illustrated in the *Mind Cupola*. The system is built upon sprites and particles of which particular attributes and behaviours are controlled by the spectator's reactions. The fractal-like structure, motion, colour and created semiotics play together, which form words that appear and disappear, and attempt to drive the spectator to a crucial cognitive state. The visualisation forms an aesthetical contribution to the concept of affection, which the *Mind Cupola* applies as the demand for the *Transparent Act*.

In summary, the artistic idea of the *Mind Cupola* (Figure 7.30) is based on the proposal that the human body is a surface of affections and reflections through which the specialised technology enables us to filter new information about human consciousness. It suggests a body-mind interconnectivity that can be used as a meaningful application for a cognitive flow production. The artistic conception of the *Mind Cupola* proposes methods for affecting human cognition by a spectrum of electromagnetic wave functions, which the technology makes visible and accessible, such as EEG technology. In this context the human brain is also a receiver that attempts to make sense of the mass of unintelligible waves and information. From this perspective, the *Mind Cupola* can be explained as a device, which approaches qualities of human consciousness through an aestheticisation of these processes. It uses a collection of affects that a person might normally experience in their everyday environment; however, its amount is multiplied in order to instantly affect the person. As this proposes that the human 'apparatus' is not only effected by perceptual but also by invisible or mechanistic forces, the thesis suggests that this approach might generate an effective encounter of body and mind relationship in interaction. This proceeds from an understanding, applied in the *Mind Cupola*, that physical





Figure 7.30 *The 'Mind Cupola' at the test installation, Peninsula Art Gallery, Plymouth (Zics, 2008)*

impact might trigger cognitive changes in the spectator and, conversely, that affection of biological processes of the brain/face might display cognitive changes. The interface of the *Mind Cupola* attempts to produce essential affections that are both biological and cognitive in the aim of revealing more about the body-mind interconnection, or more specifically about human consciousness. For this purpose, it created special devices based on scientific and non-scientific conceptions that produce a 'spectrum of frequencies', visible and invisible waves to produce a yet unknown impact on human cognition. The feedback loop of these electromagnetic stimuli might generate qualities of the human 'apparatus' that is a new or unique knowledge to the human condition. A spiritual-like experience might be achieved when the spectator is in cognitive control of the system and enters a fully immersive state. This is where the ecstatic state emerges, through the cognitive fractal structure and only the cognitive flow drives the spectator's actions. The *Mind Cupola* creates a new symbolic place for electronic meditations; an affective environment (instead of a responsive environment as was suggested by Krueger) through which the *Transparent Act* is fulfilled.

## Chapter 8

### Conclusion

The interdisciplinary research discussed in this thesis developed a critical framework for an investigation of technology-based interaction in artworks and proposed a new model, termed the *Transparent Act*, for the way in which technology should be implemented when considering for a new aesthetic. The *Transparent Act* most importantly provides a guide for artistic production and for a better understanding of interconnectivity between human and machine, and its potentiality for the transfer of novel knowledge and aesthetic experience. There is where the thesis' main intervention lies, as it introduces an aesthetic based upon the immediacy of 'artist-artwork-spectator'. The thesis claims that the potential of technology in art has not yet been fully discovered, and this new model enables the artist to understand the immaterial qualities of the spectator experience, providing an instant communication between artist and spectator. This quality is based upon the ability of technology to affect human cognition, which the artist can use as an aesthetic tool. This is the thesis intervention of the transparent medium, which explains an immaterial application of technology that is in balance (in the 'making art' process) and oscillation (in the 'experiencing art' process) between artistic meaning creation and technological functionality. Thus, technology-based meaning creation is not only produced by the content but also through the artistic design of the technology or interface. From this point of view the integration of emerging technologies, which are often not embedded in the spectator's knowledge, produces an adequate connection to comfort the user with the technological novelty. Therefore, the aim of this research was to produce a transparent medium which exemplifies the immediacy between artist and spectator, with the aim to create an optimal state of consciousness or creative ecstasy.

Drawing on the model of the *Transparent Act*, the artistic work of the *Mind Cupola* rediscovers a lost dimension of art. It has been shown earlier that pioneering technology-based works by Myron Krueger and their legacy could not offer an aesthetic solution for interaction since the framework remained in a materialistic understanding, ignoring a meaning creation through responsiveness. Most of the subsequent interactive media artworks, such as the earlier discussed *Dancing with the Virtual Dervish: Virtual Bodies* (Gromala and Sharir, 1994-99) and *Mirror\_SPACE* (Zics, 2004/05), produced by the author, were built upon the commonly applied active modality of interaction, proposing a meaning creation by bodily controlled interfaces. Revisiting these artistic applications, the thesis claims that an immaterial approach of interaction that focuses on qualities between body and mind might be more effectively produced by the unique modality of passive interaction.

One of the practical solutions of the passive modality is the concept of fractal structure, which proposes applying technological feedback in a cognitive feedback loop, as it has been applied in the pioneering works by Peter Weibel. As such, the unique bio-feedback interface of the *Mind Cupola* includes both the technologies that affect human condition by frequency generators and visualisation, and the technologies which measure the results through face analysis. The spectator's role here is much more based on embodied reactions and intentional decision expressed through a spectrum of states of cognition, which enables a condition of inwardness to be led to heightened immersion (Figure 8.01, 8.02). As the spectator operates with cognitive qualities such as emotion or behavioural changes in the artwork, the concept of the *Mind Cupola* proposes that it is possible to regulate the spectator's experience to an optimal or new state (Figure 8.03, 8.04). It aims for unique body awareness, reducing motor-driven involvement of the body and focusing upon qualities of consciousness that aim to create fully



Figure 8.01 and 8.02 *The Premiere of the 'Mind Cupola' (Zics, Pope, Ford, Prof. Weibel and Prof. Smith) (Zics, 2008)*





Figure 8.03 and 8.04 *Thermal stream activated by the spectator in the 'Mind Cupola' (Zics, 2008)*

immersive experiences, generating a new pattern of body-mind interconnection. The fractal structure, which is most evidently characterised in the spectator's experience as a complex phenomenon resulting in new knowledge through consciousness, is produced by the particular appearance of the device and the interconnectivity of the affection and capturing technologies generating the aesthetic meaning. The mechanical operation of the *Mind Cupola* provides a unique sequence of experience that has an aesthetic chain reaction based upon the data feedback to the system. The generative quality of the Cupola (i.e. the system continuously recreates itself according to the spectators) never allows the same pattern of actions and therefore the experience is specific to each individual spectator. The fractal quality emerges in the spectator's cognitive processes as they immerse themselves and perpetuate their own experience. In doing so, the spectator might achieve an ecstatic state through the simple repeated affection processes of the *Mind Cupola's* technology, resulting in the complexity within the user's cognition.

The *Mind Cupola* represents the qualities of the *Transparent Act* as it attempts to produce a flow in the spectator's experience, building upon cognitive-based interactivity. The cognitive flow is the optimal state of consciousness that the *Mind Cupola* produces by the instant affection of consciousness combined with artistic formulations of the hardware, and learning the laws of the interaction, thus mastering the tool. The direct and instant affection of consciousness drives the spectator towards a subjective experience with the incorporation of an aesthetic that is produced based upon the spectator's decision making, according to the artistic content. The *Mind Cupola* produces the immediacy between the artist and spectator, as the spectator recognises the characteristics of the interaction according to the anticipation of the artist. As a result the artistic creation process is linked to the spectator experience, which according to the quality of the artistic content creation and the spectator's involvement, achieves an uninterrupted creative flow.

A Heideggerian perspective on the *Mind Cupola* is the readiness-to-hand of embodied knowledge of the spectator and presenters-to-hand of a novel aesthetic message. Readiness-to-hand in the *Mind Cupola* is produced by the instant affection system, creating, in the human environment, familiar changes around the spectator's head. The changes of temperature, light and sound can be seen as familiar information to the spectator that he or she must link to a meaning in the system in order to be able to interact with it. This aesthetic of the interaction represents presenters-to-hand in the *Cupola*, which is generated by the cognitively analysed data as both a visualisation and audio experience, enabling the spectator to be able to master the tool and seek new knowledge. The fluctuation between these processes (readiness-to-hand and presenters-to-hand) generates a poetic level of the *Mind Cupola*; the subjective, aesthetic experience of the spectator.

The *Mind Cupola* invokes not only artistic content but also the technological medium that is produced by the artist, building upon both technological design methodologies (explained as invisible tool) and the artistic contextualisation of technology (the transparent medium). The concept of invisible tool elicits a functional application of the human-computer interaction, ensuring an efficient and effective interaction for the spectator (such as the process of programming or application of face analysis software or data analysis in the *Mind Cupola*). The transparent medium provides an effective environment, the unique interface of the *Cupola* and its generative artistic system. The two hardware implementations of the cupola itself and the camera-mover interface situated at the front are a good example how the artistic system of the *Mind Cupola* fuses cognitive-based approaches of design and art. The cupola follows a particular aesthetic formulation; it is an exclusive place, which embraces its spectator. Whereas this cupola interface draws audience attention on the surface, promoting artistic meaning, the camera-mover

interface at the front only serves for functional tasks, as it adjusts the camera to the height of the person; thus it is designed to be aesthetically invisible. The camera-mover with its low-key design and dark surfaces attempts to merge into the background, in contrast with the cupola, which with its design of lighting and reflections, is very visible and affects the perceiver. The production of a cognitive flow is achieved through the combination of perceptually visible and invisible interfaces that represent the thesis claims that interactive media art includes both effective design approaches and the artistic drive of pushing boundaries and reflecting on technology for a new artistic meaning. Therefore, the model of the *Transparent Act*, exemplified here by the *Mind Cupola*, is not only a proposal for a new aesthetic but also for effective design solutions for human and machine interfaces; the scale of the applications of the invisible tool and the transparent medium have been chosen by the artist according to the artistic meaning creation.

Looking into future applications of the *Transparent Act*, the thesis draws out a framework for both an interdisciplinary model for artistic practice and an evidence-based critical approach for reviewing contemporary technology-based artworks. The practical application of the *Transparent Act* provides a guide for artists with regards to how technology can be meaningfully incorporated into creative processes that suggest active and passive modalities of interaction. It proposes that functional responsiveness has to be linked with the aesthetic openness in order to produce a cognitive-based interaction. The concepts of body awareness and immersion facilitate particular qualities of the artistic interface that provide a meaningful application of meaning creation for art production. The application of the *Transparent Act* also draws on Eco's openness; as an interactive artwork it is a communication system, which through 'ambiguity' in the oscillate characteristic between the mastering of the technology and the seeking of artistic knowledge, creates multiple meaning and subjective experience. The 'controlled disorder' (Eco,

1989) in the *Mind Cupola* can be represented through the learning process of the spectator, in order to formalise their decision making; this is how s/he may be able to influence the visualisation in recognition of the cupola's affective processes. The process in which the spectator aims to comprehend the interaction produces noise in the information exchange, which only disappears when he or she is able to control the artistic system. Eco explained this through the example of the mosaic pieces that represent an ambiguity, as they are not perfectly interconnected but, as a whole, generate a clear response to the spectator in which this lack of clarity becomes part of the artistic message.

Drawing further on the characteristics of the *Transparent Act*, responsiveness in the *Mind Cupola* is characterised by two feedback sources: the visualisation and the cupola's instant affection system. The spectator's task is to make sense of the feedback the system creates, which is designed to achieve the optimal state for the user (Figure 8.05, 8.06, 8.07, 8.08, 8.09, 8.10, 8.11). The chain of actions and affections are generative, based upon the spectator's behavioural decision-making and thus producing a unique subjective experience. As the *Mind Cupola* is an artistic medium, the applications of 'degree of choice,' 'modifiability', 'quality of modification' and 'degree of non-linearity' (responsiveness) do not have to attain the highest degree, as seen in the use of the invisible tool, to achieve transparency, but they rather have to produce an interconnection between these functionalities and the artistic meaning.

The immersive state is generated by the limited behavioural responses measured through changes of head and eye movement. As the argument here proceeds from the position that bodily states trigger certain states of consciousness, the immersive state is achieved through the cognitive process of mastering the system, generating transparency in the spectator's cognition. Heightened immersion is achieved by the equilibrium state, which means that the flow of



Figure 8.05 Spectator in the 'Mind Cupola' (Zics, 2008)



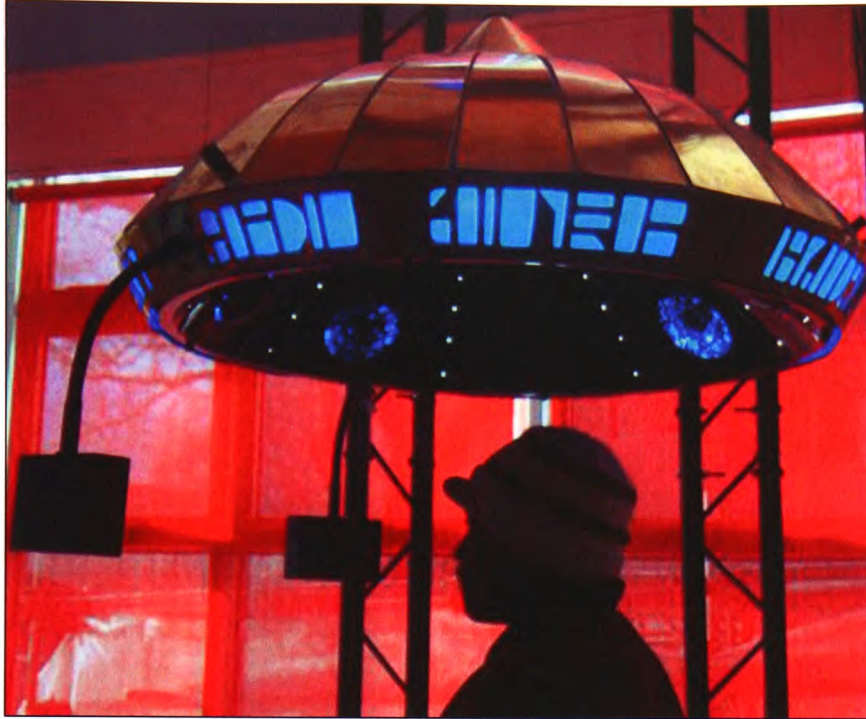


Figure 8.06 and 8.07 Spectator's interaction in the 'Mind Cupola' (Zics, 2008)



Figure 8.08 and 8.09 *Spectators in the 'Cupola' interface* (Zics, 2008)





Figure 8.10 and 8.11 *Visitors at the 'Mind Cupola's' environment*  
(Zics, 2008)

experience takes control of the interaction. This flow may produce an ecstatic state when the cognitive oscillation between functional dealing and artistic content, in this case controlling the cupola's affection system through interaction with the visual display, turns to an aesthetic immersion that produces a spiritual-like experience.

Another implication of the *Transparent Act* is that it provides new perspectives on how an aesthetic can be evaluated in technology-based artworks. The immaterial approach taken by this model applies technology; in the context of art as tools for cognitive modelling of the spectator's subjective experience. It looks at how the artwork provides content through the quality of the interaction with technology, how the emerging quality of responsiveness is linked to an aesthetic claim. Through this the artwork can be efficiently evaluated for both: artistic quality and technological capacity through the application of Goetz' model. The previous discussion also introduced the modality of experience-based evaluation of artworks: an application of the matrix of immersion that is factored into determining the degree of transparency. Thus, the quality of transparency explains how far the artist balances functionality with content production, which is the effectiveness of human-computer interaction for cognitive affection of the spectator. A particular application of this evaluation system would be for the assessment of technology-based media artworks. New media art festivals have a great pressure to evaluate emerging concepts which currently focus upon the qualities of technological meaning creation. The *Transparent Act* offers a scheme through which interactive artworks can be evaluated based upon their efficient aesthetic quality and not, as often occurs, by the quality and novelty of emerging technology, or by artistic content that is not meaningfully applied to technological responsiveness. Knowledge production in the *Transparent Act* is based on the experience design. Firstly, this is gauged by observing how far the artwork demands the user to

engage with learning processes to develop new knowledge in interaction (rather than purely using their embodied knowledge), which allows for a mastering of the tool. Secondly, the *act* accounts for how far the artistic content produces a consciousness alteration, generating new knowledge. The relation between new knowledge of function and new knowledge of artistic content determines the critical analysis through the model of the *Transparent Act*.

As a future perspective, the *Transparent Act* can also serve as novel scheme of art and design education. Art and technology education may find this model useful for an innovative cross-genre application between art and design. A network of interdisciplinary theories, conceptions and applications can generate a new understanding for students who might approach technology by more critical, yet proactive, frameworks. Through the interconnectivity of concepts (such as openness, responsiveness, invisible tool, transparent medium, body awareness and immersion and flow) the *Transparent Act* provides a framework to encourage a broader understanding and straightforward applications. It offers a method that emphasises a dynamic creation process with a great interest in emerging technologies and how they can be used for design or artistic solution. The *Transparent Act* claims that, in an educational context, technological applications may be approached not only as art or design outcomes but rather as outcomes based upon how technology produces content. This suggests that students might apply the *Transparent Act* in more universal contexts, where the purpose of the project is to decide whether the technological application pushes boundaries such as art (transparent medium) or devotes itself for a more functional solution of technology (invisible tool); both approaches work towards an effective human-computer and aesthetic application.

Future perspectives on this research will come from a supplementary investigation of the experiences of the *Mind Cupola*, based upon methods of self-reports and case studies evaluating

cognitive qualities, in order to comprehend the passive modality of interaction, and how this might be improved to produce a higher degree of transparency. This could be in the form of touring institutions with the *Mind Cupola*, with the aim to produce an audiovisual database of subjective experiences (via self-report or participant observation by artist), providing further material of the analytical applications of the *Transparent Act* or even an expansion of this modality. As the *Transparent Act* claims an ecstatic state with a tendency toward spiritual-like phenomenon, further research will be dedicated to the exploration of similarities in spiritual ecstasies and creative ecstasies. Based on these evaluations further practice could be undertaken, based on the self-report of the spectators of the *Mind Cupola*, with the aim of improving the immediacy between the artist and the spectator through more effective affection technologies. This might also result in a further exploration of technologies which directly change consciousness. New perspectives can also be identified in the application of tangible interfaces, which were defined in this thesis as active modalities of interaction, since they are built upon a completely different body-mind relationship. An investigation of knowledge-seeking in technologies that work through touch could extend views on instant affective technologies and might produce applications (along its particular quality of body awareness), providing a greater amount of adequate information exchange. This design application might serve as recognition of common computational devices, such as the keyboard, which, in this new proposal, would be integrated into a cognitive-driven method; thus an active mode would be extended into a passive mode.

The *Mind Cupola* is a product of a conceptual dematerialisation process that applies a philosophical model to re-introduce an aesthetic model of interactive technology-based applications. This proposal dissolves the dualistic interpretation of art, in which processes of

artist-artwork and artwork-spectator were considered in a separate manner. The main argument in this thesis interconnects the artistic creative processes with the spectator's experience, which happens in the way that the artist anticipates the actions in a form of affection system producing repetitive actions of a fractal structure in the spectator's cognition. The *Mind Cupola* generates transparency as its artistic model of interaction is based on the dynamic processes of experience and its artistic content is based upon this result. Its concept uses emerging technologies from a critical distance so letting it produce not merely an object as a material outcome but rather serving as a tool for experience design. The *Mind Cupola* rediscovers the lost immaterial dimension of art as it aestheticises the spectator's internalisation process triggered by the affective environment. The *Mind Cupola* with its passive model of interaction recovers qualities in art experience that might have been present before in art history, but have been lost in the materialistic modality of art.

### **Appendix 1**

Context for the Theoretical Models of Responsiveness and Immersion

### **Appendix 2**

Documentation of the Practical Research

### **Appendix 3**

Relevant Publications

## Appendix 1.1

### Lutz Goertz' (1995) four-dimensional model:

Goertz' dimension of '*degree of choice available*':

- 0 No choice available except a decision about when reception starts and ends...
- 1 Only basic changes available in the quality of the channel (such as: light/dark, high/low or fast/slow)
- 2 As in 1, plus the ability to choose between selections in one choice dimension; choices occur simultaneously (such as television or radio programs)...
- 3 As in 2, but the selections available within the choice dimension are not time dependent (such as newspapers or video-on-demand)
- 4 As in 3, but there are two or more choice dimensions for a user to choose from (for example video games with various levels of play, forms of presentation, forms of action and story lines to choose from). (Goertz, 1995, p. 476)

Goertz' dimension of '*degree of modifiability*':

- 0 No modification possible with the exception of storing or erasing messages
- 1 Manipulation or 'verfremdung' of messages is possible (through the choice of sound or colour)
- 2 Modification to some degree of random additions, changes, or erasure of content is possible
- 3 Modification possible through random additions, changes in, or erasure of any type of content (for example computer word processors or graphics software, and in most media as a means of communication. (Goertz, 1995, pp. 486-7)

Goertz' dimension of '*quantitative size of the available selections and modifications*':

- 0 No choice possible,
- 1 Some choice available (between 2 and 10 choices) within at least one selection or modification dimension (television reception via terrestrial frequencies),
- 2 As in 1, plus more than 10 choices within one selection or modification dimension (A reader can choose from several hundred newspaper articles and reviews, teletext offers more than 100 pages though no other choices are available),
- 3 More than 10 choices available in *more than two* selection and/or modification dimensions (limited selection available as for example in branched choices or: an infinite or seamless selection available from *one* selection or modification dimension respectively (video games which allow the user to write in a random name at the beginning),
- 4 An infinite or seamless selection available from all selection and/or modification possibilities (applies to media uses which allow participants random messages, word processing programs, but first actually for all media which function as a means of communication).  
(Goertz , 1995, p.487)

Goertz' dimension of '*degree of linearity/non-linearity*':

- 0 The time and order of the material is completely controlled by the information producer or the sender (television, radio, film),
  - 1 The order of the material is determined by this information producer or sender, the user initiates the communication process and can stop or re-start it (video, records, other sound media),
  - 2 As in 1, but the user determines the tempo of the reception (books),
  - 3 As in 2, the user can select single elements of information which have little or no connection to each other (newspapers),
  - 4 As in 3, the user can now retrieve elements of information which are highly connected (references in an encyclopaedia or via hypertext functions on a World Wide Web site).
- (Goertz, 1995, p. 487)



## Appendix 1.2

### Four-dimensional model of Immersion:

The following suggests model for measurement based on self-reports or observation carried out by the artist. This matrix applies the four-dimensional scheme of interactivity introduced by Lutz Goertz (see Appendix 1.1).

- 0     *No immersion*
- 1     *Discontinues immersion* (process of embodiment)  
      Learning process:   (1) semiotics of the body movement  
                              (2) symbolic evaluation  
                              (3) comprehending perceptual knowledge
- 2     *Fluctuation between immersion and embodiment*  
      Understanding:    (1) fragmental success in respond  
                              (2) fragmental success in respond  
                              (3) between comprehending and immersing  
                                      (fragmental success in respond)
- 3     *Controlled immersion*  
      Effective interaction: (1) high effectiveness in control  
                              (2) high effectiveness in control  
                              (3) under control of perceptual affects  
                                      (effectiveness in control)
- 4     *Illusion: disembodiment*  
                              (1) ecstatic state  
                              (2) fully control of action  
                              (3) meditative state

## **Appendix 2.1**

### **Documentation of the Development of the Mind Cupola Interface**

In collaboration with Andor Gaudia

#### **Introduction**

*The aim of the project is to design and implement a 'Mind Cupola' which is able to do the following things:*

- Locate user's head and change its vertical position to accommodate to the user's height
- Notify the camera holder about the user's height
- Generate light effects using LED spotlights
- Generate wind
- Sound effects/music

#### **Detailed description**

Mind cupola will be a ceiling mounted cupola which is able to perform pre-programmed things.

The cupola will be used together with the camera holder device.

The cupola project contains 2 major hardware elements:

- Cupola
- Cupola lifter

Air, light and sound effects have the best efficiency if their source is as close to the user's face as possible. Since adults' height usually varies between 150 cm and 200 cm the cupola's vertical position have to be changed. This can be done using a lifter device.

2 distance sensors will be placed inside the cupola. The first distance sensor will be used to measure whether there is a user beneath the cupola or not. If the sensor tells us that somebody is standing beneath the cupola the cupola lifter will lower the cupola's vertical position until the 2<sup>nd</sup> sensor notifies us that we will reach the user's head soon. The cupola lifter is stopped as soon as the 2<sup>nd</sup> sensor gives a signal.

Cupola lifter will be driven by a geared DC motor.

Spotlights will be placed inside the cupola facing the user's face. Ambient lights can be also used. The exact number of the lights will be specified later but the maximum number can't exceed 10 independent light sources. If less air source is required then the number of light sources can be increased.

The cupola will include 2 small speakers and the with frequency throughput of 400-22000 Hz. The cupola won't include any amplifiers; it will only provide 2 RCA connectors on the side of the cupola lifter casing.

Cupola diameter	1000mm
Cupola radius (outside)	650 mm
Cupola radius (inside)	570 mm
Cupola thickness	80 mm
Cupola material	Layered wood plates + metal coverage
Number of independent air sources	8
Fan diameter	120 mm – 180 mm
Fan speed	1000-5000 rpm
Air valve positions	Open/Closed
Number of independent light sources	6
Light source type	LED
Light operation	Digital (on/off)
Shortest light impulse	10ms
Loudspeaker frequency throughput	400-22000 Hz
RMS loudspeaker power	10 W
Cupola lifter dimensions	500mm x 500mm x 100mm
Maximum lifting distance	700mm
Light/air program selection	Serial port (C++ library)
Connectors	RS232, 2 x RCA, standard power

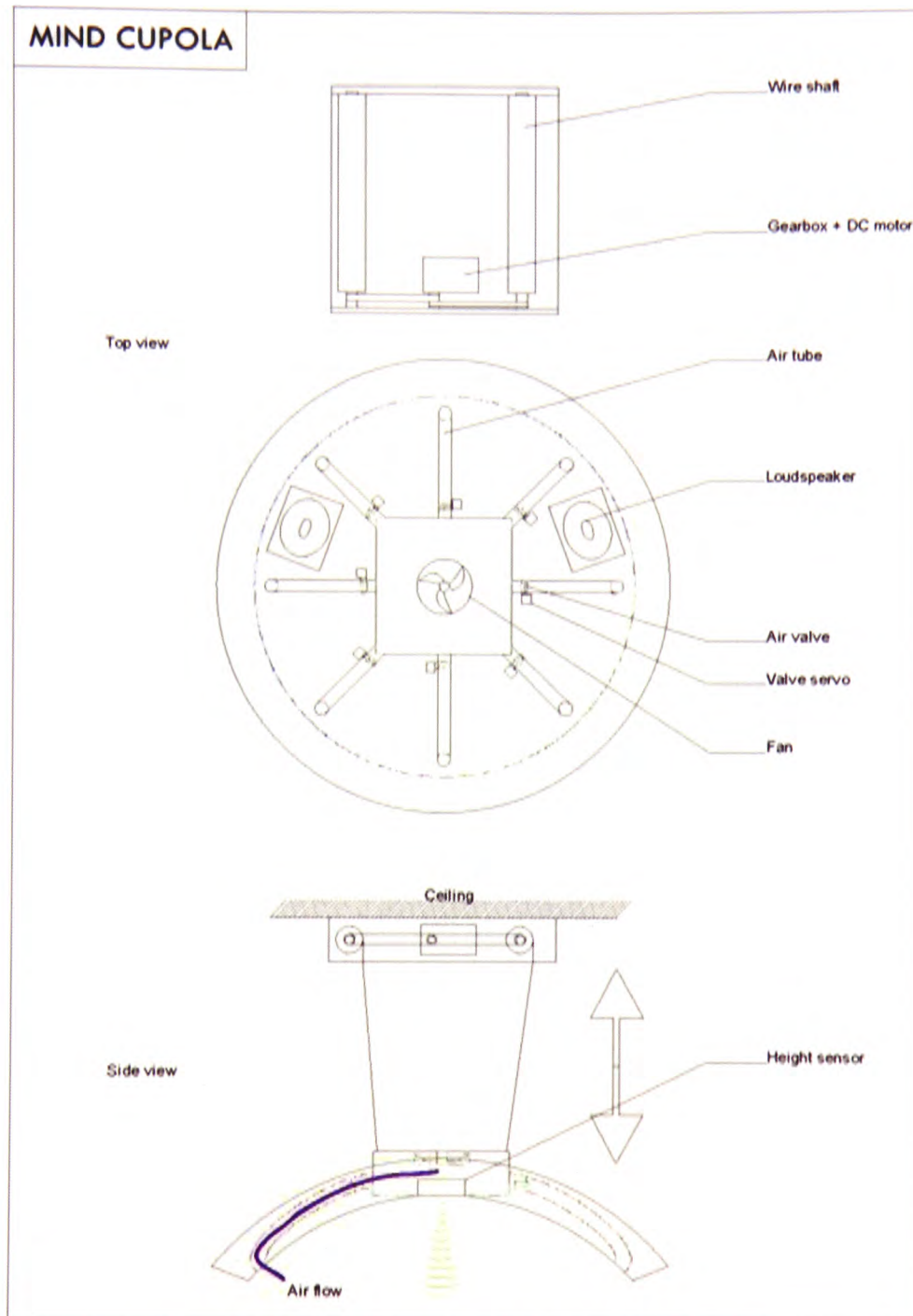


Figure 1 Draft of the 'Mind Cupola's' technical scheme, 2007

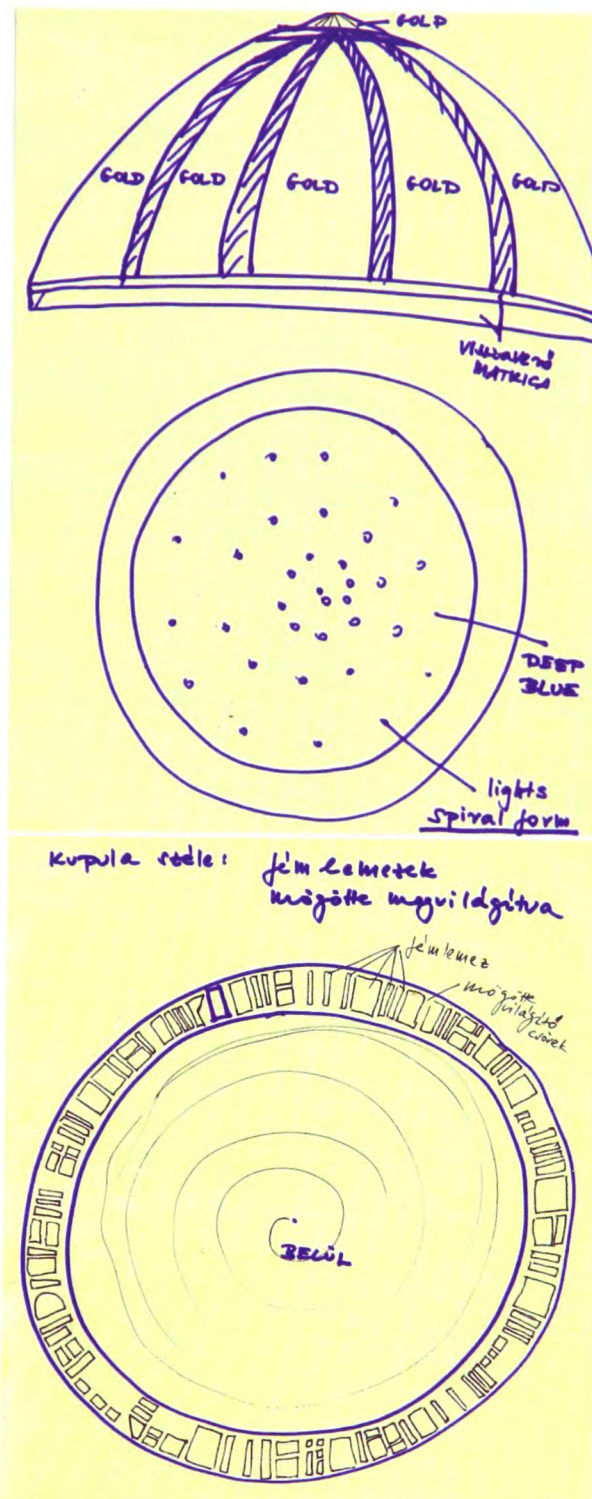


Figure 2 Initial Drafts of the 'Mind Cupola', 2007



Figure 3 'Mind Cupola' Development: Work in Progress



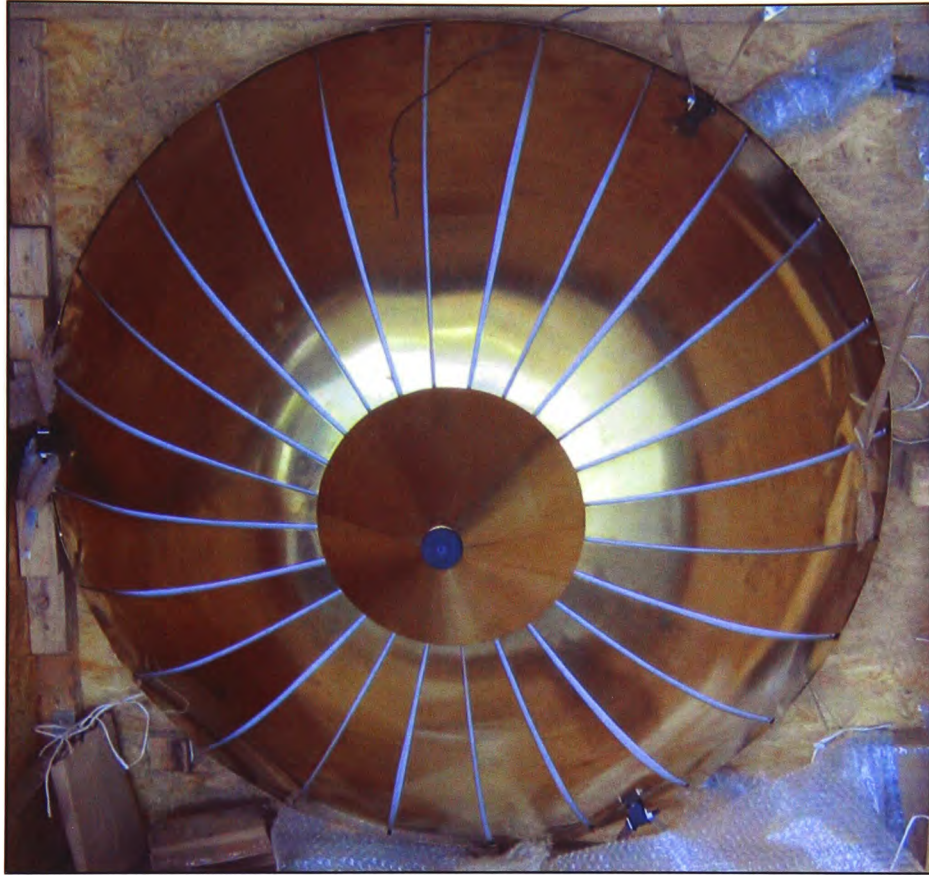


Figure 4 *'Mind Cupola' on the arrival at the University of Plymouth*

**Images used as sources for the development of the *Mind Cupola's* design:**

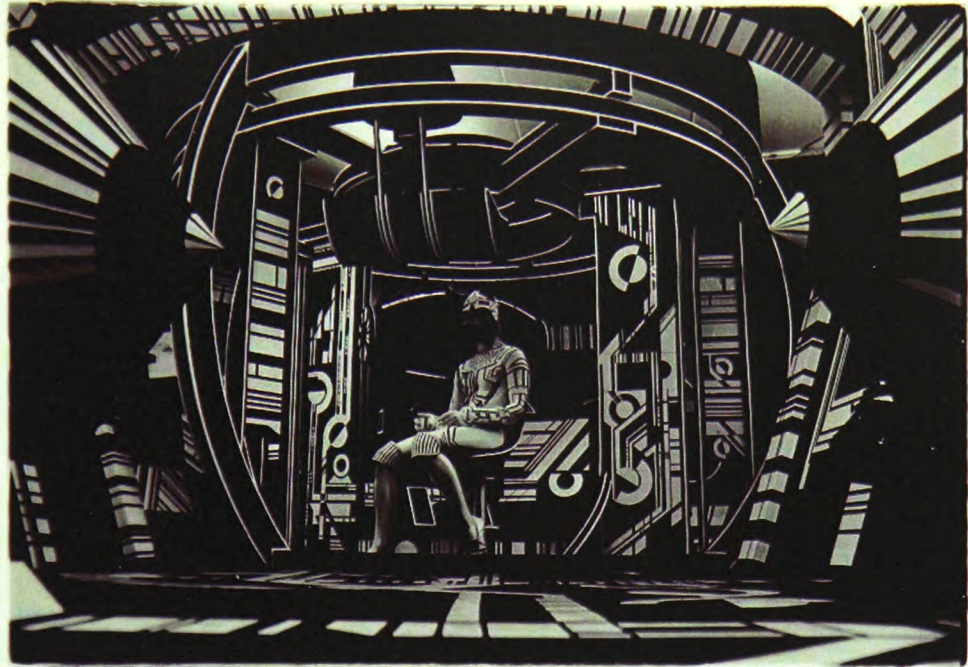


Figure 5 Screen shoot of the movie 'Tron' (1982) directed by Steven Lisberger with the visual design by Peter Lloyd



Figure 6 The 'Mind Cupola's' interior design applies similar cover pattern as Sony Ericsson MSB-100 Bluetooth Speaker





*Figure 7 Rooftop copper cupolas served as examples for the shape and design of the 'Mind Cupola'*

## Appendix 2.2

### **Documentation of the Development of Camera-Mover Interface Mechanical, Electrical, Software Overview** In collaboration with Andor Gaudia

#### **Short task description**

The aim of this project is to design and create a camera leg which is able to adjust the camera's height using a computer controlled motor.

#### *Specifications:*

- Lowest camera position: ~1200 mm
- Highest camera position: ~2000 mm
- Maximum camera weight: ~1.8 kg
- Total weight: ~10-15 kg
- Base dimensions: 200 mm x 300 mm
- Body dimensions: 150 mm x 250 mm
- Pipe diameter: 20 mm
- Precision: 0.5 mm/step

#### *Parts, materials listing:*

- Frame: Steel profile (1mm wall thickness). Joints are welded.
- Pipe: 20 mm diameter aluminium pipe.
- Guide wheels: Rubber wheels with ball bearings. Wheels are adjustable.
- Counterweight: Solid steel block. The counterweight is guided by two strained wires. The weight is connected to the lifting pipes using metal wire. The plastic pulley wheel is mounted using a ball bearing.
- Base: Metal plate with rubber foot. Will contain a heavy (3-4 kg) ballast to increase the frame's stability.
- Head: Steel profile. Joints are welded.

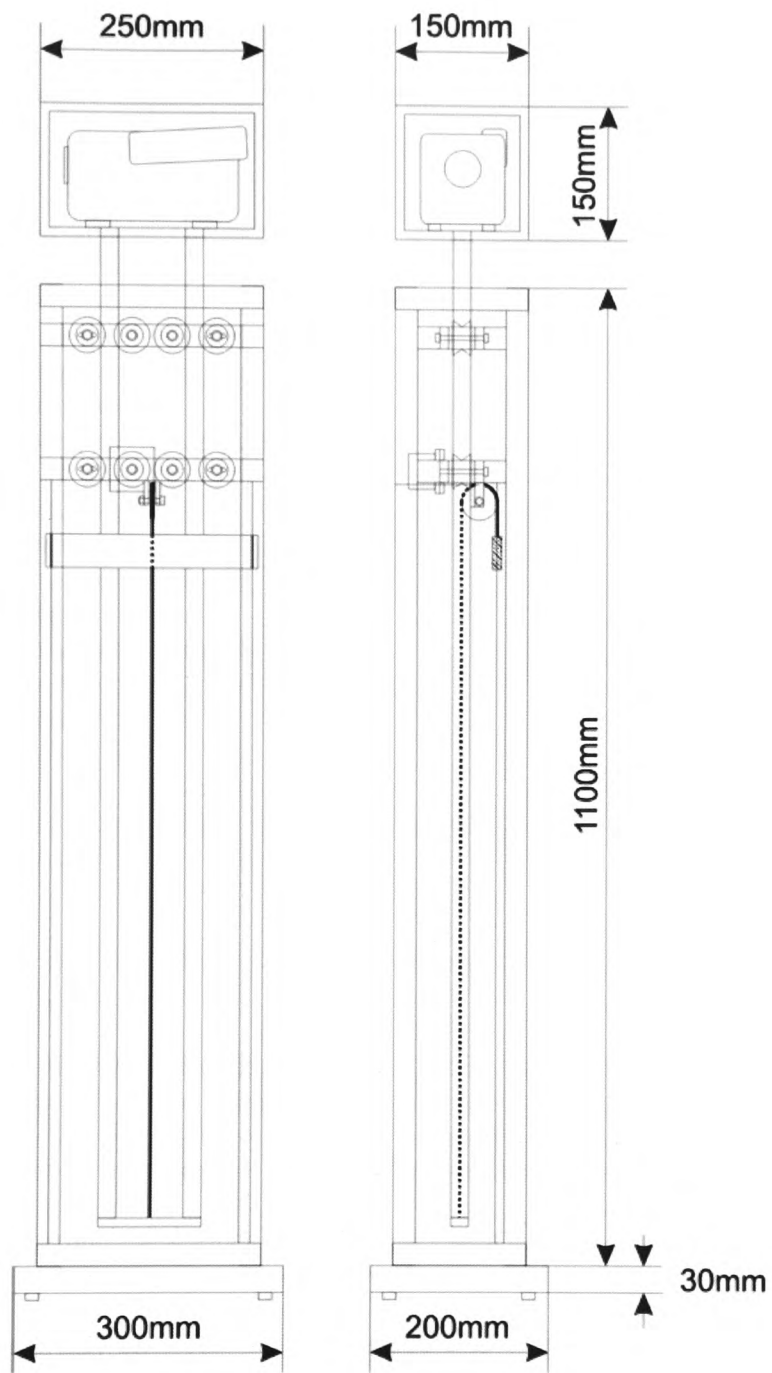


Figure 1 Schematic view of the camera-mover

The frame, the counterweight and the pipes are painted to black. The frame can be covered with glass or plastic. All the cables needed to operate the camera can be hidden inside the pipes. The power connector, the fire-wire connector and the parallel port connector will be placed to the back of the base panel.

### **Electrical plans**

*The electrical system contains the stepper motor, signal amplifier and the power supply.*

*Stepper motor characteristics:*

- Model: Minebea 23LM-C004
- Coil type: unipolar, 6 phase
- Operating voltage: 6V
- Operating current: 1.2 A/phase
- Angle/step: 1.8 deg/step
- Amplifier characteristics:
- Interface: parallel port
- Maximum current: 2A/phase
- Power supply:
- Switching mode power supply
- Operating voltage: 100-240V/50-60Hz
- Output voltage: 7.5V DC
- Output current: 1.5 A
- Overload and heat protection
- The electrical system will contain 2 switches which report the top-most and bottom-most position of the lifter.

### **Software plans**

*The software will contain a library which can be used in any other projects. The library will provide the following functions:*

- Initialize – Initializes the entire system. Calibrates the lifter.
- GoToBottom – The lifter will go down until it reaches the bottom-most position.
- GoToTop – The lifter will go up until it reaches the top-most position.
- GoTo – Moves the lifter to the specified position. The position can be specified in millimetres.
- StepUp – Instructs the stepper motor to turn 1 step up (about 0.5mm change in height).
- StepDown – Instructs the stepper motor to turn 1 step down (about 0.5mm change in height).
- Move – Instructs the lifter to start moving into a specified direction with a specified speed.
- Stop – Stops the lifter.
- GetStatus – Returns the current status.

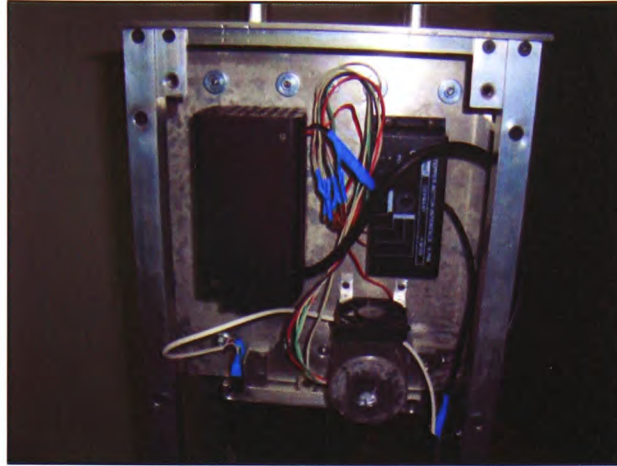


Figure 2 and 3 *Images of the camera-mover interface development*

## **Appendix 2.3**

### **Documentation of the Face Analysis Software Development**

#### **Face Recognition and Feature Analysis Using Thermal and DV Cameras**

In collaboration with Dr. Phil Culverhouse and Dr. Julian Tilbury, University of Plymouth

#### **Introduction**

This guide outlines the structure and function of a firewire camera-processing module that can identify facial features in real-time video stream from an IEEE1394 (Firewire) camera, called UoP\_face.exe and UoP\_thermal\_face.exe

The software puts wrapping code around proprietary facial feature recognition DLL from David Cristinacce at Manchester University. The wrapper is built upon the CMU IEEE1394 camera driver project for camera interface control, and post processes the camera stream to extract dynamic and static facial features. Feature parameters are passed to other processes via sockets and can therefore be situated on any internet computer.

The IEEE1394 interface and video stream analyser can be connected to a normal DV or Firewire camera, or optionally to a thermal camera. The Cristinacce facial feature recognition software must be called with the appropriate training-set, according to normal or thermal camera input. Data rates from a 25 frame per second camera drop to about 10 frames per second when the computer hosts one camera. This can be expected to drop to 5 frames per second for two cameras.

#### **Camera processing**

Cristinacce facial feature recognition software is reasonably robust to lighting and to face size, but deep shadowing, substantial face rotation in the camera plane and occlusion prevent its operation. This is particularly noticeable for thermal images where people with long hair cannot be recognised.

The DLL reports eye, nose and mouth position. The wrapping code adds a training facility to allow mouth open/closed and eyes open/closed to be analysed.

Feature messages comprise:

1. Camera type: T (thermal) or N (normal);
2. Nose x, y cord: N x y;
3. Left eye: Le O (open) or C (closed);
4. Right eye: Re O or C;
5. Mouth: M O or C;
6. Cheek temperature or Colour: L (RGB bytes), R (RGB bytes)

### Socket link

Data is sent via a socket link to another process, which may be on the same computer, or another internet computer. The connecting process is the socket master server, and the client is the UoP\_face application.

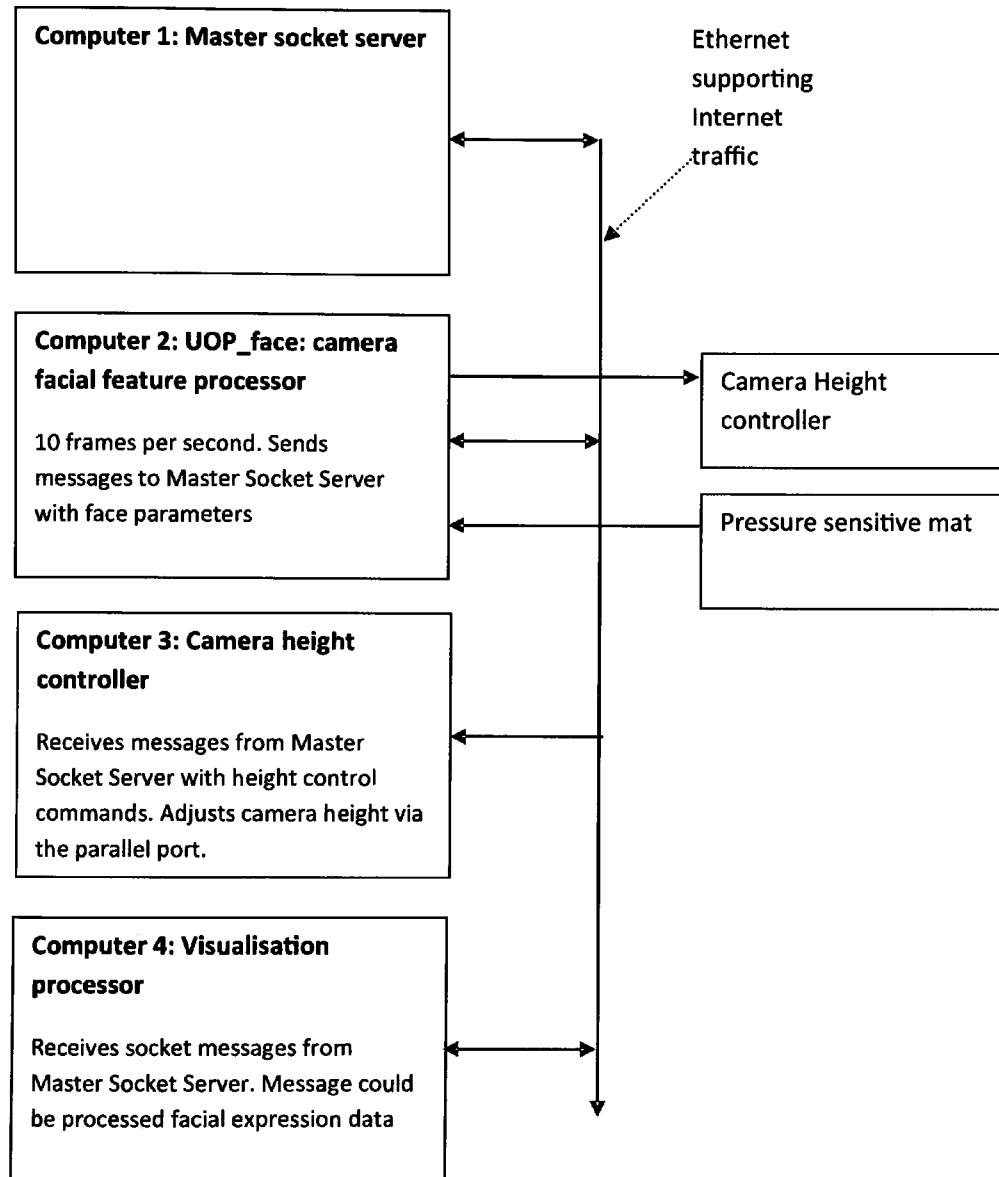


Fig.1 Block diagram of computer array for installation



The simplest configuration for control of an art installation is through using ‘sockets’. These are standard Internet protocol message passing methods that allow processes on one computer to communicate directly with processes on other computers in point to point pathways.

### Computer array operation

1. Power up all computers
2. Run Mserver.exe on Computer 1 (Master Socket Server)
3. Connect cameras and on Computer 2 run UOP\_face.exe (and UOP\_Thermal\_face.exe as required, ensuring the IP address of Computer 1 is defined correctly in the socket configuration file.
4. Connect height controller and pressure sensitive mat to Computer 3. Run height software on Computer 3, and ensuring the IP address of Computer 1 is defined correctly in the socket configuration file.
5. Run visualisation software on Computer 4, and ensuring the IP address of Computer 1 is defined correctly in the socket configuration file.

Then Computer 1 waits for a socket message from the pressure mat via Computer 3. If the camera processor receives no facial feature messages then the height controller is commanded to run through a height cycle. When the first facial feature tracking data from Computer 2 is obtained then the height controller is told to stop adjusting the camera height. The height is adjusted to keep the face in the centre of the camera field of view.

If the thermal camera fails to detect a face, then estimates of face position corrected by the known geometric relation between the normal camera and the thermal camera can be applied and feature data estimated. *(Note this will not work and requires that the two cameras are placed in the same software loop, to allow camera pixel data to be shared for the two cameras.)* Camera facial feature messages are processed to construct time-sequence data for all the 8 channels of feature data.

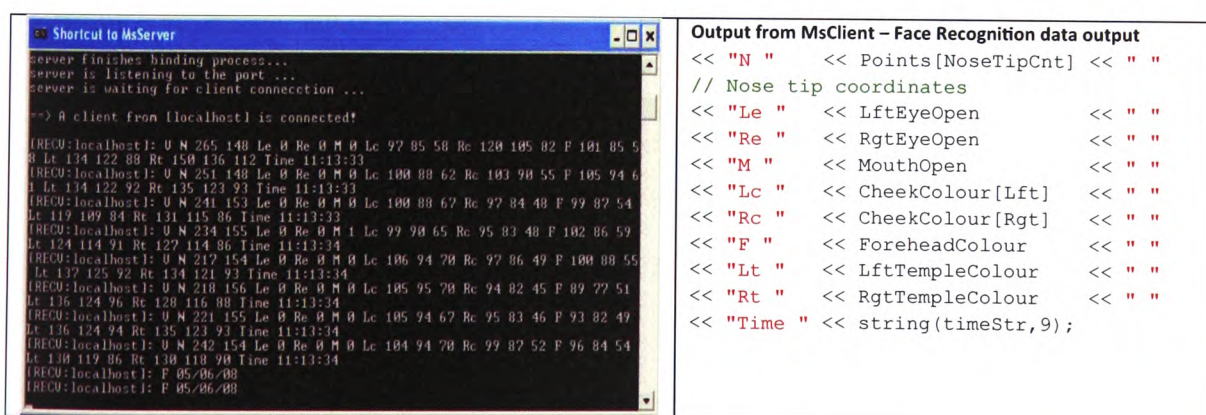


Figure 2 Server socket window displaying data stream of the face analysis



## Appendix 2.4

### Documentation of the Visualisation

In collaboration Chris Ford, University of Plymouth

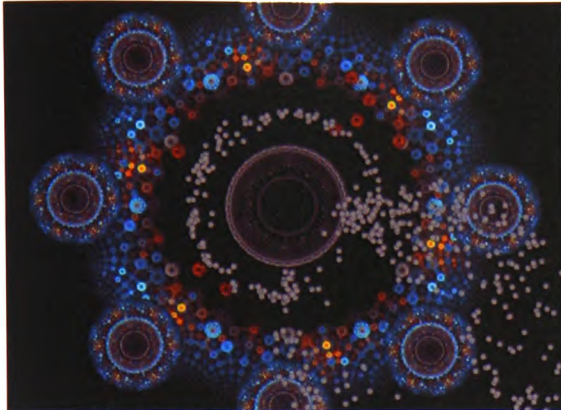


Figure 1 Screen shot of the visualisation

#### I. Visualisation System – Emotional Stage Explanations

##### 1. Chaos Stage 1 (Chaos Colours: Red <-> Orange)

- Kaleidoscopic Background (Colour Affected)
- Circle01 with Rotation (Colour Affected)
- Circle03 with Rotation and Scaling (Colour Affected)
- Mice Particles in Outer Ring area (Colour Affected)
- FractalSet2 On with Rotation – Shimmering State (Colour Affected – Initial Size .04)
- Rotation Speed Factor = .5f (Fast)
- Particles (mice) speed random between 12 and 22.
- NOTE: All other items are OFF

##### 2. Chaos Stage 2 (*Changes from Chaos Stage 1*)

- Rotation Speed Factor = 1f
- Circle03 Scaling Off

##### 3. Chaos Stage 3 (*Changes from Chaos Stage 2*)

- Rotation Speed Factor = 2f
- Circle01 Rotation Off
- FractalSet1 On with Rotation – Shimmering State (NOT Colour Affected)
- FractalSet2 On with Rotation – Shimmering State (NOT Colour Affected – tint7)

##### 4. Equilibrium Stage 1 (*Changes from Chaos Stage 3*)

- Circle01 Off
- Circle02 On with Rotation (NOT Colour Affected)
- Circle03 On with Rotation (NOT Colour Affected)
- Mice Particles in Middle Ring area (NOT Colour Affected)
- FractalSet2 On with Rotation – Circular State (NOT Colour Affected – tint7 – Pulsing (.04 - .1)
- FractalSet1 On with Rotation – Circular State (NOT Colour Affected)
- Background On (NOT Colour Affected) – No Rotation
- Kaleidoscopic Background Off
- Particles (mice) speed random between 8 and 12.

**5. Equilibrium Stage 2** (*Changes from Equilibrium Stage 1*)

- FractalSet2 On with Rotation – Shimmering State (NOT Colour Affected – tint7 – Pulsing (.04 - .1))

**6. Equilibrium Stage 3** (*Changes from Equilibrium Stage 2*)

- FractalSet2 On with Rotation – Shimmering State (Colour Affected – Initial Size .04)
- FractalSet1 On with Rotation – Shimmering State (NOT Colour Affected)

**7. Meditative Stage 1 (Med Colours: Blue1 <-> Blue2)** (*Changes from Equilibrium Stage 3*)

- Mice Particles in Inner Ring area (NOT Colour Affected)
- Particles (mice) speed random between 2 and 4.
- FractalSet1 On with Rotation – Circular State (NOT Colour Affected)
- FractalSet2 Rotation Off - Shimmering State (NOT Colour Affected)
- Circle01 Rotation On (Anti-Clockwise)
- Triangular Lights On

**8. Meditative Stage 2** (*Changes from Meditative Stage 1*)

- FractalSet1 Speed Slowed
- FractalSet2 On with (Anti Clockwise) Rotation – Circular State (NOT Colour Affected) – Speed Slowed – Initial Size .02
- Amoeba Light On
- Clock Light On

**9. Meditative Stage 3** (*Changes from Meditative Stage 2*)

- Background Image Rotation On – Very Slow
- Circle03 On with Scaling (Very Slow)

- All Lights Off

## NOTES:

Must create:

1. State Machine with control mechanism\*
  2. Multi Client IP Socket Server
  3. Cupola Control elements
  4. Foley Audio Elements
- \*Priority for completion

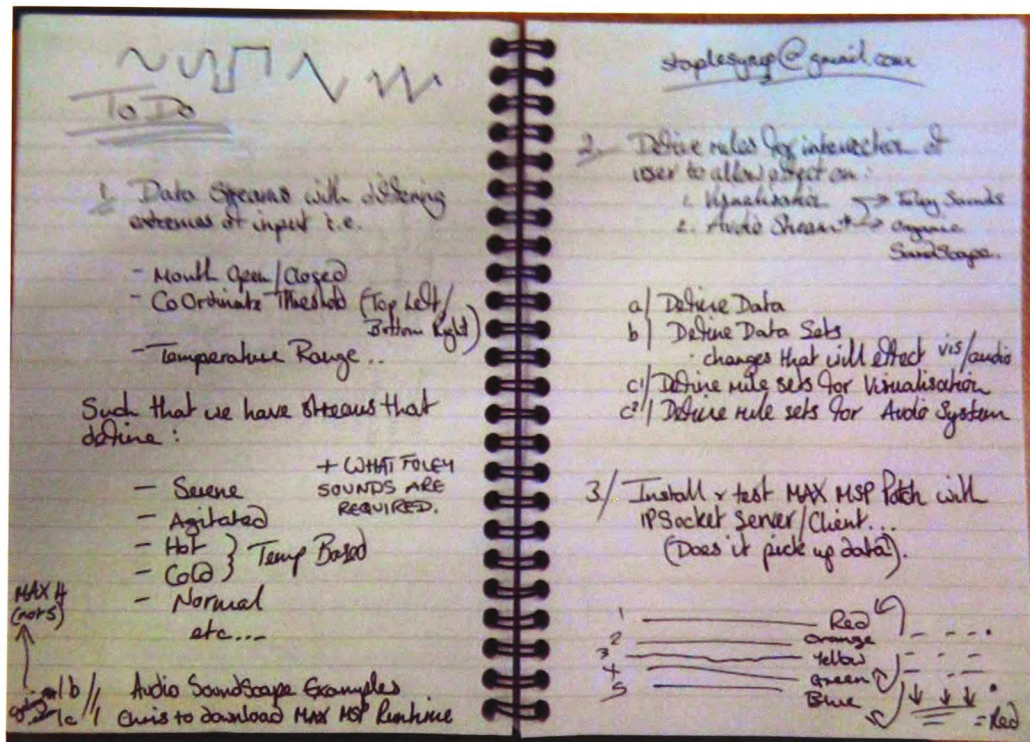


Figure 2 Brain Storm sketch created by Chris Ford during the development

## **II. Asset Control Variables for State Machine**

### **DISPLAY ITEMS**

#### **Background:**

- Colour
  - Alpha
- Display On/Off
  - Display State (Fade In, Fade Out, Normal)
- Rotation On/Off
  - Rotation Speed
  - Rotation Direction

#### **Kaleidoscopic Background:**

- Colour
  - Alpha
- Display On/Off
  - Display State (Fade In, Fade Out, Normal)
- Rotation On/Off
  - Rotation Speed
  - Rotation Direction

#### **Circles (01 – 03):**

- Colour
  - Alpha
- Display On/Off
  - Display State (Fade In, Fade Out, Normal)
- Rotation On/Off
  - Rotation Speed
  - Rotation Direction
- Scaling On/Off (for Circle03 only)
  - Scale Min (for Circle03 only)
  - Scale Max (for Circle03 only)
  - Scale Current (for Circle03 only)

**Particles:**

- Position (1, 2 or 3) (in mouseStruct)
- Speed (Random between Min and Max)
  - Speed Min
  - Speed Max

**Fractal Sets:**

- Size
- Colour
  - Alpha
- Display On/Off
  - Display State (Fade In, Fade Out, Normal)
- Rotation On/Off
  - Rotation Speed
  - Rotation Direction
- Scaling On/Off
  - Scale Min (for Set2 (Pulsing) only)
  - Scale Max (for Set2 (Pulsing) only)
  - Scale Current

**Lights:**

- Display On/Off

**SYSTEM ITEMS****System:**

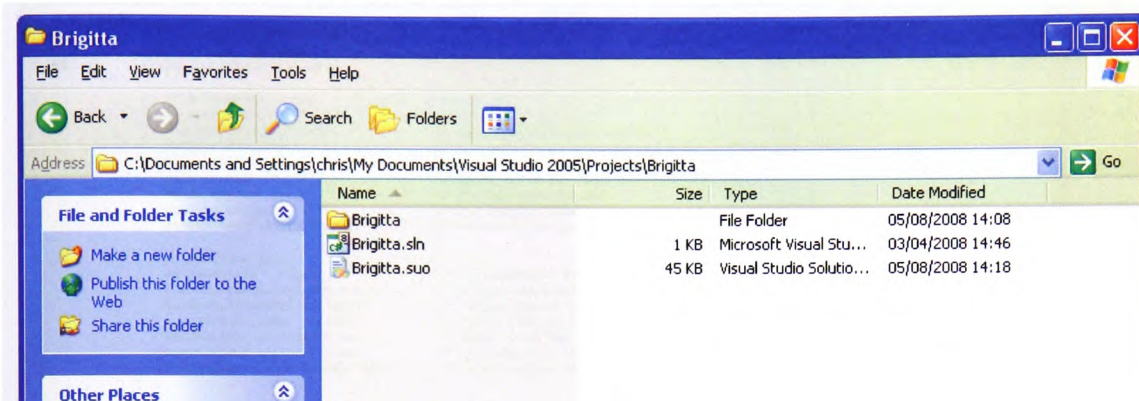
- System State (Idle, Running\*)
- Stage Timer (Clock)
- Current Stage (Chaotic, Equilibrium, Meditative) **\*While Running**



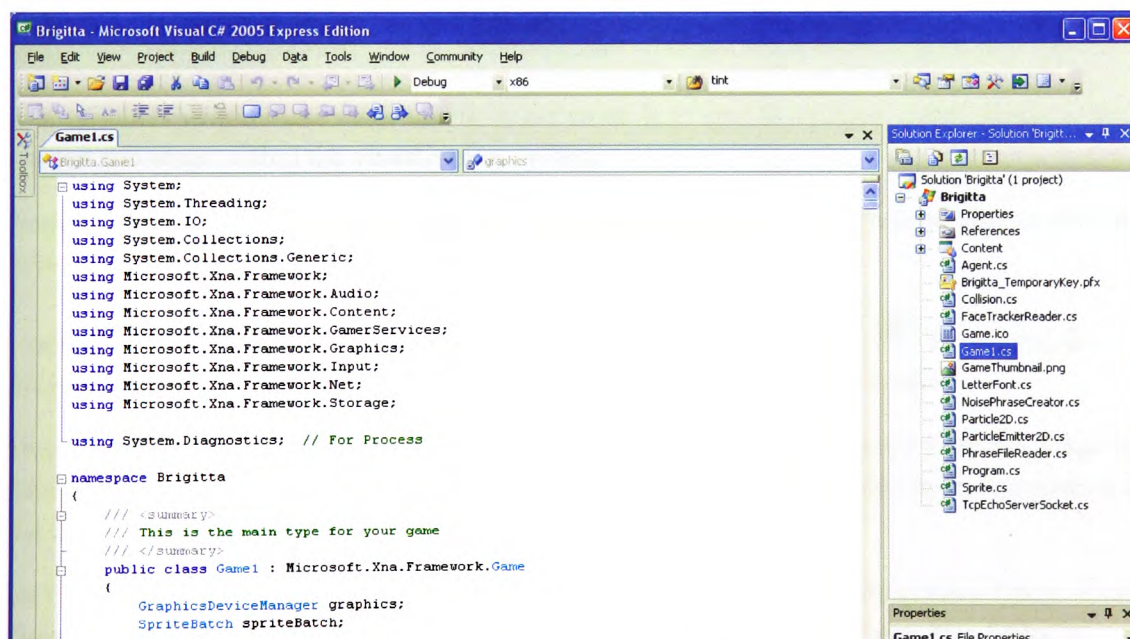
### III. Visualisation System – Stage Editing Instructions

To edit the Stage variables to change the asset details within each of the 9 sub-stages of the Visualisation System, you will first need to load the ‘Brigitta’ C# project code:

Open ‘File Explorer’ and move to the ‘Brigitta.sln’ file via the path – “My Documents/Visual Studio 2005/Projects/Brigitta”, then double click on the ‘Brigitta.sln’ file.

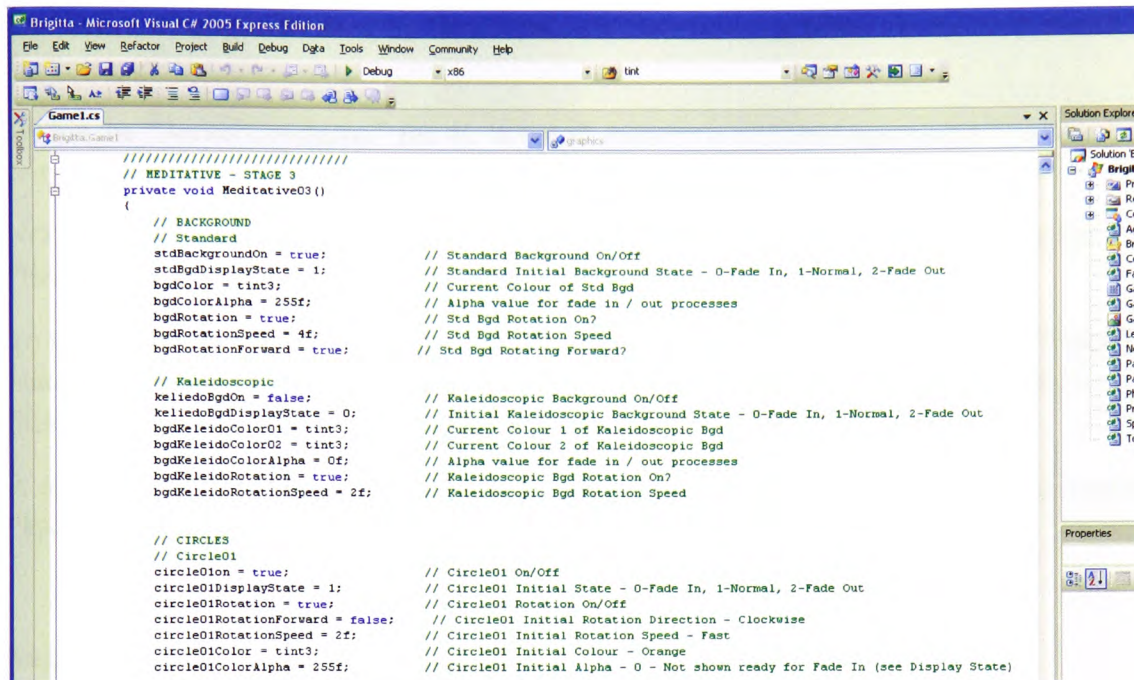


Visual Studio will now run and open with the ‘Brigitta’ project code.




If the “Game1.cs” file is not open, then double-click the “Game1.cs” file in the Solution Explorer window to the right of the screen. (File name is shown highlighted).

Scroll to the bottom of the 'Game1.cs' file to see all of the variables for stage editing, arranged in sub-stage order (i.e. Chaos01 to Meditative03). NOTE: The beginning of Meditative Stage – Sub-Stage 3 is displayed in the image below.



The variables within these stage functions are editable to enable changes in the display of the chosen sub-stage within the visualisation system.

Remarks have been placed next to each variable to explain the effect it has within the chosen sub-stage display.

Once all changes have been made, click on the “Start Debugging” icon  to re-build the project and run the new code to see / check the changes that have been made.

During system runtime, clicking on buttons 1, 2 and 3 will change the main Emotive Stage (i.e. Chaos, Equilibrium or Meditative respectively) that will be transitioned to upon completion of the current Emotive Stage (i.e. Sub-Stages 3 completed).

NOTE: Sub-Stages run from 1 to 3 (i.e. Chaos01 → Chaos02 → Chaos03) via a Timer which is currently set at 3000 frames for each sub-stage change, such that a new Emotive Stage is transitioned to (based upon that chosen via buttons 1 to 3) once the timer reaches a count of 9000.

## **Visualisation System – Data Inputs IP Address Setup**

Currently we are taking two inputs via a Multi Client IP Socket Server, these being Face Tracking and Thermal data feeds. The IP Addresses of each of these feeds needs to be edited in the “**ServerConfig.txt**” file of the Visualisation software to access this data from the correct feed computer.

Within the “**ServerConfig.txt**” file the initial IP Address is allocated against the Face Tracker camera input, and the second IP Address is allocated against the Thermal camera input.

NOTE: This functionality also needs to be performed on each of the Clients, such that their “**ServerConfig.txt**” file holds the IP Address of the Server.

To find the IP Address of any of the computers in the network, click the Windows “**START**” button and choose the “**Run**” command in the bottom right sector of the menu. Within the dialog box that appears, type “**ipconfig**” and then click the “**OK**” button.

A command window will appear giving details of the network details of the PC you are running “**ipconfig**” on, including its IP Address.

## **Visualisation System – Stage Phrases Setup**

Upon the user rolling over an invisible Hit Box within the Visualisation System, a phrase is graphically generated from the graphical “Particles” of the Vis Sys based upon the hit box affected and the main stage that the system is currently set within. There are three phrases held in each of three main stage phrase files, with three phrases held within each:

- “**ChaosPhrases.txt**” - Chaos Stage (3 phrases)
- “**EquilibriumPhrases.txt**” - Equilibrium Stage (3 phrases)
- “**MeditativePhrases.txt**” - Meditative Stage (3 phrases)

When editing these phrases bear in mind that they have sectors of the screen defined that they appear somewhere within, such that the first phrase starts somewhere within the left-hand  $\frac{1}{3}$  sector, the second somewhere in the middle  $\frac{1}{3}$  sector and the third phrase starts somewhere within the right-hand  $\frac{1}{3}$  sector. Thus, the first phrase can be the longest, but the third phrase should be very short, generally one word in length, such that the final phrase will be displayed on screen and not cut across the right hand screen edge.

NOTE: Any phrase should be no more than 30 characters long (excluding spaces) as this could crash the system if more than the 500 particles were required to create the phrase, or it’s noise based equivalents.



## Visualisation System – Cupola Matrix sub-stage display Setup

Near the top of the game1.cs file the following Cupola Matrix Display Variables will be found:

```
// CUPOLA VARS
.
.
.

byte[] cupolaChaosMatrix01 = new byte[30] { 0, 0, 1, 0, 0, 1,
                                             1, 0, 0, 1, 0, 0,
                                             0, 1, 0, 0, 1, 0,
                                             0, 0, 1, 0, 0, 1,
                                             1, 0, 0, 1, 0, 0 };

byte[] cupolaChaosMatrix02 = new byte[30] { 1, 0, 0, 1, 0, 0,
                                             0, 1, 0, 0, 1, 0,
                                             0, 0, 1, 0, 0, 1,
                                             1, 0, 0, 1, 0, 0,
                                             0, 1, 0, 0, 1, 0 };

byte[] cupolaChaosMatrix03 = new byte[30] { 0, 1, 0, 0, 1, 0,
                                             0, 0, 1, 0, 0, 1,
                                             1, 0, 0, 1, 0, 0,
                                             0, 1, 0, 0, 1, 0,
                                             0, 0, 1, 0, 0, 1 };

byte[] cupolaEquilibriumMatrix01 = new byte[30] { 0, 0, 0, 0, 0, 0,
                                                    0, 0, 1, 1, 0, 0,
                                                    0, 1, 0, 0, 1, 0,
                                                    0, 0, 1, 1, 0, 0,
                                                    0, 0, 0, 0, 0, 0 };

byte[] cupolaEquilibriumMatrix02 = new byte[30] { 0, 0, 1, 1, 0, 0,
                                                    0, 1, 0, 0, 1, 0,
                                                    1, 0, 0, 0, 0, 1,
                                                    0, 1, 0, 0, 1, 0,
                                                    0, 0, 1, 1, 0, 0 };

byte[] cupolaEquilibriumMatrix03 = new byte[30] { 0, 1, 1, 1, 1, 0,
                                                    1, 0, 0, 0, 0, 1,
                                                    1, 0, 1, 1, 0, 1,
                                                    1, 0, 0, 0, 0, 1,
                                                    0, 1, 1, 1, 1, 0 };

byte[] cupolaMeditativeMatrix01 = new byte[30] { 0, 0, 0, 0, 0, 0,
                                                    0, 1, 1, 1, 1, 0,
                                                    0, 1, 0, 0, 1, 0,
                                                    0, 1, 1, 1, 1, 0,
                                                    0, 0, 0, 0, 0, 0 };

byte[] cupolaMeditativeMatrix02 = new byte[30] { 0, 1, 1, 1, 1, 0,
                                                    0, 1, 0, 0, 1, 0,
                                                    0, 1, 0, 0, 1, 0,
                                                    0, 1, 0, 0, 1, 0,
                                                    0, 1, 1, 1, 1, 0 };

byte[] cupolaMeditativeMatrix03 = new byte[30] { 1, 1, 1, 1, 1, 1,
                                                    1, 0, 0, 0, 0, 1,
                                                    1, 0, 1, 1, 0, 1,
                                                    1, 0, 0, 0, 0, 1,
                                                    1, 1, 1, 1, 1, 1 };
```

As is shown, each of these defines a 3-frame loop to be displayed on the respective left and right 30-LED matrix on the Cupola.

Each byte matrix shows the LEDs that will be on (denoted by a '1') or off (denoted by a '0') for each of the 9 Visualisation sub-stages (i.e. Chaos 01 to 03, Equilibrium 01 to 03 and Meditative 01 to 03) as denoted within their variable names.

The speed of the matrix display update is controlled by the “cupolaAnimSpeed” variable which can be found at the bottom of the Game1.cs file at the head of each of the 9 sub stage functions (e.g. Chaos03()). Note that lower numbers speed up the animation as this value denotes the amount of timer clicks before the next frame of the matrix animation is displayed.

## DEBUG LIST

The following variables do not currently have any effect on the sub-stage display:

```
stdBgdDisplayState = 1;          // Standard Initial Background State - 0-Fade In, 1-Normal, 2-Fade Out
bgdColorAlpha = 255f;           // Alpha value for fade in / out processes
keliedoBgdDisplayState = 0;      // Initial Kaleidoscopic Background State - 0-Fade In, 1-Normal, 2-Fade Out
bgdKeleidoColorAlpha = 0f;       // Alpha value for fade in / out processes
bgdKeleidoRotationSpeed = 2f;    // Kaleidoscopic Bgd Rotation Speed
circle01DisplayState = 1;        // Circle01 Initial State - 0-Fade In, 1-Normal, 2-Fade Out
circle01RotationSpeed = 2f;      // Circle01 Initial Rotation Speed - Fast
circle01ColorAlpha = 255f;       // Circle01 Initial Alpha - 0 - Not shown ready for Fade In (see Display State)
circle02DisplayState = 0;        // Circle02 Initial State - 0-Fade In, 1-Normal, 2-Fade Out
circle01RotationSpeed = 2f;      // Circle02 Initial Rotation Speed - Fast
circle02ColorAlpha = 0f;         // Circle02 Initial Alpha - 0 - Not shown ready for Fade In (see Display State)
circle03DisplayState = 1;        // Circle03 Initial State - 0-Fade In, 1-Normal, 2-Fade Out
circle03RotationSpeed = 3f;      // Circle03 Initial Rotation Speed - Fast
circle03ColorAlpha = 255f;       // Circle03 Initial Alpha - 0 - Not shown ready for Fade In (see Display State)
fractalSet1DisplayState = 1;     // 0 = Fade In, 1 = Normal, 2 = Fade Out
fractalRotateSpeedSet1 = 2f;     // Rotation Speed Variable for Fractal Set 1
fractalSpeedSet1 = 3f;           // Initial Movement Speed for Fractal Set 1
fractalSet2DisplayState = 1;     // 0 = Fade In, 1 = Normal, 2 = Fade Out
fractalRotateSpeedSet2 = 2f;     // Rotation Speed Variable for Fractal Set 2
fractalSpeedSet2 = 3f;           // Initial Movement Speed for Fractal Set 2
fractalSet3DisplayState = 0;     // 0 = Fade In, 1 = Normal, 2 = Fade Out
fractalRotateSpeedSet3 = 2f;     // Rotation Speed Variable for Fractal Set 3
fractalSpeedSet3 = 3f;           // Initial Movement Speed for Fractal Set 3
```

#### IV. Visualisation System – Key Press Control List

Key	Effect
B	Set particles to outer position and change their texture to miceTexture4, Circle01 and 02 On
N	Set particles to middle position and change their texture to miceTexture, Circle02 On
M	Set particles to inner position and change their texture to miceTexture3, Circle01 On
C	Toggle Circle3 display on/off
V	Toggle FractalSet1 Collision System on/off
A	Set FractalSet1 Motion State to Circular Motion
Z	Set FractalSet1 Motion State to Shimmering
X	Set FractalSet1 Motion State to Position Swap
Q	Set FractalSet2 Motion State to Circular Motion
W	Set FractalSet2 Motion State to Shimmering
E	Set FractalSet3 Motion State to Circular Motion
R	Set FractalSet3 Motion State to Shimmering (Outer Position)
T	Set FractalSet3 Motion State to Shimmering (Inner Position)
Y	Toggle FractalSet1 Scaling on/off
U	Toggle FractalSet2 Scaling on/off
I	Toggle FractalSet3 Scaling on/off
J	Toggle FractalSet1 Rotation on/off
K	Toggle FractalSet2 Rotation on/off
L	Toggle FractalSet3 Rotation on/off
O	Toggle Kaleidoscopic Background on/off
P	Toggle Comet Particles on/off
A,D W,S	Comet Particle direction control (DEPRECATED)
A	ALL LIGHTS On/Off (includes Triangular Lights as Standard)
S	Circle02 Lights On/Off (if ALL LIGHTS On)
D	Clock Lights On/Off (if ALL LIGHTS On)
F	Toggle FractalSet1 on/off
G	Toggle FractalSet2 on/off
H	Toggle FractalSet3 on/off
l	Toggle Circle03 Scaling on/off
1/2/3	Change Main Stage (i.e. Chaos, Equilibrium, Meditative)

## Appendix 2.5

### Brain Storm Images for the system of Mind Cupola

Created with the contribution of Dr. Phil Culverhouse

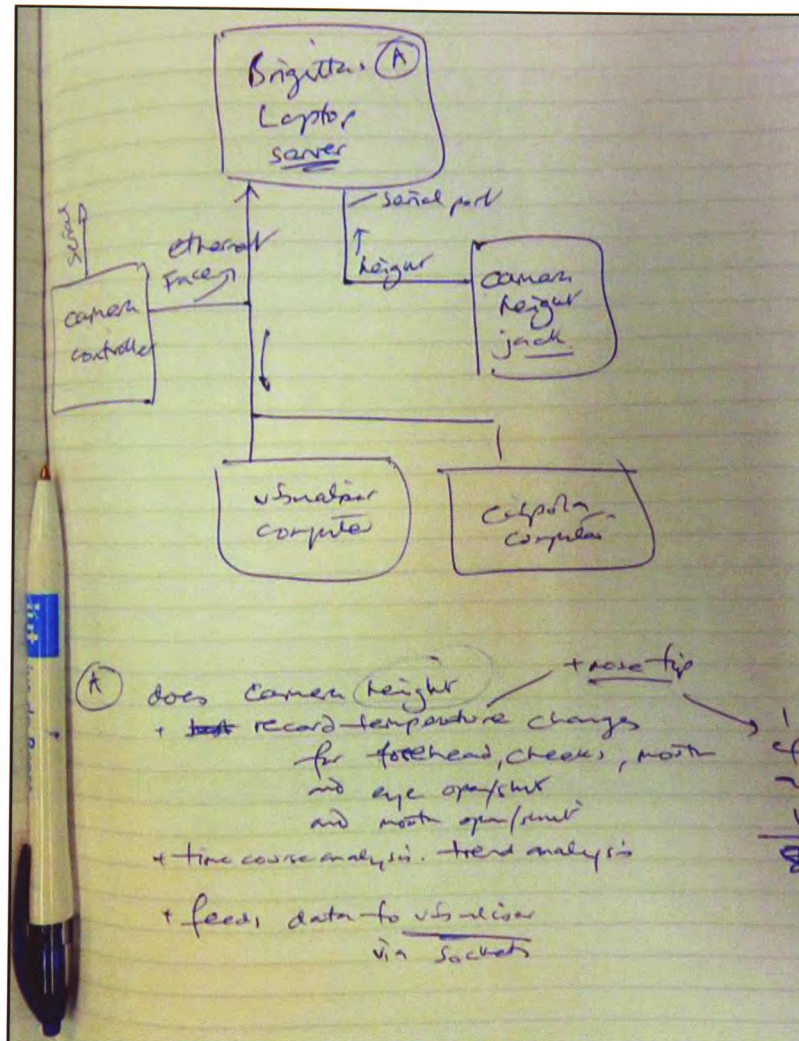


Figure 1 System plan of the 'Mind Cupola'

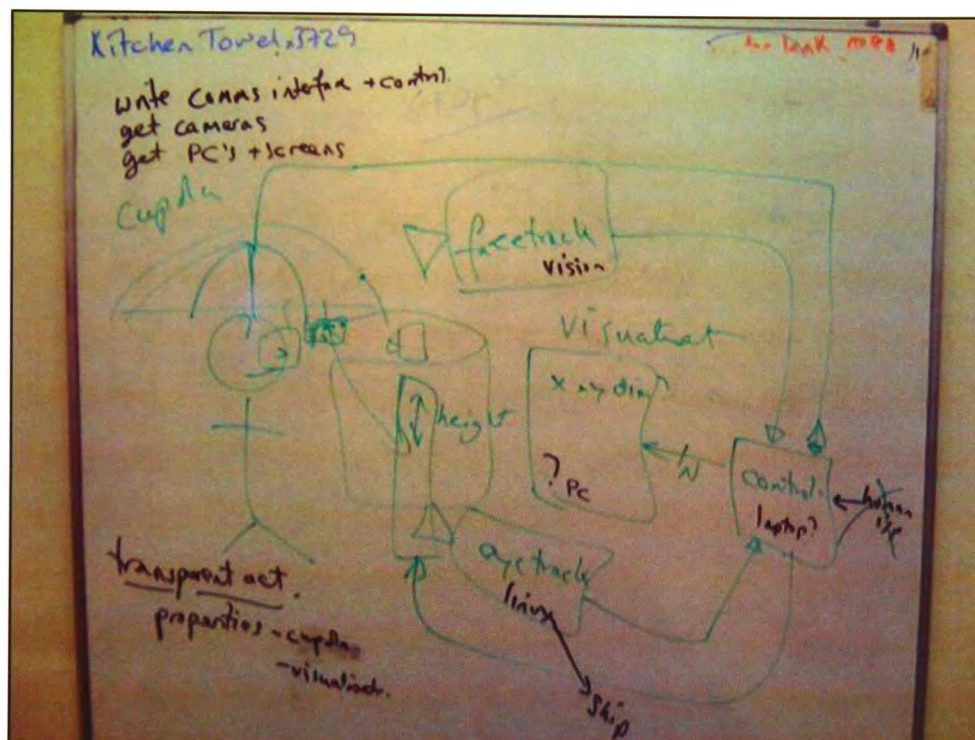


Figure 2 Draft of the 'Mind Cupola' system



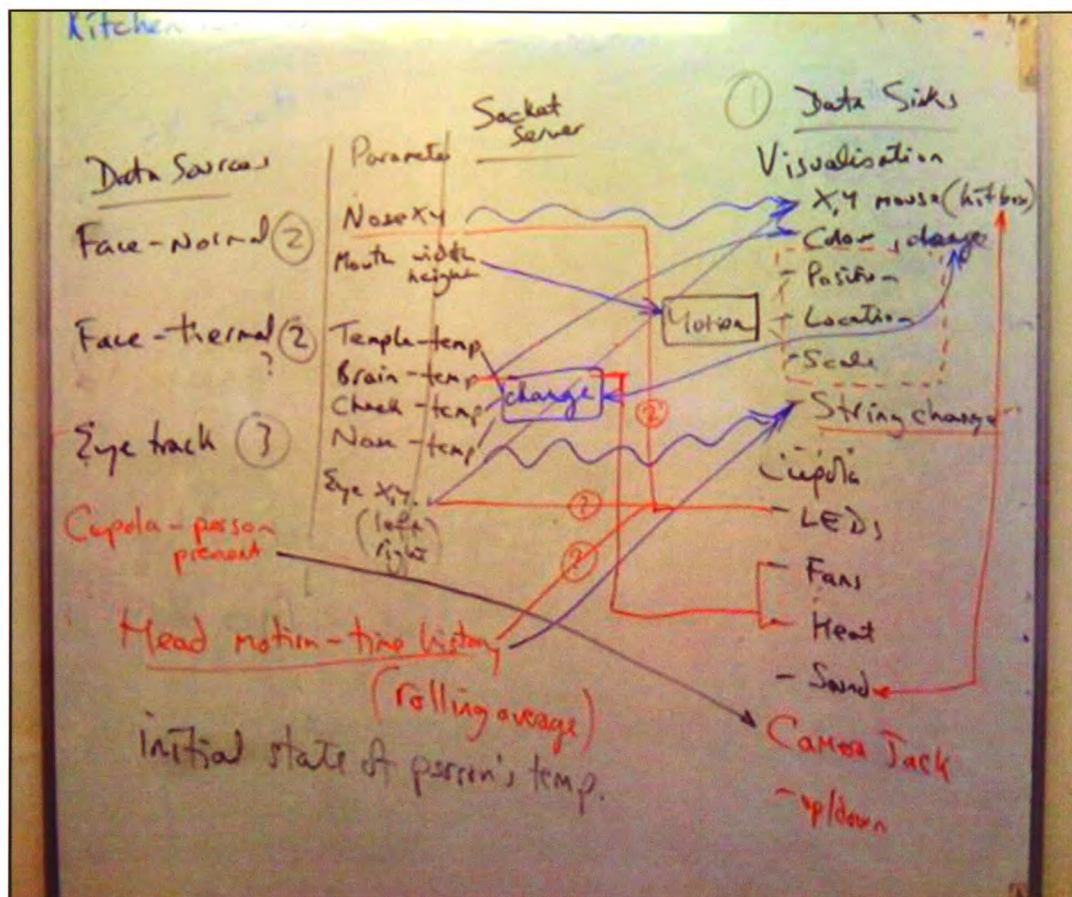


Figure 3 Defining input and output data in the 'Mind Cupola' system

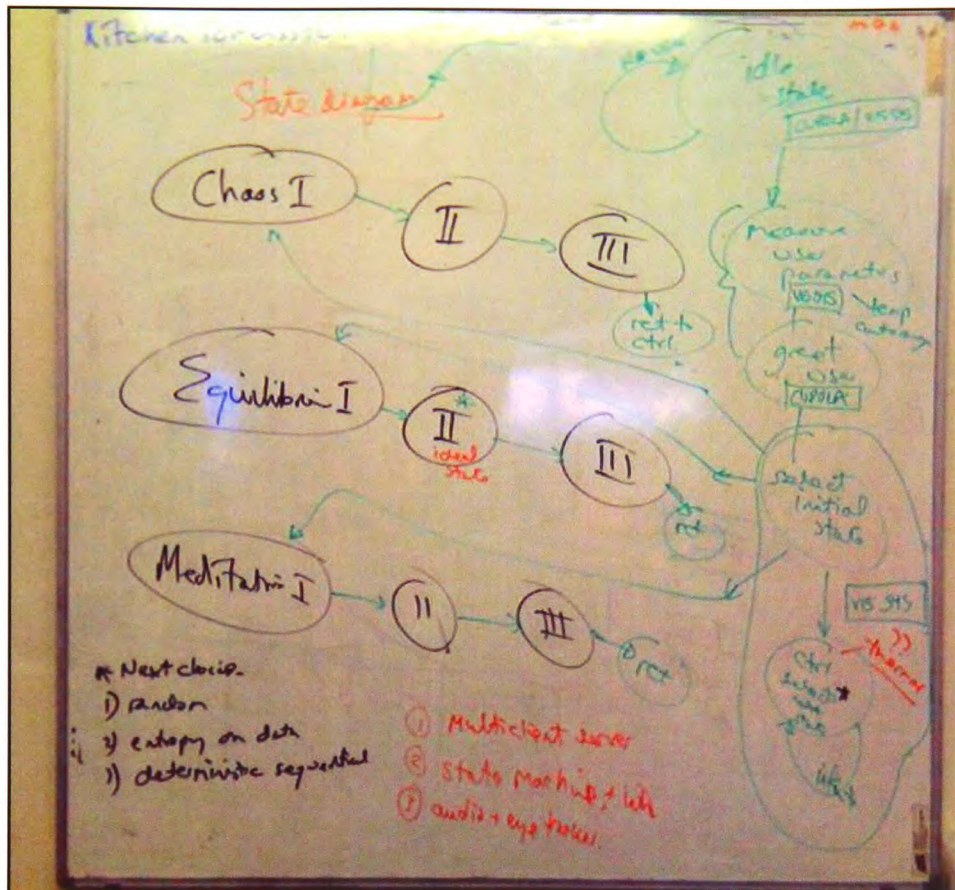


Figure 4 Structure of visualisation: The stages of visual representation







Figure 6 Cost and time plan management of the 'Mind Cupola'

## Appendix 2.6

Pictures form the Thermal Imaging Data Base collected for the training of face analysis software

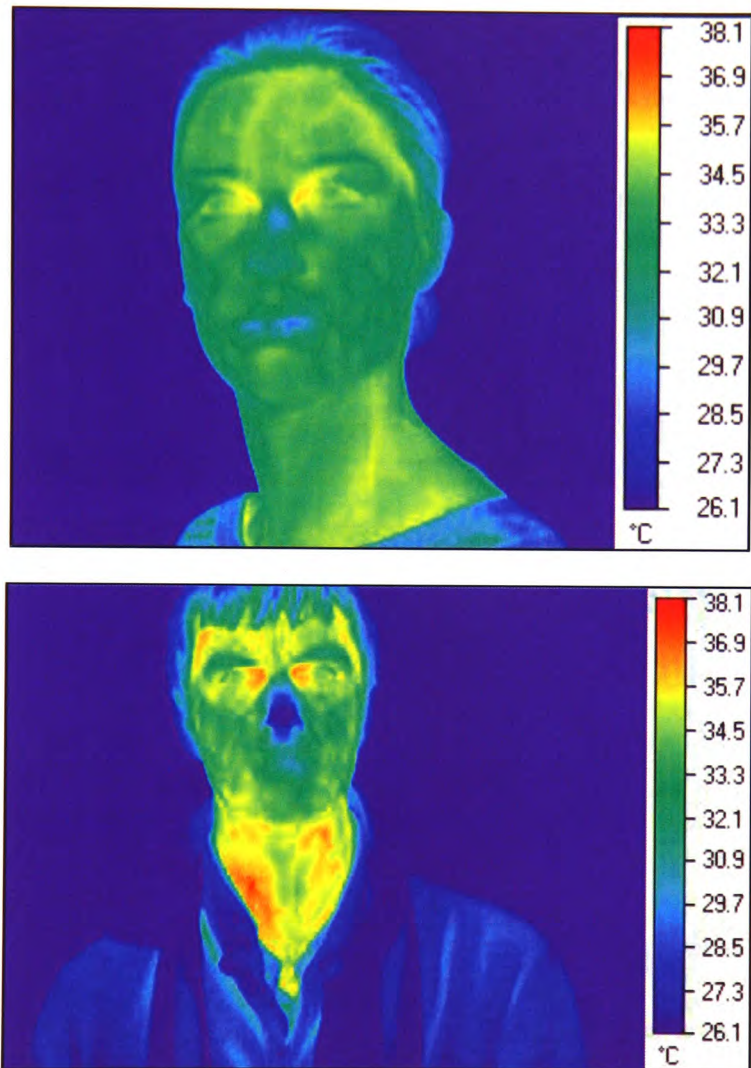


Figure 1 and 2 Thermal images with 'Rainbow' calibration  
with the temperature scale



Figure 3 and 4 Thermal images with another colour calibration

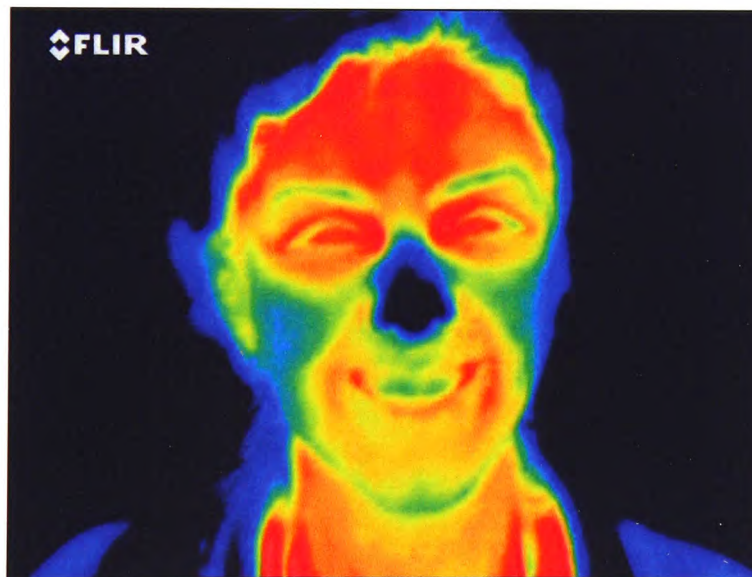
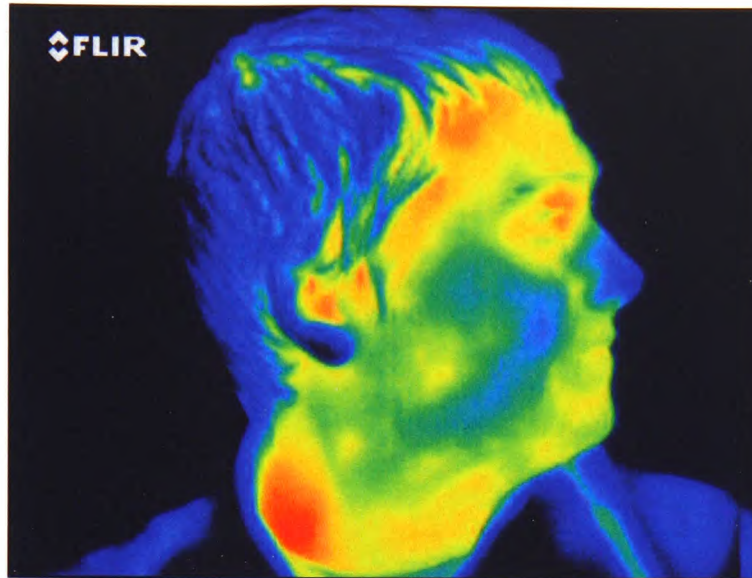


Figure 5 and 6 *Thermal images with 'Rainbow' calibration*



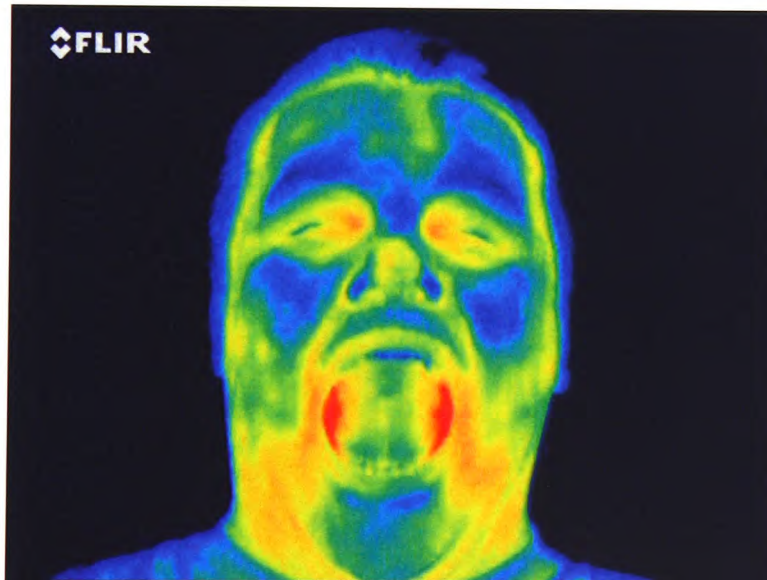
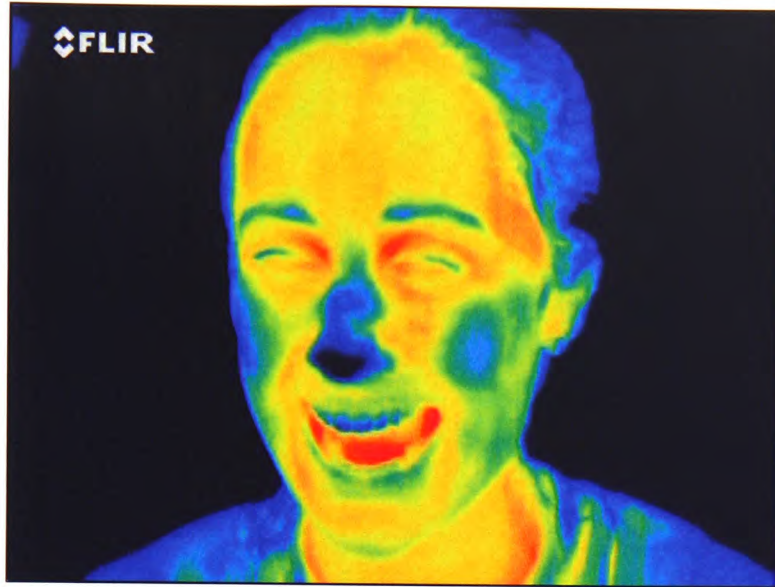


Figure 7 and 8 Thermal images with 'Rainbow' calibration

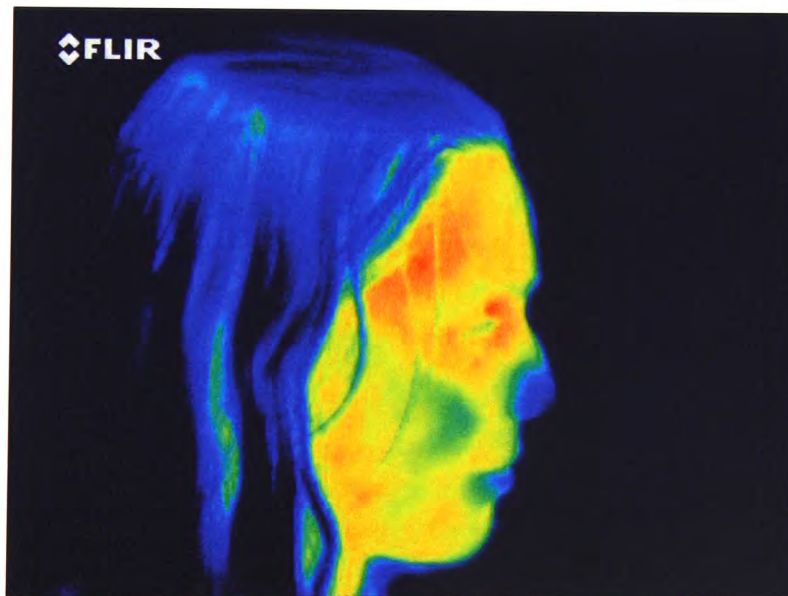
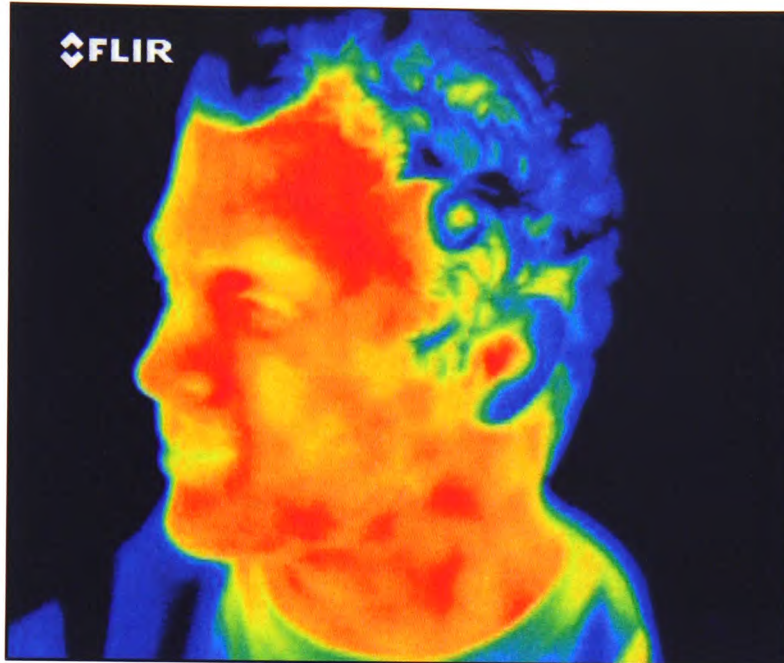


Figure 9 and 10 *Thermal images with 'Rainbow' calibration*

## Appendix 3.1

**Research paper presented at the conference:**

**Consciousness Reframed, New Realities: Being Syncretic,**  
The Planetary Collegium's IX<sup>th</sup> International Research Conference,  
University of Applied Arts, Vienna  
Publication by Springer Vienna in January 2009

### **The Mind Cupola: towards a consciousness altering device**

An immaterial model for interactive technology-based art production

By Brigitta Zics

This paper introduces a novel scheme of active spectatorship which suggests a cognitive-driven interaction. It proposes that although this new form is increasing in contemporary interactive art production it has not drawn attention to its potential as a new form of aesthetics. As such, the discussion provides an account for this interdisciplinary practical application of technology and suggests that an immaterial application of interactivity might revolutionise the previous modalities of interactive art. Exemplifying this, the paper introduces the unique interface "Mind Cupola" (2008), which is an affective artistic system with the aim of producing a new knowledge within the spectator's consciousness. Through this example it proposes that this cognition based approach might generate a more effective modality for human-machine interaction within a new aesthetics.

A cognitive-driven application of interaction will be understood here as a conception for technology-based art production which draws particular attention to the cognitive modalities of the spectator's perceptual processes. In order to comprehend this potential for interactive media art, this paper suggests investigating the notion of active spectatorship, which in the literature has been considered as the main objective for aesthetics of interactive art. An active spectatorship in this paper's context means not only an interaction on a mental level between artwork and spectator, as suggested by Umberto Eco's "openness"<sup>102</sup> (1989 [1968]) but also a participation in which both the spectator and the artwork reciprocally effect each other in the creative processes. These structural changes in the artwork, according to the activity of the spectator, produce meaning through interconnectivity between the states of the artwork and the reactively changed mental activity of the spectator.

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<sup>102</sup> Umberto Eco's well-known work "*Opera Operta*" (*Open Work*, 1989 [1962]) introduced the concept of "openness" to suggest that artworks produce an aesthetic through "meaning creation". Eco proposed that artists should work along a multiple semiotic creation process which generates an openness; thus every spectator creates his/her own subjective meaning.

Applying a cognitive-based approach in the art production means that the artist works towards an intimacy of this artwork and spectator interconnectivity. This suggests that the artist applies technology in a cognitive action/reaction capacity; thus s/he anticipates an affection of technology in the spectator's experience. Through this approach, the technology-based art is not based on the production of an object of physical qualities but on the design of the spectator's subjective experience. The paper's investigation terms this as an immaterial creation process, because it replaces a material-oriented art production, which took an interest in the physical qualities of an artwork rather than in its impact in cognitive processes. A potential for immateriality occurs through a dematerialisation process that technology brings to art. El Lissitzky, later Lippard & Chandler (1968) and recently Jacob Lillemose (2006) illuminate this notion as essential for developing a new art aesthetic and instead of object production. Lippard & Chandler announced that the object became obsolete therefore artistic meaning emerges through non-physical processes of the concept. Lillemose applied this on technology-based art and argued that immateriality is a powerful application for a critical conceptualisation of technology; therefore artworks that apply technology should formulate an appeal against sheer attractions of emerging technologies. He sees that the spectator's "continuous abstract actualisations" of this approach produce the immaterial dimension of the artwork. Although Lillemose provides a sophisticated encounter of dematerialisation as he links the notion to perceptual processes, in a similar manner to Eco's openness (mentioned earlier), he ignores a cognitive evaluation of the processes and its impact on the spectator's experience. From this perspective, the paper argues that earlier approaches stayed within a materialistic encounter of art. This materialistic encounter claimed immaterial qualities only through an intellectual satisfaction of critical socio-economic messages, ignoring cognition-based evaluation of artistic meaning creation. The view taken here instead negates the idea that an immaterial aesthetics is only based on conceptual manifestation, and instead proposes the approach of "technology-based meaning creation"<sup>103</sup>, which is produced by technologies potential of cognitive affection contributing to artistic meaning.

To establish an immaterial aesthetic of technology-based art, this paper suggests an application of the contemporary psychological account of flow theory. The notion of flow<sup>104</sup> (1975) applied by Mihaly Csikszentmihalyi concerns a phenomenological investigation of

<sup>103</sup> A "technology-based meaning creation" in this discussion means an "openness" which is not only produced by the content, as traditional artworks suggest, but also through the artistic design of the technology or interface. The paper proposes that in technology-based artworks not only the content, but also the medium (artistic interface) contributes to the meaning creation; therefore the spectator's experience design provides a balance between the processes of "mastering the interface" and acquiring the content.

<sup>104</sup> The flow theory was introduced in 1975 in Csikszentmihalyi's book *"Beyond boredom and anxiety"* which suggested that artists in their creative processes, gain optimal mental states associated with a total submersion in the artwork. He further states that during this euphoric state the artistic activity transforms into unconscious events with a strong emotional fusion between the artwork and the artist, producing a new spectrum of cognition. Csikszentmihalyi (2002 [1992] p.40) terms his concept as "flow" because many of the subjects he observed described the creative process as: "It was like floating" or "I was carried on by the flow".



human experience, suggesting an optimal state of consciousness when one's intention matches the produced outcome. The flow-like capacity of immateriality is not a new approach. There are accounts of this, such as those by Jean-François Lyotard's (1996 [1985]), the philosopher and initiator of "Les Immatériaux"<sup>105</sup>, or David Moos's "cybernetic circuit" (2002 [1995], p. 44). Lyotard's approach proposes a flow-like phenomenon as a new dynamic material for art production which is more adaptive to processes of communication. The other account by Moos describes the phenomenon as a direct feedback loop between human perception and information-flow in virtual reality. Csikszentmihalyi most crucially suggests that flow is created through one's intention but that there are states when the cognitive flow overtakes the control and produces new knowledge; he terms this as "ecstasy".

This paper proposes that the previously established artwork and spectator interconnectivity can be understood as an optimal state of cognition which is a substance of consciousness and through a meaning creation produces new knowledge. In this sense, the process of interaction is a chain of cognitive events, which through the spectator's cognitive interaction might achieve a novel state of cognition producing what could be called "creative ecstasy"<sup>106</sup>. This might happen when the artist applies the technology effectively and produces a balance between the creative processes of "mastering the interface" (acquiring functional knowledge) and "artistic content seeking" (acquiring artistic knowledge). Thus, a "creative ecstasy" means a fully immersive state, when technology produces an optimal human-machine interaction fulfilling the spectator's intentions. A new experimental knowledge or "ecstasy" can be understood in this way as the immaterial dimension of the interactive media artwork. Technology brought a potential to art which, together with the cognitive meaning creation, enables to produce this immaterial touch. This identifies a dematerialisation process as not only a responsive mental process but also as a technological affection through the particular meaning creation which impacts on cognitive properties that consequently produce new knowledge.

Since flow provides a phenomenological application - suggesting a modality of fused body and mind states – this paper proposes to investigate the aesthetic experience from the body-mind perspective, suggesting that this might provide a meaningful application for technology-based experiences. A body-mind interconnection here is understood as an examination of how bodily states might trigger a spectrum of states of consciousness through the interaction processes. This can be achieved by applying a cognition-based terminology of "body awareness"

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<sup>105</sup> "Les Immatériaux" was an emblematic exhibition in Pompidou Centre in Paris in 1985. Jean-François Lyotard, the writer of the famous *"La Condition Postmoderne"* (1979), in which he claimed the end of the Cartesian approach to human existence, in the exhibition produced a statement claiming an immaterial condition (new materials) by technologically-mediated processes in which art rather than physical qualities is an interactive process (not necessarily technological) between subjects.

<sup>106</sup> "Creative ecstasy" is a term used by the author which is developed in her recently finished thesis. It refers to a heightened quality of flow in the aesthetic experience when the user is fully immersed in the interaction processes of the artwork. In this case the flow controls the artistic events. The thesis introduces the notion of "transparent act" which suggests an immaterial model for interactive technology-based art production.

which refers to a particular state of representation of the body in the mind. The notion of body awareness helps to implement modalities of interaction in art (i.e. technological interface-spectator interconnection) which constitutes an aesthetic tool for experience design. Applying body awareness means that the artist works with the creative potential of body states, resulting in a spectrum of different modalities of body awareness. Through this, a matrix of interaction modalities can be established. These characterize the spectator's body involvement, according to a variety of proactive engagements with the interface, defined as two main kinds of modalities: "passive" and "active". It follows that an artistic choice of active or passive modalities means a selection of characteristics of triggered body awareness.

An "active interaction" refers to a bodily controlled interface (for example motion tracking) which produces the artistic meaning. This means that the artist applies body awareness, in response to bodily states as a tool of navigation. This type of interaction is special since the movement of the body is already an embodied knowledge of the users. However, there is often an artistic novelty, a semiotic system of control in interactive artworks which has to be learned; therefore the body involvement here is supreme. The "mastering the tool" process in this paper is a learning process of the symbolic interpretation of the bodily movement. This symbolic interpretation triggers a spectrum of events revealing the content through a meaning creation. The flow experience in this process establishes a balance between the innovation of the artistic interface and the quality of uncovering the artistic content; thus particular body awareness reveals particular artistic meaning. An example of "active interaction" is one of the previous works of the author in which an aesthetic experience was produced through a symbolic interconnectivity between bodily states and dynamic visual formulations. Although a spatial navigation of the user is common in virtual reality systems, Mirror\_SPACE attempted to create an experience where the unique aesthetics and its efficient source of representation (face and dynamic data analysis) produced a novel knowledge in the participator's consciousness.

Whereas in Mirror\_SPACE this novelty was focused on an active immersive involvement of the user through a bodily action that produced an interaction, the modality of "passive interaction" is a more unique form of active spectatorship as an interaction built upon cognitive responses of the user. The body involvement is very low since the spectator effects the system through representational states of cognition (for example emotion) and not through a motor driven involvement of the body. Although it might seem similar to a cinematic spectatorship, the difference is that the user still has an intentional decision expressed through a spectrum of cognitive-based, reduced bodily response which is captured by the system. Thus, body awareness is produced through much more introverted actions, whereby the functional bodily actions are reduced in order to produce inwardness through technological triggers. In this sense, technology is applied to measure the spectator's bio-data (blood pressure, emotional analysis, EEG, galvanic response, physiognomic analysis, behaviour analysis) in order to produce a response based on the cognitive evaluation of the feedback-loops.

This paper proposes that although a passive bodily involvement of the spectator – which means a heightened cognitive evaluation – has been much more frequently considered in recent contemporary artworks than earlier, it has not been acknowledged as a potential model for a cognitive-based aesthetics. Therefore it is proposed - following an exploration of both modalities of interaction – that a passive interaction might produce a more effective way of human-machine interaction, since it models a cognitive interaction of the spectator. It applies technologies for a cognitive-based affection and evaluation; thus, an artistic interface to set up a feedback loop which is based on the spectator's response, triggered and measured (“affective computing”<sup>107</sup>) by technology. This suggests that a more effective interaction might occur by a “cognitive feedback loop” which builds upon a system of technological feedbacks. The system operates by a dynamic action-reaction mechanism built upon the spectator's cognitive evaluation of changes over time. In this respect, a flow experience is created when the spectator recognizes and lives certain rules of interaction and also causes outcomes which match his/her intention. This paper suggests that such a system operating with simple processes might create complex phenomena over time, most crucially represented in the spectator's consciousness as the immaterial dimension of the artwork.

Through this, the paper introduces an interactive artwork by the author which is based upon this passive modality of interaction, entitled “Mind Cupola”. The aim of this bio-feedback device is to produce the flow experience of the spectator for a potential of creative ecstasy. Modelling new means of interaction, this device aims to generate a cognitive feedback loop in the spectator's experience. Its aim is to apply special technologies which on the one side are unique in the affection of human perception; on the other side are effective in capturing behavioural changes in the human condition. Thus the applied technologies are divided into two sources: on one side those which affect human cognition and on the other side those which monitor and analyse reflections of human cognition. The project is so far focused on the characteristics of the human head and face, because they display the changes in human cognition through affections most explicitly. This investigation implements “affective technologies” which produce changes in the consciousness not only through perception but also by means of physiological-mechanical affections. Through this, devices called “frequency generators” have been designed, which produce a pattern of affections based on scientific and non-scientific conceptions of consciousness alteration. The aim of this interface is to instantly drive the spectator's perception towards a flow experience. When entering the aesthetically engaging cupola interface, the user's mind is surrounded with a special system which recognizes the user's presence. It affects him/her with various electromagnetic visible and invisible wave functions: binaural sound (1), LED lights (2), thermo stream (3), air stream (4), and vibration (5). To close up the technological system, the Mind Cupola captures this dynamic and feeds this information back to the “frequency generators” which consequently generate a creative flow. The system

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<sup>107</sup> “Affective computing” attempts to capture and process cognitive phenomena, more particularly emotional states of humans (Rosalind W. Picard, 1997).

further applies efficient face analysis software which captures behavioural and emotional changes in the spectator. It deploys an application of hybrid facial analysis which at once analyses physiological changes as well as thermo-graphic (temperature) changes of the face. Whilst in *Mirror\_SPACE* the person's face was analyzed for an emotional characteristic, the *Mind Cupola*'s software recognizes features of the face and measures particular changes over time. It captures visible and invisible responses of the spectator which are evaluated according to cognitive states and fed back to the system. The data of face analysis, besides sending data to "frequency generators", also impacts on the visualisation based on fractal-like structures which produce a kaleidoscopic effect. This application derives from the cognitively affective quality of the unique visual language explored in *Mirror\_SPACE*, and has been developed further in *Mind Cupola* for cognitive-based interactivity. Thus, the system continuously recreates itself according to the users' cognitive reactions and intentional actions which might lead the spectator towards a consciousness-altering experience. A passive modality of interaction in *Mind Cupola* is achieved through a dynamic application of technology-based feedback systems which produce a cognitive loop in the spectator's subjective experience. This is the immaterial dimension of *Mind Cupola* which constitutes anew aesthetic.

As a consequence, it can be concluded that an immaterial, aesthetic model of interaction means not only a critical conceptualisation of technology which might produce mental responses in the spectator – as it has been suggested in earlier modalities of immateriality – but also requires a new strategy which applies cognition-based approaches in order to design the spectator's experience with a potential to a novel knowledge in consciousness. *Mind Cupola* illustrates this model as it builds a dynamic artistic system which, through an intimate interconnection of artwork and spectator, produces "spiritual-like"<sup>108</sup> phenomena.

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<sup>108</sup> Similar to the earlier term of "creative ecstasy", the notion of "spiritual-like" phenomena is developed in the author's recently finished thesis about an immaterial aesthetics for interactive technology-based art production. It refers to the ecstatic state of consciousness. This claim is based on Csikszentmihalyi's flow theory, who argues that spiritual experiences are one of the enigmatic flow activities. As such the paper suggests the similarity of characteristics between subjective experiences in interactive technologies and spiritual practices implementing stimulating technologies. In this respect it is suggested that "creative ecstasies" as well as "spiritual ecstasies" produce a flow experience built upon the earlier mentioned body-mind interconnectivity. Therefore both concepts of ecstasy describe similar methodologies in consciousness alteration. This is in this sense that this paper claims that aesthetic experiences might produce spiritual-like experiences.

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## Appendix 3.2

### **Interview with Brigitta Zics published by AXISWEB, The Online Resource for Contemporary Art**

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### **Brigitta Zics: Out of Body Control**

Interview by Julia Peck

Brigitta Zics discusses the development of a series of virtual reality projects with artist and writer Julia Peck. Zics reflects upon the different approaches she took and outcomes generated within her 'Mirror\_SPACE' and 'Out of Body Control' projects, comparing the experience of working with programmers to develop custom-made software with the opportunity to transpose pre-existing high specification software.

Brigitta Zics, new media artist, discusses two recent projects and the collaborative process that facilitated their production with her colleague from University of Wales Newport, Julia Peck. Zics was born in Hungary and has studied in Germany at the Academy of Media Arts Cologne and Britain. Zics practice concentrates on virtual reality systems and responsive interfaces to provide an immersive and interactive environment for gallery and other audiences. Zics is currently a PhD candidate, researching interface development and real-time visualisation in creative artworks for which 'Out of Body Control' will be the final major work. Zics and Peck met in their course of undertaking their research projects and have used the interview to extend their discussions on Zics' creative output and her theoretical models.

**Julia Peck:** Brigitta, we're going to talk about two recent projects, 'Mirror\_SPACE' (2004-2005) and 'Out of Body Control'(2004-2006) and the collaborative and conceptual processes that you go through to create these two pieces of art. I'd like to start with 'Mirror\_SPACE', as you initiated the project and then located programmers who could help you realise the end artwork. Did you find that the way you thought about the project was quite different to the programmers?

**Brigitta Zics:** Actually to be honest, this was the first time I had this kind of artistic idea and I wasn't really sure which form of creative process I would choose or who I was going to work with. I wasn't sure how many programmers I would need or do I just do the concept for myself. For me, this project started a new form of creating. Before I was working by myself rarely using external help. During the project I realised the whole idea was really complex, therefore I decided to use people who have specialist knowledge. So as part of the process I was asking

people to help me, and when I got these people, then we worked together and they provided ideas for the project but I had a very strong vision of how it should look, so I tried to implement the knowledge and I tried to lead them to this. But it is also important to say that these people were students not professionals, so I had to deal with problems such as they didn't have enough time etc. It also depended on the money because I just had a small budget for the project but I wanted to realise quite a complex thing. This was a new form of project management, a new way of expression. At the same time I have to admit that some of the naivety or freshness disappeared from the artwork.

**JP:** Apart from the difficulties of working through the practicalities, did the programmers affect the concept and the way it was visualised?

**BZ:** Actually I had a really strong idea of how it should look, so they, kind of, just gave me an idea of what the technology can achieve. I tried to work out for myself how I could implement this - my artistic vision. How can I say - OK, this is the right artistic tool (technology) to work with and it is worth developing further for my project? I just remember I was working with the programmer (Jerome Thoma) who was doing the visualisation for me, this was a really organic collaboration because we used to meet every two-three days and he was always showing me what he had achieved. And I can remember when I saw the first draft of the work or the first object we developed, I just thought - oh this is really not what I wanted, you know, the aesthetic and everything can't be realised through the computer, it's just, for me it's not enough. I used to work with drawing, or I was realising my ideas myself, but working with another person, it's just, kind of, difficult. Because the programmers have their own language and they cannot always understand what I want, and the other side is also the technological limitations. But then really through this process and with time, we just worked in symbiotic ways, so we could really understand each other, with time, we really developed a very strong aesthetic for the 'Mirror\_SPACE' visualisation. After that I was really happy about the working process. But the programmer doesn't give me the aesthetic idea, he just shows me what he can do and then I decide on which way we go. But there's a lot of limitation of course, so there is a big gap between what I imagine and what is realised. Generally, I understand that the programmer is also a tool and to find the right access to him is just the same as handling software professionally.



Brigitta Zics  
Mirror\_Space, 2004-2005

Mirror\_SPACE Interactive installation, depicting the visual appearance of the mirror objects. The aesthetic qualities of the objects combine a microcosmic vision of networked existence with a reduced visual component (virus/nano vision). All visitors have one of these shadow objects, which they can control with their movements.

**JP:** But the project was visually successful.

**BZ:** Yes, it was. For me the visual is a very sensitive and sensual form of expression, every little detail is important. As in a spoken language a comma can change the meaning, in the visual language very fine differences can compact the outcome or disturb the aesthetic. So it's actually really important to have this very strong visual effect. Because it's a, kind of, a traditional way to understanding art as a visual thing, but also I wanted this object or this visualisation to get some, kind of, attributes, or some kind of, technological achievement that you cannot get from just a picture. This object has attributes contributed via the computer, new aesthetics and also...

**JP:** Its own nature?

**BZ:** Yes, its own nature, and kind of, artificial attributes. So, the spectator is not only touched by the visual experience but there is a computer generated life represented, in very simple form.

**JP:** Did it have a behavioural pattern?

**BZ:** Yes, exactly. If you just see on the wall this picture, you know, you don't have this living atmosphere; this is what time-based work can give you, interaction with this object. The movement belongs to the aesthetic of the picture. Without it the visuality is lacking. The best way to see this is if we look at the still pictures of the visualisation. Even if the aesthetic has some interesting effect the main attribute is missing, the image is not completed. So it cannot work as a still picture itself.





Brigitta Zics  
Mirror\_Space, 2004-2005

Mirror\_SPACE, interactive installation. This shows the real-time scanning apparatus of the MIRROR\_SPACE project; the visitor is scanned by light and the facial features of the user are analyzed.

**JP:** OK. Once the programmers came onboard with you, did they see the project right through to the very end? I'm asking this as you see the projects as being finished only once the users are interacting with it and you get something out of seeing the way people respond to and interact with the actual thing that you've made. Do the programmers go that far, are they interested in that end response?

**BZ:** Yes, in 'Mirror\_SPACE' actually these people were also my friends, so it was a kind of useful relationship. They also came with me to the exhibitions, and I can remember at almost every exhibition they were there so they could see what's going on. And even after exhibitions we sat down and discussed new ideas and technical needs and based on this we made some new developments. Most of the time the artist creates the interaction design without any real response from the user. He or she can never know how exactly the user will react. Thus, the artist has to see the feedback of the users in a live situation and also try different people and different kinds of situations. And after that you can choose to be more successful with the artistic vision and or program further.

**JP:** So they were interested in user interaction, it was really beneficial for them to also see that stage of the project?

**BZ:** Yes, of course, these people were really freelance so they were interested to do something else... something special and creative to see what else technology can provide.

**JP:** OK, so let's talk about your latest project, 'Out of Body Control'. I get the impression that you've adopted a different working method, locating programmers and other developers of

technology who are already working on projects and asking them to contribute to your larger overall design. In what way has this changed your working method? Do the programmers and designers have a great degree of input into your project?

**BZ:** Yes, they have, because of the 'Mirror\_SPACE' experience, when I didn't work with professionals. Now I try to get some very serious technology, like software developed for professional needs. I try to really achieve the artistic quality or the artistic notion on the same level as the technology. Because with 'Mirror\_SPACE', I had a really strong concept and a really strong vision but I just had the feeling that the technology hadn't achieved what I really wanted, it wasn't always verified data or it didn't always provided the quality I wanted. In the new project the technology I'm using has been developed for many years, and this is what I will use. Of course the other side of this is I cannot contribute so much to the technological development because it's already there, I can just somehow change it for myself so it's not that flexible, my artistic vision has to be mapped on to this technology so I'm not developing my own. I wouldn't say this is a better way to work, this is just a different way and probably it's going to be another kind of outcome. I think the main emphasis lies on the balance between artistic concept and technological developments.

**JP:** So in 'Mirror\_SPACE' the concept of the artwork was partly developed through the kinds of teams that you're using in order to realise that artwork. In 'Out of Body Control' instead of having a clearer idea at the outset of what it was that you wanted to achieve, you're using more of what's around you and cherry picking it and then designing a project to go with that.

**BZ:** Yes, yes, it's true, yes. These people actually, who I work with, in Hungary, Germany, Plymouth and also Manchester, they're really interested to work with me because they want to see what can be developed from this kind of technology, how can they achieve some other kind of outcomes, like creative outcomes, how it works - technology with creativity together.

**JP:** OK. Shall we talk a bit about the other people involved in 'Out of Body Control' and what their roles are within the project, because it's a massive team actually, isn't it, altogether? Shall we start with David Christinacce, he's at the University of Manchester, isn't he, so what's he doing?

**BZ:** Actually when I was starting to think about the project, I always knew I wanted to work with face analysis because I already used this kind of technology in 'Mirror\_SPACE' but I wanted to have more serious software for this, and I started looking for people who were dealing with this very seriously. So I found him in a research group in Manchester and I think I went to visit him in 2005, and they were dealing with a lot of things based on face analysis and face detection. So he presented me with the software that they developed for Toyota, and I asked him whether I could maybe use this for my artistic project. And he was really, really useful, of course

I had to sign a contract, you know, but still he was really useful and we developed this software for my project... this software was developed for a normal camera and in 'Out of Body Control' we're going to use thermal imaging, so this software was developed for this special equipment.

**JP:** Oh, brilliant. OK, what about Andor Gaudia?

**BZ:** He is in Hungary, he's a PhD student, and we actually just finished this interface, we developed a very functional interface, not really a creative interface but we really needed something very user-friendly so the user doesn't have to do anything, you know, in terms of to wear something or to move something, you just have to move in some particular place in the room. And we developed an interface camera-mover to find the face of the user.

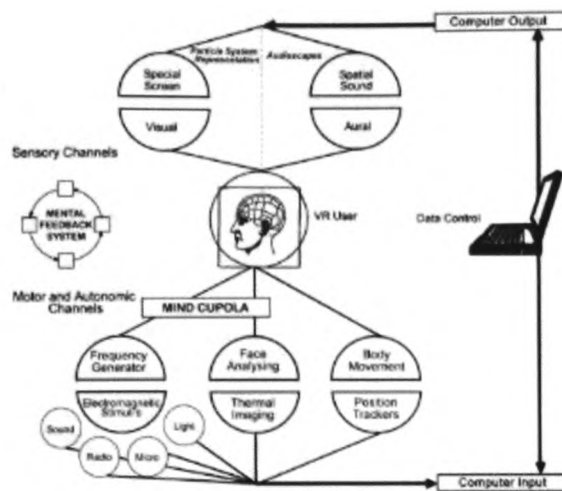
**JP:** And Doctor Barna Takacs' virtual human interface group.

**BZ:** Yes, he's based in Hungary. I'm going to develop the visualisation of the project with him; it's actually my favourite part of it.

**JP:** I guess one of the things that's becoming clearer, listening to you talking about the different relationships that you have with the people that you're working with, is how much input you have into what they're developing, in the sense that they're actually developing things very specifically in relation to your project and what you want to achieve visually and creatively with this project.

**BZ:** Yes, but to be honest I really have to always also push them, because programmers like to just reduce everything, so the artist's task is always push them to try to develop something new.

**JP:** In 'Out of Body Control', you've set up a feedback loop that actually continuously feeds information from the face to stimulate the brain. So why don't you talk a little bit about inside and outside and how that conceptually underpins what you're doing?



Brigitta Zics  
Out of Body Control, 2004-2007  
(work in progress)  
Virtual Reality System.

**BZ:** Yes, actually this is really the main point of what I'm doing actually, because inside and outside is the general concept of artistic understanding. Artists are there to express their own sensitive internal world for the outside world so that others also get something from their special view. The artist is a medium, through his or her expression opens a new world for us with a totally new translation of our world. Because you have to externalise somehow that people, other people can contribute to your ideas. But if you try to externalise your ideas, there is always some kind of loss in the process because your whole idea in your brain or the whole complexity, cannot be externalised fully. So this process, this is actually the task of the artist, to just reduce the loss of information, the complexity of what is inside or better, find the right artistic tools and medium for that particular artistic notion. So, the externalisation, we can say, is a way of putting artistic vision into the reality. The task of the artist is to make sure that his or her vision is represented in the artwork.

**JP:** Let's have a look at the importance of what you termed the 'transparent act' and the 'invisible tool'. Maybe we should start with Italo Calvino, because part of this comes from Italo Calvino's concept of the degree of openness, doesn't it?

**BZ:** The concept of openness, actually in my case relates to this concept for interactive artworks, how the interactive work works. So the openness of the work is also this kind of balance, the artist puts something into the artwork, to realise something and presents the idea to the viewer, also as Umberto Eco described, something that isn't finished yet, that's going to be finished through the user. So the user, with his or her interaction and with his or her contribution, finishes the work... this is actually the degree of openness, how much the artist allows the user to contribute to this work and how the far interactivity serves the expression of artistic notions.

**JP:** So how does the invisible tool enable this degree of openness?

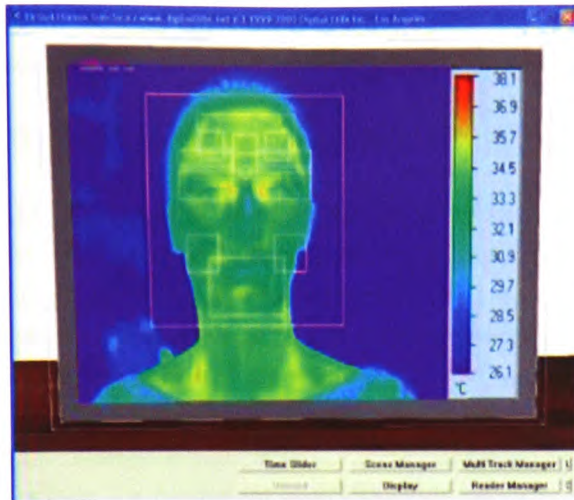
**BZ:** The invisible tool actually is also a very complex term, but generally invisible tools describe something that the artist implements in these artworks to get the users in the right position to interact. The invisible tool is something we can imagine as an interface, and the interface design is the task of the artist, it should be something that doesn't cause any disturbance for the user. So the technology, it should be somehow invisible, it shouldn't disturb the whole interaction - a user-friendly environment. But it doesn't mean the technology is not representable, it's just somehow the user can deal with what is represented.

**JP:** So this all intersects with your idea of the transparent act, can you tell us a bit about the transparent act?

**BZ:** The transparent act is a key term of my research, based on the concept of externalisation. The transparent act actually describes a two-way process. Both processes we can call creative processes, one is when the artist creates his or her work, the other when the viewer experiences the artist's creation. In the first process - the creative act - the artist develops the idea of what the artwork-user interaction should look like. Every other creative process is based on this interactive design. The second creative process is when the artistic notion becomes truth and the work is activated by the user. At this moment the artistic vision is tested by the interaction. In this test the two creative processes are mapped onto each other. This is a feedback circle when the artist through the user interaction sees a general response to his or her creation. The transparent act is a complex term which includes the different attributes of the artistic work. These attributes are degrees of openness, the invisible tool, the map of creative processes all generate the transparency of the work. The transparency informs how these attributes work together and how they achieve their quality. The main aim is the balance between technology and artistic notion, that the technology as tool or medium doesn't disturb the creative flow. Transparent act is the new form of artistic expression in which the generated experience stands in the focus.

**JP:** Shall we talk a little bit more about the thermal face imaging you're doing and physiognomy. On your website you deliberately reference physiognomy as a nineteenth century phenomenon, and it seems that you're being quite witty about this reference, that you're drawing a link to it, but you're also at the same time saying that your thermal face imaging is not the same as physiognomy.





Brigitta Zics  
Out of Body Control, 2004-2007  
(work in progress)

Out of Body Control uses special technological implementation. The colour map of the face is based on thermal imaging application.

**BZ:** Yes, well I was thinking about how really could we analyse faces and what kind of concept we could use to detect information from the face. One of the possibilities was physiognomy, which is a pseudoscience from the Nineteenth Century, so it just described the shape of the head and what kind of personality is represented. But then I didn't go into this because my interest was more about the process, what kind of emotional changes occurred, what kind of consciousness changes were going on in the user. So I chose this kind of thermal imaging used for medical purpose - somehow this technology makes invisible things (such as conscious thoughts) visible, and I was hoping to get some really special data from the face because this provides a temperature map of the face and every person has a really different map. Generally we analyse the map of each of the users and also the changes of the temperature. This is one part of the software the other part is as we already mentioned, the high-end software to pick up the emotional states of the user. At the end of the day we have a complex software which includes our own development, scientific software and professional software parts. This is our own constructed software package for our own special artistic use.

**JP:** I was also really entertained by the idea of the mind cupola. You included an image of the doctor from *Back to the Future* where he puts this contraption on his head and he's trying to conduct an experiment through this contraption. And in a sense your mind cupola is similar to that, which is why you put that photograph on your website. Do you want to talk about the ideas that you're playing with?

**BZ:** Yes, the mind cupola is a kind of 'pseudo machine', a creative interface. The idea was to affect the user mechanically and I wanted to develop something which also has symbolic meaning. The cupola somehow gives a placebo effect. I mean, if the spectator enters into its space, the cupola produces a mysterious effect on the user which not describable. On the other hand the cupola contains specially developed 'smart machines', little machines which physically

(with mechanical power) influences the spectators. The idea was to develop a mechanical construction where the user is physically affected.

**JP:** So it's greater than the actual effect scientifically produced?

**BZ:** Yes, maybe. We just tried to develop some kind of environment for the user where they can feel psychologically that something is provided, which then creates an artistic vision. To be honest probably a lot of scientists, even my programmers were sometimes really sceptical because they don't understand why I need this. But another point of view is to view the world via an artistic notion. This world is not just scientific or just proved knowledge; it is a 'collage' of the artist's world, which includes every sort of information and expression. In new media artworks this 'collage' is represented through scientific mediums such as computers, but this is just the surface, the content is multidimensional.



Brigitta Zics  
Out of Body Control (mind cupola), 2004-2007  
(work in progress)

The creative interface of the 'Out of Body Control' project.  
The spectator directed devices generate mental transformations in the user.

**JP:** OK, finally I think in reading the users' responses you could create a database which actually creates knowledge about the emotional state of each user. Are you creating some kind of taxonomy of the users or a record of the users?

**BZ:** Yes, the idea was always to collect from the different people the different data records or better to trace the interaction because every user's visualisation, every reaction and experience is very different. We can say every user experience is special and typical just for a certain place at a certain time. It would be really interesting to collect this just to see the transformation in the spectator's behavioural patterns. I'm really interested in what the user really experiences, what you really cannot see. The aim is actually to put the user in some situation that he could never be

in and to give him some really new kind of experience where we also can play with the different levels of consciousness. It's kind of like leading the user through his or her inside and letting him or her jump between the stairs of consciousness and maybe create new stairs through the artistic experience. This internal process is what you never can really record because it's somehow inside, not outside. It's very focused on the user having this kind of really special experience in this environment.

**JP:** I guess in a sense the visualisation is the 'Out of Body Control'; it's the moment where all the information and the input to the subject becomes externally visualised, and yet the amount of control that the subject has or the user has of that is actually quite limited.

**BZ:** Yes, this is true, because, I have to say I am always very excited to work on it, the visualisation is what is really my main interest, because somehow the visualisations still have this kind of traditional idea of the art what everyone can 'read', it's there, it's a visual thing, a visual language and this is just the long tradition of art. The other important attribute of these visualisations is the time-based process, in which the user has to go through a particular chain of actions. This means that the spectator is included in the live artwork. This new form of expression provides some similarities to the old traditional painters, and the experience they provided through perspective; this new kind of technological development enables us to picture the inside. So this kind of time-based idea is also the new technique of visual arts which revolutionises the form of experiencing and artist's expression.

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