Using the layers of presence as a framework for artistic practice in fulldome space.

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ABSTRACT

This paper adopts an ecological approach to presence theory derived from J.J. Gibson’s ecological psychology to consider the ways in which the layers of presence can be used as a framework for creating artistic content for fulldome spaces. By considering presence as a process of ecological exchange and a natural embodied response to environmental stimuli, this paper moves beyond mainstream definitions of presence. Drawing on examples of recent fulldome films produced by the RCA Fulldome Research Group, this paper offers examples of how the concepts of proto, core and extended presence can be employed to create rich, evocative and engaging immersive experiences in fulldome space.

INTRODUCTION

Presence is central to the fulldome experience, it affords a suspension of disbelief and enables the viewer an expanded worldview. When imbued with presence, fulldome transcends the technical structures of the dome theatre and offers a rich perceptual experience which engages the body as the primary frame of reference and has the capacity to move and inspire an audience through evocative multi-sensory communication.

Presence has been described as ‘a holy grail for immersive experience designers’ (McConville, 2016) but this elusive, multifaceted concept defies a singular definition and its meaning and interpretation varies widely across disciplines. In this paper, I offer a definition of presence which derives from J.J. Gibson’s ecological psychology. Moving beyond mainstream approaches to presence theory, this ecological perspective considers presence as process of exchange and a natural embodied response to environmental stimuli (Ijsselsteijn & Riva, 2003). From this position, I consider the ways in which the layers of presence defined by psychologists Riva and Waterworth (2015) can be used as a framework for designing artistic content for fulldome space. Whilst existing research into presence favours measuring user experience through retrospective surveys and questionnaires, this paper proposes an alternate approach, which uses the layers of presence as the foundation of the creative design process.

Riva and Waterworth’s (2015) ecological presence model, with its three incremental layers; core, proto and extended presence, provides valuable insight into the perceptual process of presence and offers a structure in which the psychological factors influencing presence can be considered as a starting point for designing fulldome content. The layers of presence, when mapped to three of the primary spaces of the fulldome experience: the dome theatre, the fulldome content and the viewer’s perceptual experience, can be considered as incremental design stages that are mediated to progressively lead the viewer to the focused attentiveness required for maximum levels of presence.

Recent fulldome films produced by the RCA Fulldome Research Group will be reviewed to provide insights into how proto, core and extended presence can be successfully employed and integrated in designing content for fulldome spaces.

I. AN ECOLOGICAL APPROACH TO PRESENCE THEORY

1.1 Moving Beyond Telepresence

Presence has been described as ‘a holy grail for immersive experience designers’ (McConville, 2016) and cultivating a sense of presence is the primary goal for artists and designers working in fulldome space. Presence is multifaceted concept which defies a singular definition or unifying theory. This is due, in part, to the term being used in different ways across disciplines (Waterworth et al. 2015) but the prevailing perspective, within the context of immersive media, considers presence as a by-
product of technological mediation. This reflects the dominance of a rationalist orientation within the field (Zahorik & Jenison, 1998) that has its origins in the philosophy of Descartes and views the phenomenal and physical aspects of experience as separate domains (Zahorik and Jenison, 1998).

In this context, presence is defined as a ‘perceptual illusion that a mediated experience is not mediated’ (Held & Durlach, 1992; Steuer, 1992; McMahon, 2003) or put more simply it is the ‘perceptual illusion of non-mediation’ (Lombard & Ditton, 1997). This illusion is derived from the integration of the ‘technical, physiological, and psychological mechanisms’ of image production methods (Grau, 2003) that ensure the viewer’s attention and perceptual experience is dominated by the mediated world over the physical environment (Steuer, 1992; Murray, 1997). This notion of presence is derived from the term ‘telepresence’ coined by Marvin Minsky in his 1980 manifesto which sought ‘that sense of ‘being there’’ when coupling artificial devices with human sensory mechanisms (Minsky 1980). Minsky’s approach has been adopted by the International Society for Presence Research (ISPR) as the foundation of their own definitions which are categorised as first and second order presence. ‘First order’ presence describes the human experience of the physical world as mediated by the senses and complex perceptual processes that provide a subjective sensation of being present in an environment (ISPR, 2016). Whereas ‘second order’ presence occurs when a technologically mediated experience is perceived as if the technology were not involved (ISPR, 2016). Second order presence can be seen as a psychological state which occurs when technological mediation forces a viewer ‘perceive two separate environments simultaneously: the physical environment in which one is actually present, and the environment presented via the medium’ (Steuer, 1992).

1.2 Toward an Ecological Definition of Presence

In contrast to the rationalist orientation adopted by the ISPR, an alternate approach to presence theory has emerged in parallel and is based on the ecological psychology of J.J. Gibson (Zahoric & Jenison, 1998; Waterworth et al., 2015; Giannachi et al., 2012).

James J. Gibson’s ecological paradigm defines an approach to visual perception which culminated in his 1979 book ‘The Ecological Approach to Visual Perception’. Gibson broke with mainstream psychological thinking, rejecting dualism in any form and emphatically declaring that mind, matter, body and the awareness of ‘one’s complementary relations to the world are not separable’ (Gibson, 1979). Gibson dismissed the idea of the mind as a separate organ, which operated upon bodily sense data and argued that perception is not the achievement of a mind in a body, but of the organism as a whole in its environment (Ingold, 2000).

Adopting Gibson’s ecological perspective, psychologists Pavel Zahorik and Rick L. Jenison (1998) view the mind, body, and environment as entwined in a dynamic, direct, continuous inseparable interaction. From this ecological position, presence is considered a natural embodied response to environmental stimuli, which is equally mediated ‘by both physical (our body, technological devices, etc.) and conceptual tools which belong to a given culture’ (Ijsselteijn & Riva, 2003). In this sense, presence is not limited to a technical ‘illusion of non-mediation’ (Lombard & Ditton, 1997), instead it can be defined as an encompassing ‘ecological process that marks a moment of awareness of the exchanges between the subject and the living environment of which they are part’ (Giannachi et al. 2012). Psychologists Giuseppe Riva and John A. Waterworth, take this definition further by identifying three layers within the process of presence.

1.3 The Layers of Presence

Riva and Waterworth define presence through an incremental three-layer structure consisting of proto presence, core presence and extended presence (2015). This structure reflects established psychological models of development of the self and the first of these layers ‘proto presence’ can be seen as ‘the fact of existing or being present’ (Oxford Dictionary, 2016). It is a largely non-conscious process which considers the physical self as separate from the non-self (Waterworth et al., 2015). ‘Core presence’ moves to a conscious real-time process which can be understood as the relationship of the self to the present world (Riva et al., 2015). This layer equates to the levels of presence experienced in the ‘perceptual illusion of non-mediation’ or telepresence. The third layer, ‘extended presence’ is a conscious understanding of the self as an integral part of present external world, in which experiences are verified in relation to their value and significance for the observer. (Waterworth et al., 2015). Extended presence reflects the interconnected relationality of Gibson’s ecological paradigm.

Riva and Waterworth (2015) propose that maximum presence occurs when these three layers are integrated and suggest that it is possible to train the tendency for increased levels of presence through appropriate design. When the layers of presence coalesce within effectively designed virtual spaces they have ‘the capacity to evoke powerful emotional experiences’ (Waterworth et al., 2015).

II. THE LAYERS OF PRESENCE IN FULLDOME SPACE

II.1 The Primary Spaces of Fulldome

In order to mediate a rich, evocative and engaging immersive experience which cultivates maximum presence, proto, core and extended presence must coalesce. In fulldome space these three layers can be seen to correspond to three of the four primary
spaces which underpin the fulldome experience. These four primary spaces are defined as the dome theatre, the media content, the perceptual space of the viewer and the emergent infinite space of the fulldome experience (French & Spanou, 2016).

II.2 Mapping the Layers of Presence into Fulldome Space
Proto presence can be seen to map to the structure of the dome theatre and relates to the quality of the experience within the physical space of the dome. Design at the level of proto presence includes elements such as seating, projection brightness, contrast, resolution, alignment and audio quality. To achieve a sense of presence at this level the physical and technical aspects of the fulldome experience must integrate seamlessly.

As the viewer becomes orientated within dome theatre and their sense of being immersed in the space increases, core presence is initiated. At this stage, design elements such as lighting, dark adaption strategies and pre-show content (audio and video) can be used to transition the viewer’s perceptual attention from the physical experience of the dome toward the media content. This transition is critical as it the point at which the viewer shifts from an exocentric to an egocentric spatial strategy. The viewer’s body becomes the frame of reference, in contrast to exocentric strategies based on external structures in the environment (Schnall et al. 2012). This is a fundamental factor which differentiates the fulldome experience from other media environments. Fulldome space is not a picture we observe remotely through a rectilinear frame, it is an encompassing embodied spherical experience. In this sense, fulldome space reflects Gibson’s worldview, placing the body at the centre of ‘an environment that surrounds one, that is everywhere equally clear, that is in-the-round, and that is all-of-a-piece’ (Gibson, 1979). Designing for core presence in the egocentric spatial strategy of fulldome space requires a unique approach to visual composition, editing and sound design. The set of design principles for visual storytelling in fulldome outlined in NSC Creative’s Domography (Bradbury, 2016) provide an effective framework to ensure the viewer’s gaze is led towards the key elements of the narrative (ibid.). For core presence to be fully experienced it is critical that the viewer’s attention be continually directed toward the media content such that the ‘perceptual illusion of non-mediation’ (Lombard & Ditton, 1997) is able to occur.

When the viewer’s sensory perception, spatial strategies and locus of attention are fully engaged in the immersive media content, the final layer of extended presence becomes possible. The framelessness and expanded field of view when combined with spatial mapping intensify cognitive experiences in fulldome space (Schnall et al. 2012). This expanded perceptual experience serves as a trigger for extended presence. As the physical structure of the dome appears to fall away the viewer perceives themselves as an integral and interconnected part of the world presented within the fulldome media. Perceptually, this is equivalent to a natural embodied response to the environmental stimuli but in this case, presence occurs in response to the immersive mediated world. Research suggests that extended presence is more likely to happen when the narrative content affords the viewer personal significance or value (Riva et al, 2015).

III. THE LAYERS OF PRESENCE AS THE FOUNDATION OF FULLDOME DESIGN

III.1 The Challenge of Designing for Extended Presence
Designing for extended presence in fulldome space is a challenging proposition, as it is highly subjective and relies upon proto and core presence as pre-cursors to the experience. However, this challenge forms one of the research themes adopted by the RCA Fulldome Research Group (FDRG) in their investigation of the creative and artistic possibilities of fulldome space. The following review of selected recent films by the FDRG offers insights into some of the ways the layers of presence can be used to design fulldome content that invites extended presence. This discussion will focus on extended presence as it assumes prior understanding of design strategies used to elicit presence at the proto and core levels.

III.2 The Space Between Image and Sound
In addressing this design challenge, it is useful to consider specific aspects of the fulldome experience. Within conventional planetarium shows and in science communication more broadly sound is often used as a way to explain the images on screen and provide factual information for the viewer. Whilst this approach is very successful in an educational context, it can limit sensory engagement for the fulldome viewer, as often they are told what and how to think about the content they see. Two recent FDRG films use sound in another way to invite a more active participation with the viewer in order to move from core toward extended presence. In Michaela French’s film ‘The Light of Home’ (2016) (see Figure 1), sound and image explore the theme of the experience of light, but one does not try to illustrate the other. Rather, the two elements work independently of one another and are merged only in the viewer’s perceptual experience. In this way, the viewer enters into an exchange with the mediated content and becomes aware of themselves as an active participant in this environment. The multi-layered audio track is designed as 5.1 surround sound and the use of spatial sound brings the content into play with the viewer’s egocentric spatial strategies by locating layers and moments of sound at specific points across the dome environment. In this way, the emphasis and interpretation of the film becomes a personal experience for each viewer that reflects a real world ecological engagement.
III.3 Seeing the Process of Seeing

Emily Briselden-Waters employs sound and image as separate elements in her film ‘Circus of Anxiety’ (2016) (see Figure 2) to build a sense of tension in the work. The film also adopts an additional multi-sensory strategy to bring the viewer into a direct relationship with the film. ‘Circus of Anxiety’ aims to communicate the experience of anxiety to the viewer through strongly contrasted black and white images and abrupt edits. At times, this technique leaves an afterimage burnt onto the viewer’s retina, ensuring a direct physical interaction with the film which combines with a moment of awareness of the viewer’s own process of visual perception. Again, this approach moves beyond core presence and the ‘illusion of non-mediation’ to invite the viewer into an experience of extended presence through an awareness of an exchange in their own process of seeing.

III.4 Movement, Space and Distance

As previously discussed, successfully leading the viewer’s gaze is a critical aspect of fulldome design (Bradbury, 2016). Two films by Kelly Spanou, achieve this by using movement and spatial design to fully engage the viewer in the mediated world of the fulldome content. In the films ‘Apeiron’ (2015) and ‘Sonar’ (2016) (see Figure 3), Spanou creates expanded space and
depth by distorting and stretching structured layers in multiple directions. As selected layers draw downward, they anchor the viewer’s body to the ground, whilst other layers simultaneously lift upward into an imagined celestial sphere. This stretching and expanding of space secures the viewer’s locus of attention and successfully leads them to perceive not only the mediated world in the projection but worlds beyond worlds that extend from their own body outward to the infinite. Once again, this awareness of the exchanges between the viewer and the environment enable the transition from core presence into the experience of extended presence.

Figure 3 – Still from Sonar (2016) by Kelly Spanou.

III.5 Extending the Layers of Presence

The progression from proto to core to extended presence has been shown to offer an effective approach in designing evocative, immersive and engaging experiences in fulldome space. However, in a recent FDRG dome project, commissioned for the Victoria and Albert Museum, designing with the layers of presence as a progressive framework was not possible because of the context in which the work was presented.

‘Climate Crimes’ (2018) (see Figures 4 & 5) is an artistc research-based fulldome installation by Dr Adrian Lahoud, Michaela French and Kamil Dalkir. The dome, which is constructed of ninety-six curved triangular panels, is suspended at the centre of the V&A’s ‘The Future Starts Here’ exhibition. The dome is open to the exhibition space and the joints, seams and projectors are exposed as deliberate elements of the work. There is no illusion of non-mediation possible in this situation. Designing the work therefore required an alternative approach, but presence remained a primary goal.

‘Climate Crimes’ investigates the complex relationship between human migration and climate change. The media content combines contemporary global data visualisations, video footage of climate summits and refugee migration and artistic digital animation with voiceover and textured surround sound. The work uses the layers of presence to invite the viewer to experience the complexity of this real-world situation, but in this case, the layers operate in a different way. The sight of the projected dome suspended in the gallery space ensures proto presence as an experiential foundation. The visual complexity, the expansion and contraction of space from micro to human to global scales, the flow of movement, and integration of sound and image discussed in the earlier examples, are all used to focus attention in this work and enable the viewer’s transition toward core presence.

Climate change and migration are presented not as abstract data sets and statistics, but as part of the ecological exchange in the viewer’s world. The content reflects the complexity of these subjects, and invites the viewer to see the highly-mediated political, economic and cultural narratives that surround these issues. In the ‘Climate Crimes’ project, extended presence is very unlikely to occur within the fulldome space because of the presentation context, rather, it unfolds as an external experience in which the viewer becomes more aware of their individual relationship to the complex global challenges of migration and global warming. In this case, the viewer’s experience aligns to the previously stated definition of presence as an ‘ecological process that marks a moment of awareness of the exchanges between the subject and the living environment of which they are part’ (Giannachi et al., 2012).
IV. CONCLUSION

By adopting an ecological foundation based on J.J Gibson’s psychological paradigm, the definition of presence can be expanded beyond telepresence and the illusion of non-mediation to incorporate a broad perceptual and cognitive exchange, that has the capacity to evoke rich emotional and engaging experiences. The fulldome experience itself can be seen as ecological when the dome space, the technology, the medium and the viewer’s perceptual experience coalesce to bring about states of presence.

It has been shown in this paper how the layers of presence; proto, core and extended, can be used as a foundation for creating artistic content in fulldome space. The discussion of selected films by the RCA Fulldome Research Group, provides detailed insights into the ways artists employ the layers of presence to engage the viewer by mediating multi-sensory composition, egocentric spatial strategies, temporal and narrative movement, and locus of attention. This approach allows the designer to enhance the sense of immersion, illusion and engagement in the fulldome space and culminates in a unified embodied experience which has the potential to elicit maximum levels of presence through structured artistic practice.

ACKNOWLEDGMENTS

The author would like to thank Dr Kevin Walker, Information Experience Design, School of Communication, Royal College of Art, London, RCA Fulldome Research Group, Dr Adrian Lahoud, Kelly Spanou and Emily Briselden-Waters for their contributions to this paper.

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