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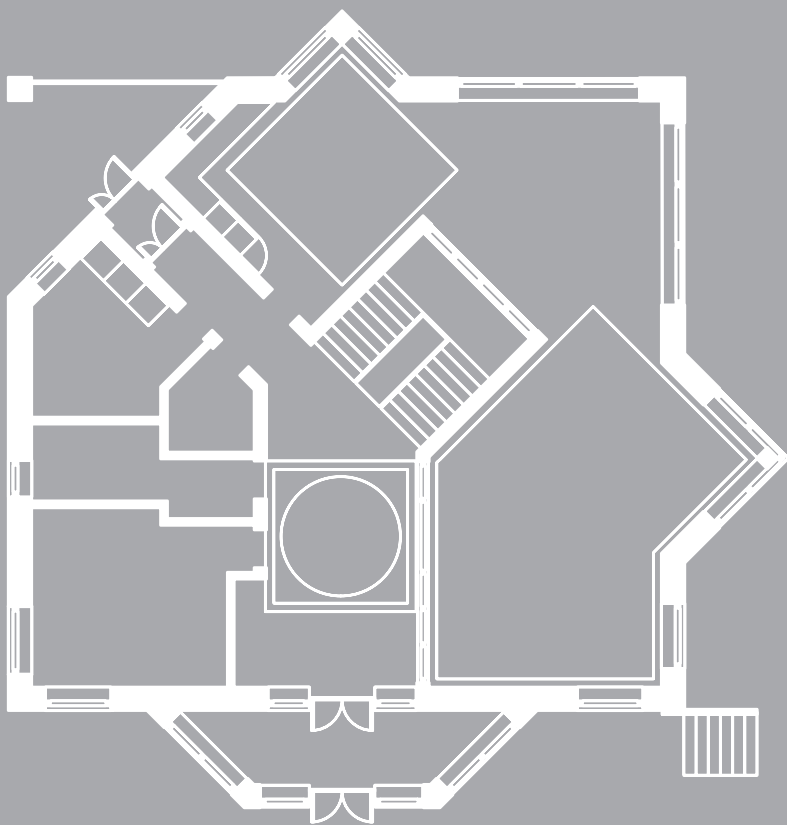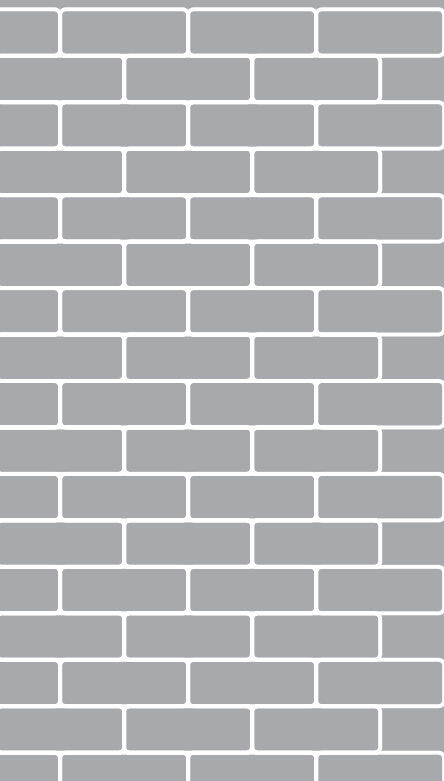
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LEONARDO ELECTRONIC ALMANAC

VOL 19 NO 1 VOLUME EDITORS **LANFRANCO ACETI** AND **RICHARD RINEHART**
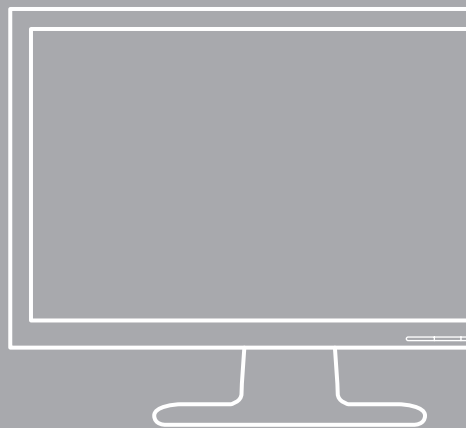EDITORS **ÖZDEN ŞAHİN**, **JONATHAN MUNRO** AND **CATHERINE M. WEIR**
This LEA publication has a simple goal: surveying the current trends in augmented reality artistic interventions. There is no other substantive academic collection currently available, and it is with a certain pride that LEA presents this volume which provides a snapshot of current trends as well as a moment of reflection on the future of AR interventions.

NOT HERE

NOT THERE

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Not Here, Not There: An Analysis Of An International Collaboration To Survey Augmented Reality Art

Every published volume has a reason, a history, a conceptual underpinning as well as an aim that ultimately the editor or editors wish to achieve. There is also something else in the creation of a volume; that is the larger goal shared by the community of authors, artists and critics that take part in it.

This volume of LEA titled *Not Here, Not There* had a simple goal: surveying the current trends in augmented reality artistic interventions. There is no other substantive academic collection currently available, and it is with a certain pride that both, Richard Rinehart and myself, look at this endeavor. Collecting papers and images, answers to interviews as well as images and artists' statements and putting it all together is perhaps a small milestone; nevertheless I believe that this will be a seminal collection which will showcase the trends and dangers that augmented reality as an art form faces in the second decade of the XXIst century.

As editor, I did not want to shy away from more critical essays and opinion pieces, in order to create a documentation that reflects the status of the current thinking. That these different tendencies may or may not be proved right in the future is not the reason for the collection, instead what I believe is important and relevant is to create a historical snapshot by focusing on the artists and authors developing artistic practices and writing on augmented reality. For this reason, Richard and I posed to the contributors a series of questions that in the variegated responses of the artists and authors will evidence and stress similarities and differences, contradictions and behavioral approaches. The interviews add a further layer of documentation which, linked to the artists' statements, provides an overall understanding of the hopes for this new artistic playground or new media extension. What I personally wanted to give relevance to in this volume is the artistic creative process. I also wanted to evidence the challenges faced by the artists in creating artworks and attempting to develop new thinking and innovative aesthetic approaches.

The whole volume started from a conversation that I had with Tamiko Thiel – that was recorded in Istanbul at Kasa Gallery and that lead to a curatorial collaboration with Richard. The first exhibition *Not Here* at the Samek Art Gallery, curated by Richard Reinhart, was juxtaposed to a response from Kasa Gallery with the exhibition *Not There*, in Istanbul. The conversations between Richard and myself produced this final volume – *Not Here, Not There* – which we both envisaged as a collection of authored papers, artists' statements, artworks, documentation and answers to some of the questions that we had as curators. This is the reason why we kept the same questions for all of the interviews – in order to create the basis for a comparative analysis of different aesthetics, approaches and processes of the artists that work in augmented reality.

When creating the conceptual structures for this collection my main personal goal was to develop a link – or better to create the basis for a link – between ear-

lier artistic interventions in the 1960s and the current artistic interventions of artists that use augmented reality.

My historical artist of reference was Yayoi Kusama and the piece that she realized for the Venice Biennial in 1966 titled *Narcissus Garden*. The artwork was a happening and intervention at the Venice Biennial; Kusama was obliged to stop selling her work by the biennial's organizers for 'selling art too cheaply.'

"In 1966 [...] she went uninvited to the Venice Biennale. There, dressed in a golden kimono, she filled the lawn outside the Italian pavilion with 1,500 mirrored balls, which she offered for sale for 1,200 lire apiece. The authorities ordered her to stop, deeming it unacceptable to 'sell art like hot dogs or ice cream cones.'" [1]

The conceptualization and interpretation of this gesture by critics and art historians is that of a guerrilla action that challenged the commercialization of the art system and that involved the audience in a process that revealed the complicit nature and behaviors of the viewers as well as use controversy and publicity as an integral part of the artistic practice.

Kusama's artistic legacy can perhaps be resumed in these four aspects: a) engagement with audience's behaviors, b) issues of art economy and commercialization, c) rogue interventions in public spaces and d) publicity and notoriety.

These are four elements that characterize the work practices and artistic approaches – in a variety of combinations and levels of importance – of contem-

porary artists that use augmented reality as a medium. Here, is not perhaps the place to focus on the role of 'publicity' in art history and artistic practices, but a few words have to be spent in order to explain that publicity for AR artworks is not solely a way for the artist to gain notoriety, but an integral part of the artwork, which in order to come into existence and generate interactions and engagements with the public has to be communicated to the largest possible audience.

"By then, Kusama was widely assumed to be a publicity hound, who used performance mainly as a way of gaining media exposure." [2] The publicity obsession, or the accusation of being a 'publicity hound' could be easily moved to the contemporary group of artists that use augmented reality. Their invasions of spaces, juxtapositions, infringements could be defined as nothing more than publicity stunts that have little to do with art. These accusations would not be just irrelevant but biased – since – as in the case of Sander Veenhof's analysis in this collection – the linkage between the existence of the artwork as an invisible presence and its physical manifestation and engagement with the audience can only happen through knowledge, through the audience's awareness of the existence of the art piece itself that in order to achieve its impact as an artwork necessitates to be publicized.

Even if, I do not necessarily agree with the idea of a 'necessary manifestation' and audience's knowledge of the artwork – I believe that an artistic practice that is unknown is equally valid – I can nevertheless understand the process, function and relations that have to be established in order to develop a form of engagement and interaction between the AR artwork and the audience. To condemn the artists who seek publicity

in order to gather audiences to make the artworks come alive is perhaps a shortsighted approach that does not take into consideration the audience's necessity of knowing that interaction is possible in order for that interaction to take place.

What perhaps should be analyzed in different terms is the evolution of art in the second part of the XXth century, as an activity that is no longer and can no longer be rescinded from publicity, since audience engagement requires audience attendance and attendance can be obtained only through communication / publicity. The existence of the artwork – in particular of the successful AR artwork – is strictly measured in numbers: numbers of visitors, numbers of interviews, numbers of news items, numbers of talks, numbers of interactions, numbers of clicks, and, perhaps in a not too distant future, numbers of coins gained. The issue of being a 'publicity hound' is not a problem that applies to artists alone, from Andy Warhol to Damien Hirst from Banksy to Maurizio Cattelan, it is also a method of evaluation that affects art institutions and museums alike. The accusation moved to AR artists of being media whores – is perhaps contradictory when arriving from institutional art forms, as well as galleries and museums that have celebrated publicity as an element of the performative character of both artists and artworks and an essential element instrumental to the institutions' very survival.

The publicity stunts of the augmented reality interventions today are nothing more than an acquired methodology borrowed from the second part of the XXth century. This is a stable methodology that has already been widely implemented by public and private art institutions in order to promote themselves and their artists.

Publicity and community building have become an artistic methodology that AR artists are playing with by

making use of their better knowledge of the AR media. Nevertheless, this is knowledge born out of necessity and scarcity of means, and at times appears to be more effective than the institutional messages arriving from well-established art organizations. I should also add that publicity is functional in AR interventions to the construction of a community – a community of aficionados, similar to the community of 'nudists' that follows Spencer Tunic for his art events / human installation.

I think what is important to remember in the analysis of the effectiveness both in aesthetic and participatory terms of augmented reality artworks – is not their publicity element, not even their sheer numbers (which, by the way, are what has made these artworks successful) but their quality of disruption.

The ability to use – in Marshall McLuhan's terms – the medium as a message in order to impose content bypassing institutional control is the most exciting element of these artworks. It is certainly a victory that a group of artists – by using alternative methodological approaches to what are the structures of the capitalistic system, is able to enter into that very capitalistic system in order to become institutionalized and perhaps – in the near future – be able to make money in order to make art.

Much could be said about the artist's need of fitting within a capitalist system or the artist's moral obligation to reject the basic necessities to ensure an operational professional existence within contemporary capitalistic structures. This becomes, in my opinion, a question of personal ethics, artistic choices and existential social dramas. Let's not forget that the vast majority of artists – and AR artists in particular – do not have large sums and do not impinge upon national budgets as much as banks, financial institutions, militaries and corrupt politicians. They work for years

1. David Pilling, "The World According to Yayoi Kusama," *The Financial Times*, January 20, 2012, http://www.ft.com/cms/s/2/52ab168a-4188-11e1-8c33-00144feab49a.html#axzz1kDck8rzm (accessed March 1, 2013).

2. Isabelle Loring Wallace and Jennie Hirsh, *Contemporary Art & Classical Myth* (Farnham; Burlington, VT: Ashgate, 2011), 94.

with small salaries, holding multiple jobs and making personal sacrifices; and the vast majority of them does not end up with golden parachutes or golden handshakes upon retirement nor causes billions of damage to society.

The current success of augmented reality interventions is due in small part to the nature of the medium. Museums and galleries are always on the lookout for 'cheap' and efficient systems that deliver art engagement, numbers to satisfy the donors and the national institutions that support them, artworks that deliver visibility for the gallery and the museum, all of it without requiring large production budgets. Forgetting that art is also about business, that curating is also about managing money, it means to gloss over an important element – if not the major element – that an artist has to face in order to deliver a vision.

Augmented reality artworks bypass these financial challenges, like daguerreotypes did by delivering a cheaper form of portraiture than oil painting in the first part of the XIXth century, or like video did in the 1970s and like digital screens and projectors have done in the 1990s until now, offering cheaper systems to display moving as well as static images. AR in this sense has a further advantage from the point of view of the gallery – the gallery has no longer a need to purchase hardware because audiences bring their own hardware: their mobile phones.

The materiality of the medium, its technological revolutionary value, in the case of early augmented reality artworks plays a pivotal role in order to understand its success. It is ubiquitous, can be replicated everywhere in the world, can be installed with minimal hassle and can exist, independently from the audience, institutions and governmental permissions. Capital costs for AR installations are minimal, in the order of a few

hundred dollars, and they lend themselves to collaborations based on global networks.

Problems though remain for the continued success of augmented reality interventions. Future challenges are in the materialization of the artworks for sale, to name an important one. Unfortunately, unless the relationship between collectors and the 'object' collected changes in favor of immaterial objects, the problem to overcome for artists that use augmented reality intervention is how and in what modalities to link the AR installations with the process of production of an object to be sold.

Personally I believe that there are enough precedents that AR artists could refer to, from Christo to Marina Abramovich, in order develop methods and frameworks to present AR artworks as collectable and sellable material objects. The artists' ability to do so, to move beyond the fractures and barriers of institutional vs. revolutionary, retaining the edge of their aesthetics and artworks, is what will determine their future success.

These are the reasons why I believe that this collection of essays will prove to be a piece, perhaps a small piece, of future art history, and why in the end it was worth the effort.

Lanfranco Aceti
*Editor in Chief, Leonardo Electronic Almanac
Director, Kasa Gallery*

Site, Non-site, and Website

In the 1960's, artist Robert Smithson articulated the strategy of representation summarized by "site vs. non-site" whereby certain artworks were simultaneously abstract and representational and could be site-specific without being sited. A pile of rocks in a gallery is an "abstract" way to represent their site of origin. In the 1990's net.art re-de-materialized the art object and found new ways to suspend the artwork online between website and non-site. In the 21st century, new technologies suggest a reconsideration of the relationship between the virtual and the real. "Hardlinks" such as QR codes attempt to bind a virtual link to our physical environment.

Throughout the 1970's, institutional critique brought political awareness and social intervention to the site of the museum. In the 1980's and 90's, street artist such as Banksy went in the opposite direction, critiquing the museum by siting their art beyond its walls.

Sited art and intervention art meet in the art of the trespass. What is our current relationship to the sites we live in? What representational strategies are contemporary artists using to engage sites? How are sites politically activated? And how are new media framing our consideration of these questions? The contemporary art collective ManifestAR offers one answer,

> *"Whereas the public square was once the quintessential place to air grievances, display solidarity, express difference, celebrate similarity, remember, mourn, and reinforce shared values of right and wrong, it is no longer the only anchor for interactions in the public realm. That geography has been relocated to a novel terrain, one that encourages exploration of mobile location based monuments,*

and virtual memorials. Moreover, public space is now truly open, as artworks can be placed anywhere in the world, without prior permission from government or private authorities – with profound implications for art in the public sphere and the discourse that surrounds it."

ManifestAR develops projects using Augmented Reality (AR), a new technology that – like photography before it – allows artists to consider questions like those above in new ways. Unlike Virtual Reality, Augmented Reality is the art of overlaying virtual content on top of physical reality. Using AR apps on smart phones, iPads, and other devices, viewers look at the real world around them through their phone's camera lens, while the app inserts additional images or 3D objects into the scene. For instance, in the work *Signs over Semiconductors* by Will Pappenheimer, a blue sky above a Silicon Valley company that is "in reality" empty contains messages from viewers in skywriting smoke when viewed through an AR-enabled Smartphone.

AR is being used to activate sites ranging from Occupy Wall Street to the art exhibition ManifestAR @ ZERO1 Biennial 2012 – presented by the Samek Art Gallery simultaneously at Bucknell University in Lewisburg, PA and at Silicon Valley in San Jose, CA. From these contemporary non-sites, and through the papers included in this special issue of LEA, artists ask you to reconsider the implications of the simple question *wayn* (where are you now?)

Richard Rinehart
Director, Samek Art Gallery, Bucknell University

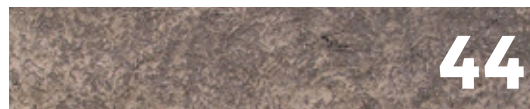# Leonardo Electronic Almanac
Volume 19 Issue 1

Situated Soundscapes: Redefining media art and the urban experience

by

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1. INTRODUCTION

The advancement of the telecommunications industry has enabled the telephone to become a portable communications device and a tool for providing social networking and information services. With the development of mobile technology, smartphones now also provide an entertainment experience previously only available on portable devices such as the Nintendo DSi, to present an integrated, ubiquitous communication and information services, social networking and entertainment device. This has allowed mobile phone gaming to move from early games such as Nokia's *Snake* [40] to graphically rich and interactive games such as *iPhone's Epoch* [14] which is reminiscent of a traditional console presentation. The smartphone's portability and accessibility to the Internet has enabled multimedia applications to be downloaded and experienced at any location that the user chooses, at anytime. This new device has led to individual access to various multimedia and creative experiences,

alowin it to become a creative tool employed in the art domain and for entertainment experiences that can include downloadable interactive games, enhanced audio books and music.

With the integration of GPS (Global Positioning System) technology to the mobile phone platform, smartphone applications based on the Apple or Google Android platforms, can now interact with real world locations where the physical space becomes a contextual cue for the social interaction or media narrative. With the addition of location technology, digital media has now become a personalized experience that is revolutionizing the way people engage and experience their everyday environment, [6] just as the mobility and ubiquity of the Walkman did in the 1980s. However, whereas the Walkman could be seen as a metaphor for the individualistic culture, the smartphone can be viewed as representing the connectedness of a larger and more global society. [23] Thus, mobile computing can give rise to new types of interactions within an urban setting and creative behaviors and aesthetic practices in people's everyday life.

2. FROM INSTALLATIONS TO AUGMENTED REALITY

The use of the digital medium as a form of artistic expression can draw its roots from the development of information technology. Vannevar Bush was one of the first scientists to consider information technology being used for creative thought, and subsequently

A B S T R A C T

The rise of GPS (Global Positioning System) enabled smartphones, such as the iPhone and Google Android mobile operating system, together with the high-bandwidth network access afforded by third generation (3G) networks, has meant the use of these devices progressing beyond their social networking and communication purposes to become creative tools employed in the art domain and for entertainment experiences. Smartphones are able to augment real world spaces by introducing a digital narrative that can alter one's experience of a space, allowing it to reveal details and experiences in a previously unseen manner, thereby providing a rich and new encounter of this new world. A number of applications currently exist that augment space using visual means, however, there are still only a limited number that use audio. This technology allows for new ways to experience the static audio installation, previously experienced in the studio or gallery. It is now possible to experience dynamic and interactive soundscapes, influenced by one's movements, location and environmental stimuli. Hence the experience is aural and unencumbered, creating an automated embodied encounter where one becomes the performer and the space an interactive soundscape. This paper presents the concept of interactive soundscapes and looks at a methodology for the use of mobile technology that challenges the tendency to simply extend traditional media onto the mobile sphere. Instead, location technology and the urban space can be viewed as an artistic canvas on which sound artists, musicians and composers can test the classical constraints of design, ruled so long by the physics of space, time, and material in order to experiment with new media content compositional strategies to create entirely new forms of art.

the 1960's saw an emergence of multimedia work in scientific circles that embraced technology. This new experimentation in the creative arts between scientists and artists led to work that could incorporate multisensory engagement and interactivity. [27] As this collaboration continued, multimedia presentations in the 1960s and 1970s soon began to take the form of 'installations' with this word being used to describe the combined use of media such as video, music, lighting and computer technology for immersive creative

experiences in a traditionally static space. [37] As information technology continued to advance, artists such as Myron Krueger began to consider the possibility of virtual experiences. In the early 1960s, Krueger coined the term 'artificial reality' (virtual reality) to describe his interactive immersive environments. The 1980's saw an investment in interactive technology where virtual spaces are navigated by developed interfaces. [33] Scott Fisher's Virtual Interface Environmental Workstation system (VIEW) included a Head Mounted Dis-

play (HMD) with two small liquid crystal display screens, a microphone for speech recognition, earphones for surround sound effects, a head-tracking device and a data-glove for the processing of the user's gestures in order to place them within the virtual environment, an idea populated by the film *The Lawnmover Man* (1992). [8] Fisher believed that engaging, immersive environments could lead to a new form of participatory, interactive electronic theatre. The majority of virtual reality applications resulted in an encumbered experience – one in which the user is bound by wearing the technology enabling the virtual interaction and which is separate from the world around them.

As artists utilized technology for media art expression, entertainment technologies such as film and gaming also applied the developing digital and information technologies in creating engaging environments. These scenarios used immersive surround sound presentations, rich visuals and interactivity. With the continued advancement of personal computer technology and gaming devices, portability of interactive entertainment experiences for the individual was made possible. [15] Portable devices can be described as handheld game consoles which are lightweight, portable, with a built-in screen, game controls and speakers. Unlike console games which are static in nature, portable devices such as Nintendo's *Gameboy* (1989) allowed the flexibility of players to engage with a game space at any time and place. [45] With the introduction of mobile technology and its subsequent increased memory and processing power, the majority of these entertainment experiences have now moved from traditional portable entertainment devices to the smartphone, signaling a merging of telecommunications and information technology industries.

Currently, not only can the media experience be undertaken in any location at any time, smartphones with integrated GPS capabilities are also able to aug-

ment real world spaces by introducing a digital narrative overlay onto a real world location. [10] In contrast to virtual reality where the user is separated from the outside world and isolated within a digitally mediated narrative, augmented reality experiences encourage the user to remain engaged with their surroundings while interacting with the digital media, hence occupying a blended, mixed reality 'third space' where the real world is changed or 'augmented' by the digital overlay, thereby giving it a different meaning. [31] Mäyrä at al points to the possibilities of augmented reality gaming as not only testing the imagination and creativity but also questioning the ideas of what constitutes reality and what it means to be present and virtual. [29] There are currently many applications that utilise GPS technology for a variety of purposes but fewer that use visual and/or audio overlays over real world locations. *Layar* [28] is a browser application that visually displays local information and reviews on the mobile phone camera view and relies on a combination of the GPS receiver, internal compass, accelerometer and mobile Internet connection. The camera captures the world as seen through its lens and displays it on the screen. The GPS information determines the exact location and the compass and accelerometer the field of view. *Foursquare* [18] is an example of a GPS mediated social networking application, where users note their location and that of their friends. An example of an augmented reality game is *SpecTrek,* [44] a ghost hunting game where the player must capture ghostly images in the camera view in order to win rewards and progress in the game. In the majority of mobile phone and portable device experiences, the location of the player is not of paramount importance to the narrative structure. However in augmented reality applications the user's physical location coordinates and movements are important elements of the narrative experience.

3. MEDIA ART AND THE URBAN SPACE

The emergence of augmented reality has not only redefined the entertainment experience but has also opened up the possibilities for artists to recontextualize media art and the urban experience by exploring the use of portable, location aware devices in which the physical space becomes the canvas. The practice of locative media art (a term coined by Karlis Kalnins) [20] utilizes location aware technology in real world locations for an emphasis upon locality and the deinstitutionalization of the traditional artistic installation, [46] hence breaking down the exclusivity barrier between artist and the general public – a concept first popularized in the 1990's by French critic Nicolas Bourriaud. [24] However locative media art has differed from the general understanding of augmented reality. Locative media art aims to enhance the social engagement with a space together with a critical understanding of oneself and culture. [24] Locative media projects such as *Can you see me now?* (2006) [1] and *Uncle Roy All Around You* (2003) [5] explore user interactions of the social and spatial relations of a narrative in a given space and their cultural understandings, allowing private narratives to become public and subject to reinterpretation. Other narrative-led location aware projects also include *Urban Tapestries* [24] which combined GPS information to enable users to explore their physical space and to map and share their knowledge and experiences of the environment. Therefore, locative media art can facilitate the understanding of the relationship between one's agency and the social and cultural structure around them.

Augmented reality is a descriptor of the technological experience rather than a social statement such as locative art [24] and refers to GPS information and smartphone technology allowing for the embedding of visual and audio information over a physical space where reality is overlaid with virtual reality. Now with the popularity and ubiquitous nature of the smartphone, artists are able to experiment with the merging

of the locative media art paradigm, location technology and augmented reality. Smartphones and location technology can offer new ways of media art to engage the world and reconfigure ones understandings and experiences of space and culture. [20] This creates a sense of territory, in which there is the mapping of physical space and the production of an artistic or cultural milieu: the artist creates a new way of seeing and occupying the world. [24] By including the physical location in the virtual medium, an urban intervention is constructed to encourage encounters from outside the contained realities, hence interrupting everyday life. [48] By augmenting an urban space, places and activities that were previously viewed as mundane become reinterpreted, revealing details and experiences that were unseen, thereby providing a rich and new encounter of this new world.

4. SOUND AND SPACE

4.1 Sound Installations
With the emergence of collaborative work between the creative arts, scientists and technologists in the 1960–70's, artists strived to develop works that could appeal to the entire sensory experience. Therefore, there was a progression to incorporate or exclusively use sound to immerse the listener in a space. [27] One such example is composer La Monte Young's and Marion Zazeela's *Dream House* (1964) installations, which are an environment for sound and light installations where speakers are positioned to guide the listener through a given space. [12] This is an example where sound is spatially experienced in a given environment and extends the music from the traditional concert hall setting. [27] The sound artist Christina Kubisch, also began experimenting with sound and space by creating sound installations produced from the mutual interaction of electromagnetic fields towards the end of the 1960s. [13] The 'electrical' sound was made

by loudspeakers interacting with a field of electrical wires where the sounds changed depending on the person's movement. The participant 'mixed' their own sounds as they moved through the gallery space in a timeframe of their choice. Don Ritter's *Intersection* (1993) is another sound installation where visitors interacted with sensors controlling the sound of 4 or 8 lanes of traffic rushing across a dark space. As they moved through the space, the traffic sounds changed with the result of the sound depending on the visitor's physical reaction. [26] The Canadian sound artist Janet Cardiff, also aimed to recreate real world soundscapes in static installation spaces. Her work *Forty-Part Motet* (2001) aimed to recreate the performance of Tallis's *Spem in alium* by the Salisbury Cathedral Choir by utilizing a forty channel stereophonic experience. [17] In order to receive the full effect of the installation, the listener had to stand in the centre while surrounded by the speakers. Otherwise they would not experience the surround sound effect and proper psychoacoustics (sound propagation) for the almost hyper-real sonic clarity of the recording. In these examples, sound art installations in a static space have aimed to recreate real spaces and their sonic qualities or create new interactive means of engaging and changing the audience with sound in a given space. Even though, these artists have aimed to deconstruct the elitist and exclusive nature of art installations, there is still the requirement for the audience to enter a 'space' of the artist's choice rather than experience it at their leisure. There is the additional problem that the viewer must be placed in the correct position for the sound interaction to be effective and installations recreating real events can at times appear artificial, as they may lack other sensory information associated with the experience. By positioning the work in a studio or gallery space, the work is removed from the real world and may undermine the desired immersion and engagement to a narrative. By transferring sonic art experiences from the gallery space and onto relevant

real world locations, the audience is able to engage in a realistic way with the added benefit of inclusivity and accessibility for the general populace. Situated soundscapes can accurately depict real locations and their sound qualities and allow for greater interactivity and individual movement within the sound space.

4.2 Situated Soundscapes

Sound artists began to experiment with transferring their gallery installations into the real world whereby soundscapes would change depending on the movement of the participant. Max Neuhaus sought to bring sound, space and interactivity together while drawing on environmental noise, acoustical dynamics and architectural elements, thereby positioning the listener and sound inside a greater urban space. His work *Drive In Music* (1967) consisted of a series of radio transmitters located along a half-mile stretch. Each transmitter broadcast a certain frequency for that zone. As listeners drove through the given locations, the frequencies could be tuned into, overlapping and mixing as one drove from one zone to another. [47] This signaled a change for sound artists in appreciating the creativity afforded by dispersing sound across a greater real world space, effectively fixing sound to a location. Kubisch also moved her gallery work into the urban space by extending her 1980's work with electromagnetic fields to include interactions with real world locations. With magnetic headphones altered in order to perceive local electrical currents translated to acoustic sound, Kubisch developed her *Electrical Walks* (2003) site-specific sound installation. [13] As the participant moved throughout an urban space they were able to hear the audio effects of electrical currents of cell phones, elevators, light systems to name a few, hence augmenting the real world location with a unique soundscape. Therefore with situated sound art, the perception of everyday reality changes and there is a blurring of boundaries between the real and the media, the unheard becomes heard, and the urban space

is experienced in an altered way. Another example that explored the possibilities of interactive soundscapes in urban spaces is *Sonic City* (2004) which draws upon ubiquitous computing and wearable computing to create a portable music system that responds via sensors to changes in the ambient environment as the user walks through an urban environment. [22] *Sonic City* generated a personal soundscape co-produced by physical movement, local activity, and urban ambience. Using the city as an interface, *Sonic City* enabled users to create a realtime personal soundscape of electronic music by walking through and interacting with urban environments. The prototype consisted of a wearable computer that sensed the user's physical actions and mapped them to an algorithm that generated music in real-time. Sensors used included; a metal detector, an IR-sensor (infrared) measuring proximity to walls and objects, a light intensity sensor, a microphone that measured sound level, an accelerometer that sensed starts and stops and a pace sensor that set the music tempo of the session. When wearing this system, urban atmospheres, random encounters and everyday activities all participate in creating music while walking. As technology has developed, artists have sought

different methods of anchoring and triggering sounds in relation to real world locations. In Mark Shepard's *Tactical Sound Garden (TSG)* (2007) [39] project, wireless (WiFi) "hot zones" were used to install a "sound garden" for public use. The participants downloaded the software and travelled to the specified location of the soundscape within an urban place. Upon entering a sound garden, participants connected to a local *TSG* server and downloaded a small client application along with a library of sounds to their device. As the participant moved through the sound garden, the client application periodically identified the participant's position. This positioning information was fed to the 3D audio engine running on the client, which subsequently output a realtime audio mix specific to the current location of the listener. As well as anchoring sounds to specific locations, *Tactical Sound Garden (TSG)* also utilized psychoacoustic principles such as spatialized sound to place the audio in a sound field, with the soundscape changed in relation to the user's direction. Three-dimensional audio has increasingly been utilized in creating realistic sound presentations for interactive soundscapes. Janet Cardiff's *Her Long Black Hair* (2004) audiowalk was created by using a binaural technology narrative (accurately emulating 3D human hearing) played on a Walkman together with photographs, guiding the listener through Central Park in New York City. [25]

> *Even though these artists have aimed to deconstruct the elitist and exclusive nature of art installations, there is still the requirement for the audience to enter a 'space' of the artist's choice rather than experience it at their leisure.*

With increased public access to GPS technology in the 1990's, sound artists were able to begin to explore methods of accurately anchoring sounds to specific sites that could be triggered by a dedicated GPS receiver device or a mobile phone. As the technology developed, sound installations became more sophisticated and mobile. *Sound Mapping* (1998) by Iain Mott is an example whereby participants realized a composition by wheeling four movement-sensitive suitcases within a public place, with the "aim to assert a sense of place, physicality and engagement to reaffirm the relationship between art and the every day." [24] *Sound Mapping* produces music in response to nearby architectural features, subtle movements and gestures, and by the movements of the participants. Similarly, *Aura* (2004) by Steve Symons is an example whereby a virtual sound environment is accessed by walking through a space equipped with GPS and digital compass. Individual users can "hear" the location of other participants, and work together to create sonic tapestries through their relative movements. [3]

These examples have all described unique methods of creating a new soundscape layer over a real world space. However the majority of previous site-specific sound installations have required encumbered setups. The development of GPS enabled mobile phones such as the smart phone, provided the means for artists to create increasingly unencumbered soundscape experiences in physical locations that allowed for ease of movement and an embodied control of audio to augment the local space. Additionally, with the popularity and availability of smartphones these experiences can be unique for the participant and experienced at a time of their choosing, facilitating an inclusive sound art experience. *Dimensions* (2012) developed by RJDJ, an augmented music team together with composer Hans Zimmer, is an auditory cinematic experience where the movement of the smartphone and environmental sounds create a dynamic soundscape, mediated by the surrounding urban space. [11] External sounds are recorded, filtered and added to the audio together with pre-determined music that is mixed into the overall soundscape. Another augmented reality audio experienced on the smartphone is *Soundwalk* (2009) which uses the *Layar* browser and mixes fiction and reality in a cinematic experience giving the listener the impression of actually being in a film.

Soundwalk augments reality with additional audio content overlaid onto certain locations around Paris. [43]

The listener's perception and experience of a space can be modified depending on movement through the space and surrounding environment. Since the ground rules defining the structure of environments are changing, our idea of how we are embedded in the world is changing. Urban spaces can be experienced in an alternate way that uses sound to blur the boundary of virtual and reality, allowing the interpretion of different spaces in a new and creative way. The use of smartphone technology in artistic practice signals the development of a new art form medium that can be further extended to afford artists even greater avenues of creativity and interactivity, outside the gallery space. Pushing the limits between art, urban space and mobility, liberates us from the conventional way of relating to technology, society and physical spaces.

5. METHODS OF REDEFINING SOUND ART IN THE URBAN SPACE

In order for locative sound artists to continue to socially redefining the art space and experience, artists must expand and challenge established notions and develop new models of interaction. As technology progresses, new ideas of an interactive engagement in a real space continue to evolve, and the role of the participant is redefined. New methods of implementation must be considered in order to modify how soundscapes can evolve and respond to the environment and participant. The aim now is to look to the creation of an all-encompassing soundscape application, on several smartphone platforms, that incorporates the effect of not only the local architectural and natural environment, but also the social and economic factors that impact everyday life. In combining these factors together with the manipulation of external

sound and established music compositional idioms and guidelines, the participant is able to not only experience the locative sound artwork but also to become an integral part of its final compositional outcome.

5.1 Mobile Technology and Audio
5.1.1 Location Technology
In order to create interactive and immersive soundscapes overlaid onto an urban space, the location of the participant needs to be established. The sound design framework must be such that it is unencumbered, smooth in its transitions and automatic in the sense that the user is not consciously aware of the technology. Various methods can be used to trigger audio. In the case of locative art in an urban space, GPS technology is the most easily accessible and commonly used. However, problems with this technology continue to persist such as network unreliability and inaccuracy, which can at times consist of an eight metre delineation error. [34] This can disrupt the desired experience and immersive quality. Locations must be carefully sourced that not only support the narrative context but that also provide enough open space to enable the GPS system to register three points from three different satellites for best accuracy. Additionally, smartphones that utilise a three-axis internal compass are able to accurately determine the direction the person is facing enabling the sound artist to anchor audio to specific architectural landmarks. Research into new methods of triggering content is currently underway such as *SonicNotify* [41] which utilise inaudible frequencies from televisions and radios to trigger content on the smartphone. Additionally there has been recent work on improving the already available GPS technology with the launching of additional satellites for improved location tracking.

5.1.2 Triggering of Audio

Once the location and the direction of the device has been ascertained, and the direction, audio files can be triggered in a number of ways. The most popular smartphones platforms, the *iPhone* and *Google android* offer two distinct methods of audio playback. The first is a media player that allows for longer, linear files to be triggered and the second player is used for shorter files for 'sound effect' playback. Longer files can be used to trigger and loop pre-determined soundscapes that are relevant to the given space. Additionally, shorter files can be triggered that respond dynamically to the person's movement and direction. These can be detected by an accelerometer (ascertains speed of movement) and compass integrated within the smartphone. Gaming middleware (services beyond those available from the operating system) applications such as FMOD (for *iPhone*) [16] can act as an audio engine for the smartphone in order to trigger audio files when pre-programmed criteria are met (i.e. such as GPD data). Additionally, audio samples can be stored on the internal memory card of the smartphone and triggered by midi text files in relation to GPS data. *Sonivox Jet* [42] provides realtime mixing of a full wavetable MIDI synthesizer to create textures by customizing the wavetable. Many samples can be mixed differently according to locations with midi text files being streamed from local networks. Another method of triggering audio would be simply to stream files directly from a local server in response to a location. However, this method is unreliable and slow.

5.1.3 Manipulation of Audio
Once audio is triggered using a variety of methods, the artist can choose to either use pre-determined and recorded sound or to manipulate the audio using realtime computing on the smartphone. Examples of simple manipulations are the looping of files, playing multiple files simultaneously or changing file play-

back parameters such as speed of play, which would change the pitch and timbre of sound. For example, *Viking Ghost Hunt* (2010), [34] an augmented reality ghost-hunting prototype, uses the process of generative audio. This technique utilizes the playback of numerous overlapping audio files with varying pause times between them. This process depends on careful sound file creation and results in an evolving soundscape that is dynamically changing and perceived as continuous. Furthermore, middleware software such as FMOD and Pure Data [35] can again be used in filtering and manipulating audio files so that the original file is altered. This software utilizes digital signal processing technology in order to change audio parameters such as the filtering of audio frequencies to create altered sounds from the one audio file. Additionally, external audio can be recorded and digitally processed by the middleware software to created altered real world sounds that can be added to the overall soundscape mix. Again these technologies are progressing to include more functionality. For example granulation (altering the timbre by using small millisecond 'grains' of sound) of audio is now possible on the smartphone by using the *Curtis* [9] application. Even though, the processing capabilities of smartphones lack that of general computing, it is still possible to create immersive, complex soundscapes.

5.1.4 Psychoacoustics

Psychoacoustics describes the propagation of sound in the real world, and is presented in a three-dimensional manner to enable localization, distance perception and recognition [2]. The most accurate method of spatialized audio over headphones is by the use of HRTF (Head Related Transfer Function) binaural audio filters. These filters take into account the effect of the ear structure, head and torso on the sound input before it reaches the eardrum for sound localization [21]. By utilizing software that incorporates binaural technology, spatialisationof sound can be accurately

Even though the processing capabilities of smartphones lack that of general computing, it is still possible to create immersive, complex soundscapes.

represented. Currently, it is difficult to accurately binaurally spatialize sound in real time, with middleware programs already mentioned (FMOD, Pure Data) only having the functionality to approximate (semi) binaural audio presentations. However, the artist is still able to manipulate the positioning of sound objects in any way they desire within a sound field – with the ability to spatialize multiple sounds in different spatial locations. Other programming software, such as OpenSL ES [32] for the *iPhone* also spatializes audio sound objects in a three-dimensional plane, but depends upon programming language for implementation. In the context of locative sound art, it would be creatively desirable to anchor sound objects to a real world location in such a way that they remain static in the sound field even as the participant physically changes direction in relation to it. In the previously mentioned prototype, *Viking Ghost Hunt* this was achieved by panning the sound (changing the amplitudes between two channels) in relation to head movement in the

real world. However, it was found to be unreliable and dependent on the type of smartphone that was used. [34] This is an area requiring further research that could significantly alter the creative possibilities available to artists in regards to spatial audio digital overlay on a physical location.

As well as spatialization, the use of reverberation is of importance when creating sound pieces that aspire to be immersive. Reverberation describes the propagation and interaction of sound with surfaces that create the ambience of a space. [38] Two types of reverberation can be used in sound art designs: 'artificial' and 'convolution' reverberation. Convolution reverberation is the process of simulating the reverberation of a physical (or virtual) space and is based on the mathematical process of convolution (multiplying two signals to create a third). An impulse response measurement (a recording of the reverberation) of the intended space to be simulated is recorded and then convolved with the dry audio signal to be processed. This reverberation of the processed audio signal then reacts to that of the intended physical or virtual space. [4] Real space reverberation simulation is a technique already used in film. "Worldising" – a sound concept made famous by sound designer Walter Murch, is a process where existing recordings are re-recorded in a real world acoustic space therefore taking on the characteristics of the new space. [30] Artificial reverberation is an approximation of real reverberation and involves controlling various reverberation parameters such as time delay, room size, number of early and late reflections. The use of reverberation on audio files for smartphone sound artworks can currently be accomplished to a limited extent in realtime using FMOD [16] and Pure Data. [36] Due to the current processing power possible on the smartphone platforms, it is not possible to produce convolution reverberation that is reactive to the physical space of the participant. This area would benefit from new research as the creative implications for sound art installations would be significant.

There are many technological constraints when considering the smartphone as a creative device for sound installations especially when considering psychoacoustic principles, such as reduced memory ca-

pacity and processing power. However, the avenues of creativity are endless, and the challenge that confronts the artist is to form new solutions through experimentation in order to realize the creative potential. Working with mobile technologies is simultaneously a glance into the future but also a reminder of the past; many amenities, functionalities, and power of modern computing technology on which we depend on, are increasingly becoming available on the mobile platform. Hence, the avenues of creative expression are continuously evolving and changing.

5.2 Automated Composition: The audience as performer

In order for the processes of triggering and manipulating audio to result in a sound artwork, it ultimately must be mediated by a 'performer' and a physical space. As one moves through a space, incoming data from GPS coordinates, internal compass information and accelerometer readings can trigger different audio files and digital processing in order to augment a physical space with sound. When these sounds are mixed, together they combine to create a unique soundscape for a specific location. Hence the emergent soundscape is the result of an 'embodied composition' where the smartphone acts as an automated instrument and with the movement through the space creates the 'performance'. An 'automated instrument' is a device which automatically produces sound where the formal processes are algorithmically derived and controlled. There are many early examples of automated instruments such as the Hurdy Gurdy of the fifteenth century and mechanical singing birds of the eighteenth century. Viewing music procedurally rather than purely as expression dates back to ancient times and includes early church music and the formulation of the rules of counterpoint. Wolfgang Amadeus Mozart's *Musikalisches Wurfelspiel* is an example of an algorithmically derived piece where the performer composes a piece of music based on the throw of a

dice with values corresponding to precomposed measures of music [7].

Iannis Xenakis was a contemporary composer utilizing probabilities to control shapes, densities and statistical data to control changes of contour between musical parameters together with compositional processes that are outside the musical medium. Using this same concept, statistical data can be retrieved from the smartphone such as the time of day, climate and stock market values that are then 'sonified', that is, represented by sound. Therefore as the performer moves through a space, the digital soundscape can be informed by the sonification of this input data by either adding sound or by controlling various musical parameters. An urban space can be augmented with the overlaying of a given soundscape together with the sonification of social data. Creating a dynamically changing soundscape that embodies the experiences of architecture, economics, environment and technology, enabling the potential for different performers to encounter the same space differently each time. In addition to the sonification of data, external sound can be recorded, altered and added to the soundscape mix.

Compositionally, the use of external or 'found sound' objects for music making is described as musique concrète. The theoretical underpinnings of the aesthetic were developed by Pierre Schaeffer, beginning in the early 1940s, [46] where the compositional material was not restricted to the inclusion of sounds derived from musical instruments or components traditionally thought of as 'musical'. *Net_Dérive* (2008) [46] is an example of utilizing the mobile platform and GPS technology together with the concept of musique concrète, where recorded sounds of the city are processed to give the listener an abstracted soundscape experience of the urban space.

The term idiomatic writing is used to describe the process of composing music that takes into consideration the characteristics of an instrument. If we apply the principle of idiomatic writing to the smartphone and its technological frameworks, the challenge for artists is to develop formal processes of design to create soundscapes that respond in a profound way to the locative, social and interactive dynamics of an urban space. The use of interactive, participatory, and location aware technologies poses an interesting set of compositional, aesthetic and technological challenges. Firstly, the sound design framework must take into account the non-linearity of the medium and unpredictability of the interactions within an urban space. Formal compositional processes and input data that will control audio parameters must also be considered. Finally the technical constraints of realtime digital processing of audio must and its effects should be measured when developing a situated soundscape application.

6. CONCLUSION

By using many of the audio technologies on the smartphone originally developed for gaming and commercial ventures, sound artists are now able to expand on the known boundaries of locative sound art to include unique and ubiquitous experiences that can be accessed by the general public. This paper has reviewed just a few of the potential methodologies available in creating an interactive urban sound experience. Each time we experience a space, factors such as the environment, speed of ones movement, climate, time of the day and location all add to our encounter of the same space and may be experienced differently depending on our interactions. Sonification of this dynamically changing data embodies the experiences of architecture, economics, environment, technology and creativity in an audio and spatial narrative that enables society to engage differently with a location, opening up alternate explorations. Using the smartphone as an automated musical instrument for an algorithmically derived original soundscape provides a new way of relating to technology, society and the urban space. ∎

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NATASA PATERSON & FIONNUALA CONWAY

interviewed by
Lanfranco Aceti & Richard Rinehart

Is there an 'outside' of the Art World from which to launch critiques and interventions? If so, what is the border that defines outside from inside? If it is not possible to define a border, then what constitutes an intervention and is it possible to be and act as an outsider of the art world? Or are there only different positions within the Art World and a series of positions to take that fulfill ideological parameters and promotional marketing and branding techniques to access the fine art world from an oppositional, and at times confrontational, standpoint?

Our work is situated at the meeting-point of disciplines – art, technology and design – and we feel that the boundaries are fluid and ever-changing. Because of that, we are constantly shifting within these spaces and find it difficult to define the territory and boundaries. Our practice lies more securely in the domain of experience design, which tends to be seen as outside the art world. However we are not interested in creating works that challenge, oppose or take a confrontational standpoint.

"In *The Truth in Painting*, Derrida describes the *parergon* (*par-*, around; *ergon*, the work), the boundaries or limits of a work of art. Philosophers from Plato to Hegel, Kant, Husserl, and Heidegger debated the limits of the intrinsic and extrinsic, the inside and outside of the art object." (Anne Friedberg, *The Virtual Window: From Alberti to Microsoft* (Cambridge, MA: MIT Press, 2009), 13.) Where then is the inside and outside of the virtual artwork? Is the artist's 'hand' still inside the artistic process in the production of virtual art or has it become an irrelevant concept abandoned outside the creative process of virtual artworks?

In our practice, the work is most certainly guided by the artists' hands. The establishment of a framework

from which to allow the viewer, listener or performer to experience the work is our primary concern. We set up the rules and let them play out. Therefore, the boundaries of the extrinsic and intrinsic of our virtual work is blurred as the artist and the viewer collaborate in producing the emergent artwork.

Virtual interventions appear to be the contemporary inheritance of Fluxus' artistic practices. Artists like Peter Weibel, Yayoi Kusama and Valie Export subverted traditional concepts of space and media through artistic interventions. What are the sources of inspiration and who are the artistic predecessors that you draw from for the conceptual and aesthetic frameworks of contemporary augmented reality interventions?

The practice of locative media art utilizes location aware technology and digital overlays on real world locations with emphasis upon locality and the deinstitutionalization of the traditional artistic installation. The aim is to use art to redefine or enhance the social and physical interaction with a space in order to develop a critical understanding of oneself and culture. An early predecessor for the conceptual framework would be Richard Long with his augmenting of physical landscapes. In regards to a digital narrative real world overlay, projects such as Blast Theory's *Can you see me now* and Proboscis's *Urban Tapestries* explore one's agency and the social and cultural structure around them. As our particular emphasis is the auditory experience in a given space, works by Janet Cardiff and Christina Kubisch are of inspiration in regards to sound, space and interactivity with an urban space. Additionally, architect Christopher Alexander and his theories on urban design and the nature of space and affect are also of interest.

In the representation and presentation of your artworks as being 'outside of' and 'extrinsic to' contemporary aesthetics why is it important that your projects are identified as art?

For our work it is not important that our projects are identified as art. What is most interesting is personal interaction with a space, in the creation of an individualized soundscape, reflective of the urban space and the cultural experience. Whether this is viewed as art is inconsequential – of most importance is the emergence of a creative interaction and redefinition for the individual of their everyday space.

What has most surprised you about your recent artworks? What has occurred in your work that was outside of your intent, yet has since become an intrinsic part of the work?

It has been interesting to note that the over use of technology can take away from the artistic experience. For locative media projects, immersion where one is not distracted by the technology is desirable, hence smooth, unencumbered and easy to use setups must be implemented. The use of psychoacoustics has now become an interest in our artwork as user feedback has indicated a potential immersive/creative application. ■

NATASA PATERSON & FIONNUALA CONWAY

statement & artwork

Natasa Paterson is a Dublin based composer and performer. Dr. Fionnuala Conway is a composer and multimedia artist.

Originally from Australia, Natasa completed her M.Phil in Music and Media Technologies in Trinity College, Dublin and is currently studying for a PhD exploring sound design and composition for location aware media. Natasa is also currently the lead audio designer and composer for Haunted Planet Studios Ltd. and has worked on augmented reality projects such as Scottish Ghost Hunt, Pirates of Emerson and Bram Stoker's Vampires. Trained in piano, cello and voice, Natasa was project manager of the Irish Composers' Collective in 2010–2011 and is a member of the collective and IMRO. Natasa's compositional work include pieces for choir, piano, string quartet and the use of electroacoustic elements and she was the 2012 winner of the first Annual Ad Astra Composition Competition. Natasa is also the 2012–2013 recipient of the Fulbright-Enterprise Ireland scholarship to study Film Scoring at UCLA. Her pieces have been performed at The National Concert Hall, Samuel Beckett Theater, Cake Contemporary Centre and Centre for Creative Practices.

Dr. Fionnuala Conway has been lecturing on the M.Phil. in Music and Media Technologies course at Trinity College, Dublin, Ireland, since 2002 and was appointed Course Director in 2006. With a background in music and music technology, she has worked as composer and performer on a number of theatre productions and produced work in a wide variety of forms, from traditional materials to interactive digital media, wearable technology, installations and theatre presentation, including *Art of Decision* and *Urban Chameleon*. Her PhD thesis, *Exploring Citizenship through Art and Technology,* focuses on the creative use of technology to generate awareness of citizenship (and other social issues), with a particular focus on interactive immersive physical environments. *Art of Decision* is the practical manifestation of Fionnuala's thesis. As a multidisciplinary and multimedia artist, she is comfortable using a wide variety of media and methods to realize her work and this approach is presented in a diverse number of artworks.

Urban Chameleon, 2003, Katherine Moriwaki and Fionnuala Conway, wearable technology. © Copyright Moriwaki and Conway, 2003.

Visual Overlay – Visual media overlay in an urban alleyway. *Viking Ghost Hunt*, 2009, Natasa Paterson, audio. Courtesy of HauntedPlanet Studios Ltd.
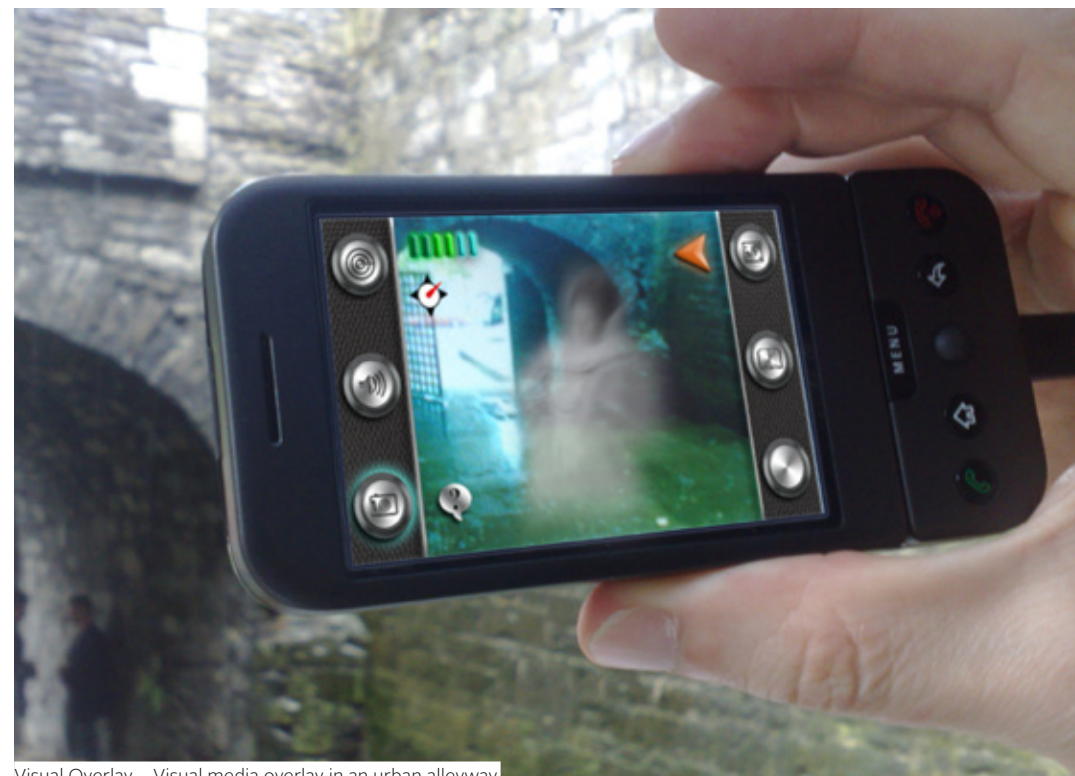
Their collaborative interests include an exploration of compositional techniques in locative media, such as algorithmic composition and sound design, as well as, an architectural syntax that relates to urban paces, mood and design. With the advent of Global Positioning System (GPS) technology, specific locations can trigger audio backgrounds and effects, while the tracking of performer's movements using integrated smartphone orientation technology, can also contribute compositional original elements to the overall soundscape experience. Because locative media art aims to interpret the relationships between society, culture and the individual, they also have a keen interest in how the urban space can be expressed through sound. ■
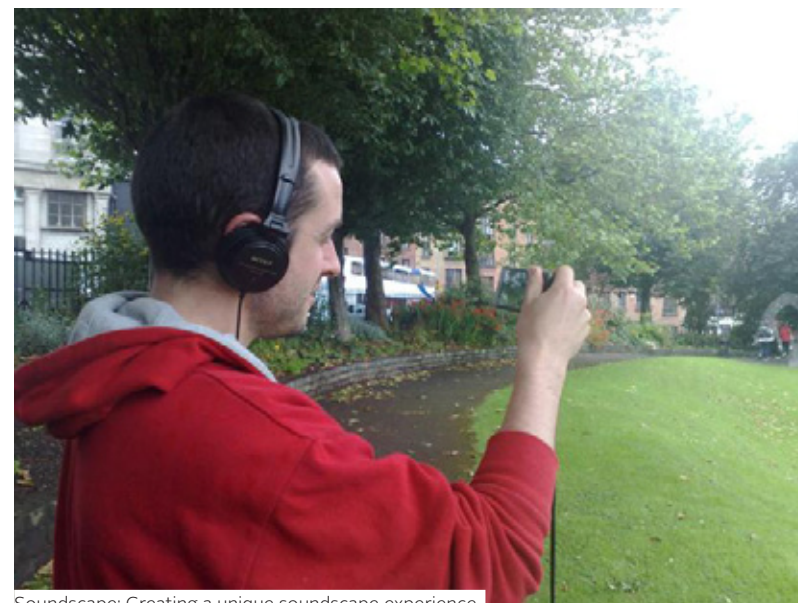
URL'S

http://www.natasapaulberg.com

http://vimeo.com/user2288756

http://www.fionnualaconway.com

http://vimeo.com/user1135842

Art of Decision - DATAmap exhibit, 2005, Fionnuala Conway, interactive installation. © Copyright Fionnuala Conway, 2005.

Soundscape: Creating a unique soundscape experience. *Viking Ghost Hunt*, 2009, Natasa Paterson, audio. Courtesy of Haunted Planet Studios Ltd.

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