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## Augmented Unreality: Synesthetic Artworks and Audio-Visual Hallucinations

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### <1> Introduction

During 'altered states of consciousness' (ASCs), such as those produced by psychedelic drugs, an individual may experience substantial changes to mood, thoughts and perception, and have subjective experiences of visual or auditory hallucinations. In Hobson's (2003, 44–46) discussion of his AIM (Activation, Input, Modulation) model of consciousness he distinguishes the imagery of dreams and hallucinations as 'internal' sensory inputs, in contrast with the 'external' inputs that are received via the senses from the surrounding environment during normal waking consciousness. For the purposes of this chapter, external inputs correspond with physical 'reality,' while the internal inputs generated by the brain during dreams or hallucinations shall be considered as 'unreality.'<sup>1</sup>

The use of 'unreality' as a label should not undermine the significance of these ASCs as, throughout history, hallucinations have held a special place in human culture. Ancient shamanic traditions utilize hallucinogenic plants and other 'techniques of ecstasy' (Eliade 1964) in order to induce visionary states that are

considered to have religious significance. Such practices are believed to have been used in early forms of human religion (La Barre 1972), and still exist in a variety of surviving indigenous cultures today. In contrast, the use of hallucinogenic drugs such as LSD is illegal in most countries, and is typically viewed in more negative terms. Despite this, various counter-cultures since the 1960s have celebrated hallucinogens and their profound effects on conscious experience. Within these subcultures, representations of ASCs have been incorporated into a substantial amount of ‘psychedelic’ art, literature, and music. Meanwhile, as mainstream films and video games have sought to provide audiences with ever more exotic experiences and storylines, representations of hallucination have also been incorporated.

The focus of this chapter is on the material design of these representations of hallucination within audio-visual media and the role of sound within these. First, I discuss the form of visual hallucinations, auditory hallucinations, and synesthesia. Following this, I consider how these may provide a basis for the design of audio-visual artworks. Many of these artworks can be categorized as either diegetic or synesthetic in their essential operation, as I reveal through an examination of examples from avant-garde films, feature films, light shows, visualizations, VJ performances, music videos, and video games. Following this exploration, I propose a conceptual model with three continua that describes a range of possible approaches for the representation of ASCs using audio-visual media. One of the theoretical configurations implied by this model is what I refer to as ‘augmented unreality’: the convergent layering of synthetic sensory information on real-world environments in order to simulate hallucinatory experiences of unreality through digital media.<sup>2</sup> Augmented unreality benefits from technological advances such as high-resolution computer graphics, projection mapping, and multi-channel surround sound systems.

These allow not only for greater levels of accuracy in the representation of hallucinations, but also for these to be embedded in arenas where audiences may not be expecting such an encounter. In these spaces, the boundaries between the real physical environment and the synthetic unreal can be subverted and dissolved; and it is this illusory capability that presents an important new paradigm shift for digital cultures. Early examples of augmented unreality can be seen in electronic dance music culture, in which projection mapping techniques, decor, and sonic manipulations are combined to simulate the experience of hallucinations at outdoor psychedelic music festivals. In this chapter, through consideration of these various examples in relation to the conceptual model, I will demonstrate how sound is used in the context of audio-visual representations of hallucinations, and the role it may provide in the emerging paradigm of augmented unreality.

#### <1> Altered States of Consciousness

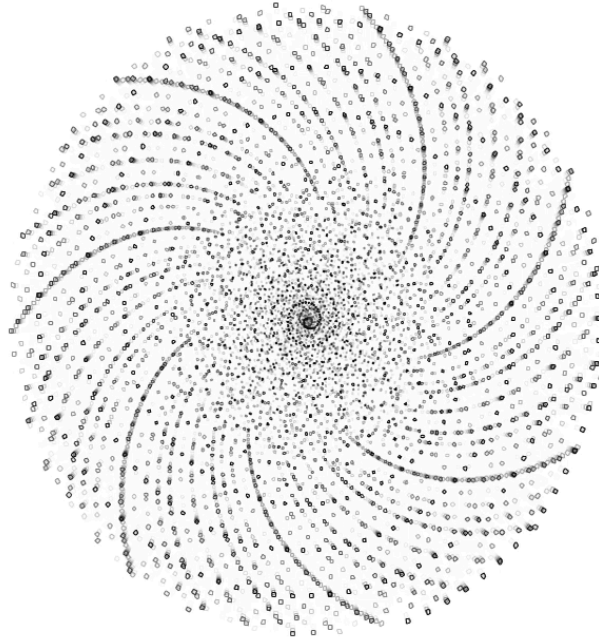
The term 'altered states of consciousness' rose to prominence in the 1960s, to describe the variety of conscious states that lie beyond the typical experience of normal waking consciousness (Ludwig 1969). The varieties of ASCs include: psychosis, such as may be experienced by schizophrenics; psychedelic experiences as produced by hallucinogenic drugs such as LSD; the hallucinations caused by sensory deprivation; states of hypnosis; trances, as experienced in spirit possession rituals; and states of meditation that are used in Buddhism and other religions. Dreaming is also sometimes considered as a form of ASC (e.g., Hobson 2003), as are the unusual states that occur on the boundaries of sleep such as hypnagogic hallucinations or sleep paralysis. ASCs may be induced through various means, including: sensory deprivation; sensory overload, during which the senses are bombarded with excessive

stimulation through rapid drumming, the spraying of liquids, and the energetic dancing of trance ceremonies; focus or absorption in a repetitive task; or changes to physiological condition that may be caused by fasting, dehydration, sleep deprivation, or the use of intoxicating substances such as psychoactive drugs. The symptoms of an ASC are also various, with each type exhibiting a selection of effects. These effects may typically include changes to thought processes, memory, emotional state, and perception. Changes to sensory perception that occur as ‘hallucinations’ may affect vision, body image, sound, tastes, and smells. While hallucinations are a component of many forms of ASC, this chapter will focus mainly on their occurrence in psychedelic experiences, and the visual, auditory, and synesthetic aspects of these in particular. As we shall see, these aspects of hallucinations have been significant as a basis for a large number of psychedelic, audio-visual artworks.

## <2> Visual Hallucinations

Considering the visual effects of hallucinogens in more detail, Heinrich Klüver (1971) carried out studies exploring the effects of mescaline on the visual system. These and related studies (Ostler 1970; Siegel 1977) explored the commonality of visual patterns of hallucinations between subjects. Klüver proposed a set of ‘form constants’: lattices, cobwebs, funnels, and spirals that constitute the basic form from which the visual impressions perceived during mescaline hallucinations are derived. According to Klüver, in the early stages of hallucination these form constants provide the basis for the visual patterns of hallucination commonly described, while in later stages of hallucination, other forms such as tunnels may be abstracted from these basic forms. In their study, Bressloff and colleagues (2001) suggested that these form constants arise in the visual cortex, and they are believed to be a cross-cultural feature of visual

perception during hallucinations. Figure 1 presents a spiral image based on the form constants, as utilized in *Psych Dome*: an interactive audio-visual installation based on hallucinations (Weinel et al. 2015).



[insert Fig 1 here]

FIGURE 1 Artistic impression of visual patterns of hallucination from *Psych Dome* (Weinel et al. 2015). The *Psych Dome* installation uses a consumer-grade electroencephalograph (EEG) headset to control parameters of an audio-visual artwork based on hallucinations.

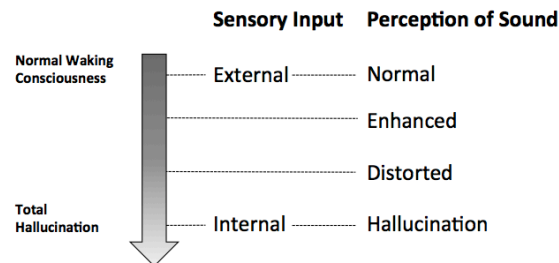
## <2> Auditory Hallucinations

Though visual hallucinations seem to be more prevalent, auditory hallucinations are also commonly reported. Studies of auditory hallucinations have mainly focused on schizophrenics, who experience ‘auditory-verbal hallucinations’ (AVH) in which voices are heard as if from the external environment or inside the head (Wayne 2012,

87). Though AVH are the most common type experienced by people with schizophrenia, ‘non-verbal auditory hallucinations’ (NVAH) are also known to occur and may consist of hallucinated music (Kumar et al. 2014), bangs, or noises (Jones et al. 2012). Neuroimaging studies have suggested that auditory hallucinations activate the parts of the brain involved in inner speech and Heschl’s gyrus (the auditory cortex), supporting the view that auditory hallucinations are perceived with a sense of reality comparable to that of sounds that have origins in the external environment (Dierks et al. 1999). In the hallucinations caused by drug experiences, perception of sound is also altered, ranging on a continuum from enhanced enjoyment (or otherwise) to distortions in sound quality and total hallucination of sounds with no external acoustic origin (Weinel et al. 2014). The latter may consist of either AVH or NVAH.

Figure 2 illustrates a continuum of aural experience from normal waking consciousness to total hallucination (as discussed in Weinel et al. 2014). In normal waking consciousness, auditory input comes predominantly from external sensory input, which provides a basis for aural perception. As hallucinatory effects are intensified, the perceptual experience of sounds becomes enhanced; sounds are perceived as more or less enjoyable than usual or as profoundly significant. Further along the scale, the subjective experience of sound becomes distorted, as if properties such as volume, spatial location, or audio quality have been altered or manipulated with Digital Signal Processes (DSP). As these effects intensify, the balance shifts from external to internal sensory inputs that arise within the brain. In the most extreme cases, total experiences of hallucination occur that consist of hallucinated

noises, voices, or music that have no acoustic origin in the external environment (for further discussion of auditory hallucinations see also Grimshaw, this volume).



[insert Fig 2 here]

FIGURE 2 Continuum of Auditory Hallucination.

## <2> Synesthesia

The term synesthesia comes from the Greek *syn* (union) and *aisthesis* (sensation), and describes the dissolution of boundaries between the senses (Cytowic 1989). In such experiences, sounds may have tastes or colors may have smells. These are not merely imagined correspondences but actual experiences across the senses that are caused by a given stimuli. The phenomenon is reported as a general trait for some individuals in typical states of waking consciousness. However, psychedelic drugs such as mescaline, psilocybin, or LSD are also known to promote experiences of synesthesia. Although synesthesia can involve the blurring of any of the sensory modalities, in these psychedelic experiences sounds often trigger corresponding visual images (e.g., Bliss and Clark 1962, 97), suggesting the directional flow of information that is illustrated in figure 3.



[insert Fig 3 here]

FIGURE 3 Sound-to-image synesthesia.

### <2> Towards Representation

The visual and sonic components of hallucinations can be used to inform the design of corresponding visual images and sounds. Indeed, such practices may be very old; it has been proposed that examples of early shamanic rock art might have been based on the visual images seen during hallucinations (Lewis-Williams 2004). In more recent examples of psychedelic art and films, the internal experience of hallucinations can be represented through appropriate design of audio-visual content. The design of this content has been assisted by developments in sound and visual technology, such as computer graphics and audio techniques that have allowed almost any sound or visual image imaginable to be created. These technologies have allowed the subjective visual and aural experience of hallucinations to be represented in digital video, by creating materials that correspond with the visual or aural experiences observed during ASCs. Audio-visual artworks have also enabled sound-to-image processes, similar to those found in synesthesia, to be realized through the design of moving images that correspond with music.<sup>3</sup> In recent years, these representations of hallucination have also become interactive, as video game technologies present simulations of hallucination or synesthesia. As we shall see, representations of hallucination do not have to follow one fixed approach but may use a variety of



possible approaches, ranging from those that seek to replicate visual or aural experience as accurately as possible to those that use more stylized approaches such as impressionism, metaphorical imagery, or symbolism.

### <1> Audio-Visual Representations of Hallucinations

From observing audio-visual representations of hallucinations in a range of existing cultural artefacts, it is possible to consider a variety of possible design approaches that are utilized. In the following sub-sections I have grouped illustrative descriptions of some of these artefacts into two broad categories:

- Diegetic Representations of Hallucinations
- Synesthetic Artworks

These categorizations are by no means definitive, but provide a useful means through which we can initially begin to distinguish some key differences between works that utilize representations of hallucination. ‘Diegetic representations of hallucinations’ is the phrase that describes representations of ASCs occurring within narrative contexts and applies to examples in various films and 3D video games. These examples utilize the illusory properties of audio-visual media in order to construct narratives involving characters in various environments. Within these narratives, scenes of hallucination are portrayed through the use of various audio-visual techniques that enable changes to the conscious state of the character to be communicated to an audience. In contrast, ‘synesthetic artworks’ provide audiences with sensory experiences of sound and light similar to those that may be experienced during hallucination. Artworks in this category do not typically present these representations of synesthesia within a narrative framework; examples of synesthetic artworks can be found in avant-garde visual music films, visualizations, VJ

performances, music videos, and interactive music visualizations. These two categories can also be distinguished by whether they use audio-visual representations of hallucination to enrich the sensory experience of a present location (synesthetic artworks), or immerse the audience in a narrative depiction of another time and place (diegetic representations of hallucination). In the following subsections, each of these categories are illustrated through a selection of examples.

## <2> Diegetic Representations of Hallucinations

Examples in this category incorporate representations of hallucination within narrative progressions. In early examples this was achieved primarily through visual innovations. For example, the classic Surrealist film *Un Chien Andalou* (Buñuel 1929) creates a dream-like narrative through a series of bizarre, non-sequitur events intended to reflect the irrationality of the unconscious according to the Freudian view (e.g., Freud 1899). Various works of the ‘trance-film’<sup>4</sup> genre follow a similar approach. For example, Maya Deren and Alexander Hamid’s *Meshes of the Afternoon* (1943) constructs a dream narrative through the use of props, camera techniques, and editing. In *Meshes of the Afternoon*, a swaying camera suggests disorientation from the eye-view of the protagonist, while manipulation of props and other elements suggests the unreality of the dream. Perhaps one of the most significant early representations of hallucination, Kenneth Anger’s *Inauguration of the Pleasure Dome* (1954), rises to a hallucinatory visual crescendo following the protagonists’ ritual consumption of intoxicating substances. Anger uses a visually stunning process of ‘vertical montage’ (in which images are superimposed) to reflect visionary experiences and brightly colored symbols flash on screen to reflect Thelemic<sup>5</sup> visual hallucinations with increasing intensity. A similar technique was also later used in

*The Trip* (Corman 1967) to reflect the visual hallucinations of LSD experiences. These early examples all show significant developments in the use of props, editing and animation techniques – essentially ‘special effects’ – to reflect the subjective visual experience of hallucinations within a diegetic context. However, it is notable that almost no attempts are made to represent the diegetic experience of auditory hallucinations; sound is simply used to provide a non-diegetic musical support that sets the mood of the film for the audience.

By the 1990s, the widespread availability of computer-generated imagery (CGI) and digital audio techniques allowed the possibility for more accurate representations of the subjective experience of hallucinations, and we begin to see diegetic representations of auditory hallucination. For example, Terry Gilliam’s (1998) cinematic adaptation of Hunter S. Thompson’s *Fear & Loathing in Las Vegas* (1971) uses CGI alongside props, costumes, and lighting to describe visual hallucinations: faces metamorphose; vine designs on a carpet creep up the walls; rooms pulsate with colored lights; while cameras sway and frame-rates are dropped to suggest the cognitive impairment of the intoxicated characters from a first-person perspective. This is matched by the sound: as Hunter S. Thompson (Johnny Depp) listens to a telephone conversation in a hotel lobby, the sound of the stranger’s voice is processed with reverb causing it to momentarily fill the sound stage, in reflection of Thompson’s absorbed attention; the sound literally fills his ‘head space.’<sup>6</sup> As a receptionist transforms into a snake, a pitch transposition effect is applied to her voice; and as Thompson wades through the mud of his reptile zoo hallucination, the audience hears the sloshing sounds of the unreal sludge. These uses of sound go beyond non-diegetic musical accompaniment to reflect the aural experience of hallucinations. These sounds can be seen to reflect the full continuum suggested in

figure 2: from sounds that have an acoustic basis within the diegetic environment, to distorted versions of these, and sounds that are entirely internal products of hallucination with no acoustic basis in the diegetic environment.

Later examples, such as *Enter the Void* (Noé 2009), push further still towards accurate representations of hallucination with the aid of CGI and digital audio techniques. *Enter the Void* utilizes a sustained first-person perspective: the camera presents the subjective eye-view of the protagonist, allowing the audience to see what he sees (including his blinking eyelids); while sound presents his aural experience so that the audience hears what he hears. Sound is not only used to relate his conversations, but also to reveal the inner speech of his thoughts that are delineated from vocal speech by processing the dialogue with an echo effect. Early in the film, the character smokes a glass pipe containing DMT (dimethyltripamine), a powerful hallucinogen with a rapid onset and short duration. As he inhales the drug and the effects onset, his vision becomes blurred and spots of light flash across his visual field. He closes his eyes and we see a network of organic fibers and fractal patterns (created using CGI), suggestive of abstractions from Klüver's (1971) form constants. Throughout this sequence we hear an abstract sound collage, in which the sounds from the Tokyo streets below are processed with flangers and other effects in order to suggest perceptual distortions and auditory hallucination. Through these various techniques, *Enter the Void* demonstrates how both sound and visual images can be used to render the subjective experience of visual and auditory hallucination with improved levels of accuracy, so that the media presented bears stronger resemblance to the visual and aural experiences people actually describe during hallucinations.

In recent years, the use of computer graphics and sound to describe visual and auditory hallucinations has also been used in interactive media, such as first-person

shooters (FPS) video games. For example, Weinel's (2011) *Quake Delirium* demo project and *Far Cry 3* (Ubisoft 2012) are video game projects that provide animated visual properties in order to simulate distortions to visual perception, while also using digital effects and sounds to simulate auditory hallucinations. In the latter game, the simulation of hallucination provides a means through which to enrich the narrative, but also demonstrates an emerging paradigm shift in which games allow the player to explore new potentialities through the simulation of altered states of consciousness in the context of virtual worlds.

## <2> Synesthetic Artworks

Synesthetic artworks present audiences with experiences of light and sound that are comparable to those that may occur during a hallucination, without the use of a clearly defined narrative context. 'Visual music' is a form of avant-garde film that is specifically orientated towards synesthetic forms (Brougher and Mattis 2005). In the films of artists such as Len Lye, Norman McLaren, Oskar Fischinger, and John Whitney, animated arrangements of color and shape are used to form dynamic relationships similar to those found in musical composition. While much of the work in this idiom has been characterized by the quest for a harmonic visual language that Whitney (1980) articulated in his writings on visual music, some works were also conceptualized as representations of the internal experiences of the 'inner eye' (Wees 1992). Harry Smith's *Early Abstractions* (1946-1957) series<sup>7</sup> and Jordan Belson's visual music films, such as *Allures* (1961) and the unfinished *LSD* (1962), are notable as examples that seek to present internal sensory experiences through film. Both artists utilized music as a complement to their visuals, creating synesthetic audio-visual experiences for their audiences. Although both drew inspiration from their own

experiences of ASCs, their work can be more appropriately seen not as attempts to convey their own first-person experience but as constructing new sensory experiences for their audiences that provoke a form of synesthesia through the use of audio-visual media. This approach was also explored through the use of psychedelic light shows such as: Jordan Belson and Henry Jacob's *Vortex Concerts*; works by the USCO collective (Davis 1975, 67; Oren 2010); and Andy Warhol's *Exploding Plastic Inevitable* shows with live music by the Velvet Underground (Youngblood, 1970, 102–105; Joseph 2002). For audiences on psychedelic drugs, these light shows may provide a complementary experience; however, they also construct a multimodal experience of sound and light for those individuals who are not operating under a chemically altered mind-set and this imitates the processes of synesthesia, constructing a similar experience synthetically through sound and projections.

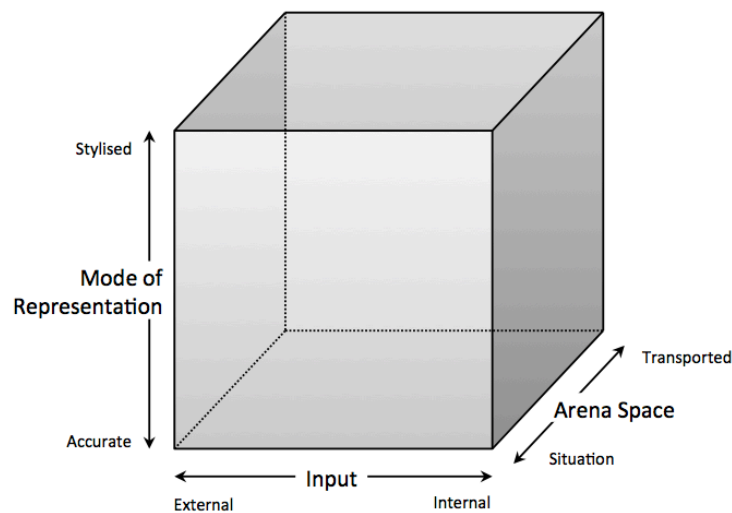
New technologies such as light synthesizers and computer software acted as a catalyst for the furthering of these synesthetic audio-visual experiences from the late 1970s onwards. Early sound-to-light devices such as the Atari Video Music (1976) can be seen as simulating sound-to-image synesthesia (as in figure 3). Subsequently, programs such as Jeff Minter's *Psychedelia* (Llamasoft 1984), *Trip-A-Tron* (Llamasoft 1988), *Virtual Light Machine (VLM)* (Llamasoft 1990), and later *Neon* (Llamasoft 2004), are successive iterations of synesthetic equipment that incorporate progressive levels of computational integration between sound and image (Minter 2005). Along with the availability of computer graphics software on home computers, programs such as these, and hardware such as the NewTek Video Toaster, would be among those that supported the nascent VJ ('video jockey') performances that flourished in tandem with the electronic dance music culture<sup>8</sup> of the 1990s, as demonstrated on the Studio !K7 *X-Mix* (1993–1998) series. The mode of these is

essentially one of sensory stimulation, and incorporates replications of visual hallucinations and synesthesia: looping 3D graphics, fractals, and cycling textures are combined in correspondence with music to produce impressions of psychedelic hallucinations and rave culture iconography. VJ culture became a common element of larger dance music clubs and outdoor raves and has also grown to encompass the use of projection mapping technology that allows multiple surfaces to be used as video screens. Modern VJ software allows the use of real-time audio parameters as a means to manipulate graphical filters that are applied to pre-designed video clips, or as parameters that drive animations. Recent examples of this type of work include the videos of VJ Chaotic (Ken Scott), such as *Forever Imaginary* (2014a), and planetarium (‘fulldome’<sup>9</sup>) works such as *Crystallize* (2014b).

As with diegetic representations of hallucination, these synesthetic artworks have gradually been moving towards interactivity. The antecedents for this can be found in various earlier works such as the GRAPhics Symbiosis System (GRASS c.1975) real-time visual system or the interactive features of Jeff Minter’s work. Robin Arnott’s game *SoundSelf* (2014) is notable in this area: reportedly “inspired by a group-ohm on LSD” (Ismail 2014), the game uses the human voice as an input to control synesthetic tunnel visualizations reminiscent of Klüver’s (1971) form constants, and supports the Oculus Rift virtual reality (VR) headset. Similarly, the *Psych Dome* software (figure 1) utilizes EEG as means to control real-time generation of sounds and graphics (Weinel et al. 2015) and has been used as part of an interactive performance by Darren Curtis and Bradley Pitt based on the concept of a vision quest: *Noosphere: A Vision Quest* at Adelaide Fringe Festival (Sacred Resonance 2016).

<1> A Conceptual Model for Audio-Visual Representations of ASCs

The discussion so far has outlined two main types of representation of hallucinatory ASCs: diegetic representations that present hallucinations within the context of a narrative progression, and synesthetic artworks that enrich the sensory experience through the presentation of hallucinatory audio-visual experiences.<sup>10</sup> In order to further consider the differences implicated by examples within these groups, figure 4 presents a conceptual model describing possible approaches for the representation of ASCs using three continua: ‘Input,’ ‘Mode of Representation,’ and ‘Arena Space.’



[insert Fig 4 here]

FIGURE 4 Conceptual Model for Audio-Visual Representation of ASCs

## <2> Input

The *x* axis of the model describes Input, and corresponds with Hobson’s (2003, 44–46) discussion of sensory Input that can be modulated between internal and external sources. Visual or sonic materials can be used to represent experiences of external sensory experience (e.g., impressions of actual environmental surroundings), or



internal sensory experience (e.g., hallucinated visions or sounds). For instance, a narrative representation of hallucination may include visual and auditory elements that describe either an actual environment or a hallucination. Modulation between both external and internal elements is also possible, such as if an audio-visual representation of an actual environment is presented with gradually increasing distortions and the introduction of hallucinated elements.

## <2> Mode of Representation

The *y* axis of the model describes Mode of Representation, which may range from ‘accurate’ to ‘stylized.’ ‘Accurate’ representations are those that attempt to render the visual or auditory elements of hallucination as authentically as possible for the audience; hence, visual effects may be used to present the visual experience of hallucination in a way that closely approximates the first-person experience, while sound may be used to render auditory distortions and auditory hallucinations.<sup>11</sup> At the opposite end of this continuum, ‘stylized’ describes a wide range of artistic possibilities for rendering hallucinations, such as through the use of art styles such as impressionism, cartooning, symbolism, or metaphorical techniques.<sup>12</sup> Modulation between accurate and stylized approaches is possible, such as if an accurate representation diverges into the use of metaphorical materials during certain sequences in order to describe hallucinations. Such modulation is not uncommon, as movie directors often show the onset of hallucinations using visual effects or geometric patterns, before transitioning into the use of symbolic or metaphorical cinematic materials to describe the more intense phases of hallucination.

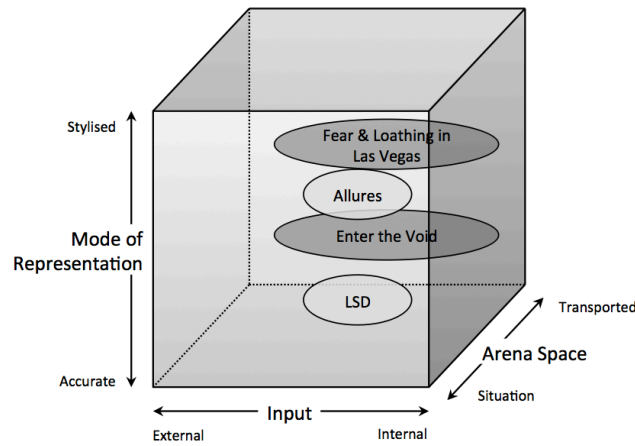
## <2> Arena Space

The  $z$  axis of the model describes ‘arena space’: the entire performance space in which musical and visual elements are presented.<sup>13</sup> At one end of this continuum, ‘transported’ approaches are those that seek to remove the audience from the awareness of their real-world context through immersion into the illusory audio-visual medium. This is the position typically utilized by diegetic works that seek to absorb the audience into a fictional world and narrative. At the other end of this continuum, ‘situational’ approaches are those that work in conjunction with the real-world environment, presenting sound and visual images that enhance the experience of the ‘here and now’ (as opposed to the ‘then and there’). Synesthetic artworks such as psychedelic light shows at rock concerts often use this approach, since they aim to stimulate the senses of the audience within the present. Modulation between transported and situational approaches is also possible, since an audio-visual work may operate in conjunction with the arena space or seek to transport the listener from it at various points during a performance.

## <2> In Practice

As demonstrated in figure 5, the conceptual model can be used to describe the representational approach used by various examples, such as those discussed previously. *Enter the Void* (Noé 2009) uses representations of both internal and external sensory experience and modulates between the two as the protagonist shifts between normal and hallucinatory states of consciousness. Due to these modulations, the actual point on the conceptual model changes through the course of the film; hence, the ellipse indicates not one point but the approximate range that is traversed over time. The mode of representation in *Enter the Void* leans towards accurate

representations of ASC, and as a fictional narrative, it seeks to transport the audience from awareness of the movie theater into the diegesis of the story.



[insert Fig 5 here]

FIGURE 5 Examples of audio-visual works positioned on the conceptual model.

*Fear & Loathing in Las Vegas* (Gilliam 1998) also uses both internal and external inputs; the hotel lobby scene described earlier includes real-world sounds of the environment and modified versions of these that suggest movement along the continuum towards internal sensory perception and hallucination. However, while aspects of the visual and auditory approach used in *Fear & Loathing in Las Vegas* correspond with the actual form of ASCs, the mode of representation is relatively more stylized than *Enter the Void*. As the work is diegetic, use of the arena space is similarly ‘transported’ for this work, and indeed this is the arena space position for most works in the ‘diegetic representations of hallucination’ group.

Psychedelic visual music films such as those by Jordan Belson do not generally include representations of external elements; visual elements are descriptive

of visual impressions of inner experience and therefore occupy the internal part of the axis, as indicated for *Allures* (1961) and the unfinished work *LSD* (1962) in figure 5. Considering the mode of representation, these films each fall somewhere between accurate and stylized positions. For instance, *LSD* leans towards accuracy through the depiction of forms similar to Klüver's form constants; it resembles the type of imagery people actually describe during visual hallucinations with closed eyes during LSD trips. In contrast, *Allures* is a more metaphorical work. Both works could be considered as 'situational,' since they aim to actually induce synesthetic experience rather than transport the listener into a fictional narrative. The situational approach is also the typical position for many other works discussed in the 'synesthetic artworks' category, since psychedelic light shows and VJ performances typically seek to bombard the senses with light and sound and enhance the sensory experience of a space, rather than extract the individual from his or her awareness of it.

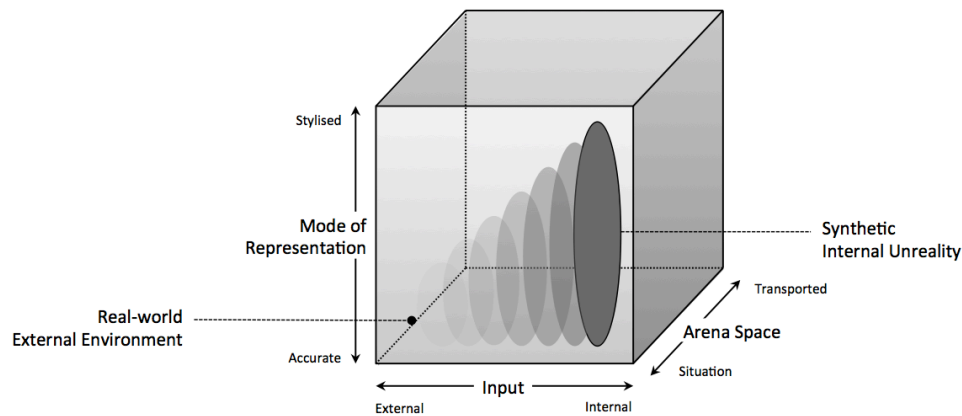
### <1> Augmented Unreality

As we have seen, audio-visual representations of hallucinations may utilize a variety of different approaches. The historic development of these forms has also been closely related to the advancement of computer graphics and digital audio. These technologies are especially useful because, by their very nature as subjective, unreal phenomena, hallucinations cannot be captured or recorded in the way that images and sounds from the external environment can be. Computer graphics and sound then provide a means to create synthetic representations of visual or sonic material based on the form of hallucinations, thus avoiding this problem. Through digital technologies we have witnessed a progression from the use of camera techniques and props to represent ASCs (*Un Chien Andalou*, Buñuel 1929; *Meshes of the Afternoon*,

Deren and Hammid 1943), to sophisticated CGI and digital audio as a means to portray the subjective experience of hallucinations (*Fear & Loathing in Las Vegas*, Gilliam 1998; *Enter the Void*, Noé 2009). These technologies have also had a significant impact on synesthetic artworks that are presented in social situations such as psychedelic rock concerts and raves, taking us from the early model of projecting analogue film with approximately synchronized music, to real-time, audio-visual light shows involving multiple projection surfaces where visuals are linked computationally to electronic dance music (VJ culture).

The development of synesthetic artworks that occur in social situations, often in ad-hoc locations such as outdoor performance spaces (e.g., music festivals and raves) is currently on the cusp of a further new development: ‘augmented unreality.’ In computing, ‘augmented reality’ describes the use of immersive computer technologies in order to add an additional layer of information that allows the user to access additional or virtual data. Typically, the aim of these systems is to enrich the user experience by providing access to useful information in correspondence with the location of the user. The proposed concept of ‘augmented unreality’ is similar in that it also utilizes immersive technologies to add an additional layer of information; however, it is distinguished by the use of this layer to disrupt the perceived reality of the situation, effectively bending it towards imaginary or hallucinatory experiences of *unreality*. In these terms, the modification is a distortion or subversion of physical, external reality, and may exist to alter or corrupt information rather than add new data. The aim is less to inform, and more to misinform and destabilize the perceptual experience of the subject. Figure 6 illustrates the concept of augmented unreality with regards to the conceptual model for audio-visual representations of ASC. As shown by the model, in a given situation the audience will experience both the real-world

external environment of the situation and a synthetic construction of internal unreality that is facilitated through digital technologies. However, these two input sources converge, so that sounds or visual images from the external environment appear as if distorted, dissolving the boundaries between the real-world environment and the synthetic unreality.<sup>14</sup>



[insert Fig 6 here]

FIGURE 6 Conceptual model of 'augmented unreality.'

Augmented unreality is significantly aided by the quality with which digital technologies allow the production of media that accurately resemble the form of hallucinations. As discussed, high-resolution computer graphics and digital audio techniques such as realistic spatialization, provide a powerful means through which to construct synthetic illusory representations of unreality that are effective and convincing. The process is also assisted by the computational processes that link the experience of sound to the visuals, allowing the media to form a synesthetic mesh across the modalities, imitating the mechanism of actual synesthesia (as in figure 3). Materials can also be designed to converge with the external environment through the

use of techniques such as the imitation and processing of visual or aural information derived from the external environment; the external environment then becomes an input source that can be subjected to graphical or sonic transformations. We find visual examples of this in the spectacles of projection-mapped buildings, where artists utilize the actual form of the building and its texture as a basis for the design of transformed materials. In sound, we find a similar principle in electroacoustic compositions such as Rajmil Fischman's *No Me Quedo...* (2000; discussed in Fischman 2008) which uses recorded sound and digital transformations to provide convergence between instrumental sounds and synthetic electroacoustic sounds. The delivery of these illusory forms of media is supported by the availability of increasingly powerful technologies, such as multi-channel speaker systems and multi-projection mapping systems. These allow the media to be delivered convincingly, and their (semi) portable nature also enable the illusions to be 'thrown' and sited outside of the usual arenas of cinemas or on computer screens where we might otherwise expect to see them. This, in turn, allows the potential for illusory encounters that are unexpected and, in some cases, may be indistinguishable from the real, physical environment. It is the combination of convincing illusory media, coupled with the ability to site or throw these anywhere, which exposes an important paradigm shift for digital culture, since almost any public space is then a potential location where perceived reality can be corrupted through the augmented unrealities of digital media. In ideal cases, the high-quality sound and graphics will allow the surface of the media to qualitatively approach the point where its synthetic nature cannot be detected with certainty, while the portability of these illusions will help to catch audiences off-guard.

Early examples of augmented unreality can be observed in electronic dance music culture. For example, psychedelic trance culture<sup>15</sup> prioritizes the aesthetics of the psychedelic experience in music, and at outdoor festivals ultraviolet decor and VJ collectives such as Trip Hackers and Artescape design synesthetic visual elements that are intended to mesh with outdoor (real-world) festival environments (e.g., Dickson 2015). Projection mapping is used in conjunction with sculptural elements that provide custom surfaces for projection and temporary architectural spaces that imitate the form of visual hallucinations and mandalas. These sculptural elements allow animated fractals and tunnel elements suggestive of visual hallucinations to be integrated into real-world environments such as forests, subverting the physical reality of these situations. As heard on Durango's *Tumult* (2005), these visual elements are typically used in conjunction with music that includes a combination of rhythmic and melodic elements (intended to produce maximum energetic dance effects), coupled with sounds such as noises and voices that are suggestive of auditory hallucinations. These sounds are manipulated using high-quality digital spatialization and transformations, enabling the enhancements and distortions of auditory hallucinations (figure 2) to be represented through sound. Both sounds and visual materials then explicitly simulate the sensory experience of visual and auditory hallucinations. Since the light show is linked to the audio, the form of synesthesia is also imitated, so that the colors and movement of visual images fluctuate and jump in response to the sounds. The overall effect is 'situational,' since it works in conjunction with the real-world, outdoor setting of the festival, integrating real environmental features such as trees, birds, and the skyline into the equation. Digital media are used to elicit a synthetic experience of unreality in a manner that blends with the real, physical environment, and thus augmented unreality (figure 6) is accomplished. In these



situations, it is entirely possible that the audience may begin to experience dissolution of the boundaries between the real environment and the synthetic presentations of unreality. This may be especially true for audiences using chemical substances to alter their mind-sets, however drugs may not be a pre-requisite since the illusory properties of digital media alone could be sufficient to provide such experiences.

As the audio-visual technologies discussed above become pervasive, the capability to convincingly invoke augmented unreality should increase. Although I have characterized augmented reality here in terms of projections and loudspeakers, it is possible that other emerging audio-visual technologies could also be used to achieve similar effects. For example: wearable video equipment such as the ‘smart contact lenses,’ which play and record video (currently in development); augmented/mixed reality glasses such as the Microsoft’s Hololens; or headphone systems such as Doppler Labs’ Here (Doppler Labs 2015), which modifies and filters sounds from the external environment, are among those could theoretically be used to simulate hallucinations and achieve augmented unreality.<sup>16</sup> The long-term implications of this type of media could be dramatic, as the glow of synthetic virtual environments and their accompanying sonic vibrations extend over the everyday, allowing the potential to simulate ASC experiences without the use of intoxicating substances.

### <1> Concluding Remarks

This chapter has provided an outline of the main effects of hallucinations (a form of ASC) with regards to the visual and aural components of the experience, including sound-to-image synesthesia. As we have seen, the typical form of psychedelic hallucinations follows some structural norms that produce commonality in the

experiences between participants. These norms have allowed the representation of hallucinations in a variety of audio-visual media such as films, visualizations and computer games. These can be broadly classified in terms of diegetic representations of hallucination and synesthetic artworks and may utilize a range of possible approaches. These possible approaches can be considered in terms of the conceptual model presented, which allows the use of Input, Mode of Representation, and Arena Space to be considered for a given work. The conceptual model also allows us to reflect upon the recent move towards improved accuracy found in representations of hallucination and as afforded by digital technologies for sound and computer graphics. I have argued that this drive towards realism, coupled with new technologies for siting work in ad-hoc locations, has opened up a new paradigm of ‘augmented unreality,’ in which real external environments and synthetic representations of unreality converge. Augmented unreality is currently exemplified by the synesthetic environments of psychedelic trance festivals, but over the next few decades we can expect the trend to grow as illusory audio-visual technologies become increasingly pervasive. As these technologies provide improved resolutions and capabilities for modifying audience experience, the boundaries between external reality and synthetic unreality may dissolve to the point where the two can no longer be distinguished; in effect, producing synthetic digital forms of altered states of consciousness.

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<sup>1</sup> In drawing upon Hobson's distinction of 'external' and 'internal' sensory inputs, we should note that he does not propose these as binary categories, but rather a continuum of possible states. It is acknowledged that internal processes can significantly shape normal waking consciousness, and indeed, conversely, in some cases the contents of dreams can also be influenced by external sensory inputs. What is important here is the main origin of sensory material, which in normal waking consciousness is predominantly 'external,' unlike dreams and hallucinations that are primarily 'internal.' As I explore in this chapter, both the real (external) and the unreal (internal) can provide a basis for corresponding art, sound, and music.

<sup>2</sup> While the emphasis of this chapter is on digital practices, many of the essential approaches I explore in this chapter were first proven with analogue technologies such as film and magnetic tape, and before that, techniques such as painting and the use of acoustic instruments.

<sup>3</sup> It should be acknowledged here that experiences of synesthesia are highly individualized; nonetheless, in drug experiences we find that a common mechanism of sound-to-image synesthesia occurs, along with typical visual effects such as the 'form constants' (Klüver 1971). In this regard, there are generalizable processes that audio-visual media can begin to reproduce, even if the specific manifestations of synesthesia that are experienced by individuals may remain somewhat elusive.

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<sup>4</sup> As discussed by Sitney (1979, 21), the concept of the ‘trance-film’ (similar to the ‘psychodrama’) describes films on such themes as dream, somnambulism, ritual, or possession.

<sup>5</sup> ‘Thelemic’ refers to the use of iconography derived from Aleister Crowley’s Thelema religion, which Anger was a member of. These icons are presented in *Inauguration of the Pleasure Dome* (Anger, 1954) as if they were visual hallucinations, suggesting that the ritual invokes visionary experiences related to the Thelemic principles.

<sup>6</sup> For further discussion of the metaphorical use of reverb to suggest internal psychological processes in films and popular music, see Doyle (2005).

<sup>7</sup> During this period Harry Smith created a series of untitled films, of which several were subsequently lost or destroyed (Sitney 1979, 232–233). *Early Abstractions* (1946–1957) collects the remaining films from this series.

<sup>8</sup> For a further discussion of electronic dance music culture, see St. John (2009).

<sup>9</sup> ‘Fulldome’ environments project video on to the hemispherical ceiling of a dome structure, in order to provide an immersive 360° experience. These environments are used for planetarium shows, but have also been used to provide various forms of expanded cinema. Notable fulldome events showcasing new work in the UK have included Mario DiMaggio’s *Dome Club* series and *FullDomeUK*.

<sup>10</sup> The description of ‘hallucinatory audio-visual experiences’ here does not presume that audiences experience a hallucination in exactly the same way as would be precipitated by other means (e.g., psychedelic drugs); rather, the experience of sound and images may elicit distinct illusory experiences that imitate the form of hallucinations.

<sup>11</sup> Instead of the term ‘accurate’ we might otherwise have used the term ‘realistic’ here, to describe the stylistic approach taken, in correspondence with ‘realist’ approaches in the visual arts (e.g., photorealism). As Kennedy (2008, 449–450) remarks, realist approaches can be used for depicting actual scenes, but they can also be used when rendering the imaginary (or in this case, the hallucinatory). However, for our purposes here the terms ‘realist’ or ‘realistic’ are unhelpful, since by definition the hallucinatory is *unreal*; hence the term ‘accurate’ is preferable, to avoid having to describe unreal materials as also ‘realistic.’

<sup>12</sup> For a further discussion of metaphors in art, see also Kennedy (2008).

<sup>13</sup> The term ‘arena space’ is borrowed for Smalley (2007), and describes “the whole public space inhabited by both performers and listeners” (42) Here, the term is adapted to include audio-visual elements.

<sup>14</sup> The convergence of synthetic and real-world materials here is a development and adaptation of Fischman’s (2008) discussion of convergence of instrumental and electronic materials in electroacoustic music, especially his own composition *No Me Quedo...* (2000).

<sup>15</sup> For more information on psychedelic trance culture, see St. John’s definitive account *Global Tribe: Technology, Spirituality and Psytrance* (2012).

<sup>16</sup> In a series of public lectures, Carl Smith (see also 2014; 2016) has described these and other technologies as enabling a new paradigm that he refers to as ‘context engineering’: computer systems



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that allow the user to modify his or her contextual awareness, utilising reality as a medium. In these terms, 'augmented unreality' could be considered as a specific branch of context engineering.