Art.CHI **2016**

Interactive Media Works

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About Art.CHI 2016

Our second volume of the Art.CHI catalog accompanies the first dedicated Art Exhibition at the SIGCHI Conference, CHI2016, San Jose, CA curated by Ernest Edmonds and Jason Challas. It follows on from our first Art.CHI catalog, which accompanied workshop and Interactivity demonstrations in Seoul, South Korea at CHI2015. This catalog documents the work shown in the exhibition, "Inter/Action: digital art that responds" presented by ACM SIGCHI CHI2016 and Works/San Jose, as well as high quality contributions that could not be shown physically. The curators were looking for artworks that were novel, thought-provoking, evocative, sensorially-rich interactive art experiences, and created by a diverse and broad group of creative practitioners. The selection process was based on the criteria listed below.

- ***Originality and Novelty:*** the work should be highly original, creative and imaginative. It should exemplify novel concepts in surprising and challenging ways that add something to what exists already.
- ***Aesthetics:*** the work should have a strong aesthetic element and communicate effectively through form, function, behavior and emotion. Aesthetically interesting qualities include features that are pleasing and exciting as well as provocative.
- ***Realization:*** the work must have a tangible aspect, in the form of an installation, object or art piece that can be included at a reasonable cost. It should be built and executed to a high standard suitable to be exhibited at CHI 2016.
- ***Value:*** the work has the potential to open doors to new ways of thinking about interaction, evaluation and aesthetics, both in HCI and the Interactive Arts and/or critiques present and emerging forms.

Our aim was to invite work which challenges the notions of what it means to interact with digital technology, and provoke discussion on where research, design and development in Human Computer Interaction might go in the future, especially when considering the cultural and aesthetic impact of interactive technology. We trust the reader will find that the catalog demonstrates that our aim was more than met, find it equally thought-provoking and a stimulus for discussions with artists as part of their own work.

— David England, Celine Latulipe, Ernest Edmonds, and Jason Challas

Interactive Art *— Ernest Edmonds*

Introduction

Art becomes *interactive* when audience participation is an integral part of the artwork. Audience behavior can cause the art itself to change. In making interactive art, the artist goes beyond considerations of how the work will look or sound. The way that it interacts with the audience is a crucial part of its essence. The core of the art is in the work's behavior more than in any other aspect. The creative practice of the artist is, therefore, quite different to that of a painter. A painting is static and so, in so far as a painter considers audience reaction, the perception of color relationships, scale, figurative references and so on will be of most interest. In the case of interactive art, however, it will be the audience's behavioral response to the artwork's activity that will be of most concern. Audience engagement will not be seen in terms of just how long they look. It will be in terms of what they do, how they develop interactions with the piece, whether they experience pain or pleasure and so on.

Interactive art is distinguished by its dynamic 'behavior' in response to external stimuli, such as people moving and speaking. For artists, this means that observing people interact with their works provides a way of understanding exactly how the work 'performs', that is, how it responds to the gestures, sounds and other features of audience behavior in the immediate environment. Observing the responses of an interactive work can reveal unexpected effects that may or may not be desirable from the artist's point of view. By contrast, understanding how people feel about their experience with interactive artworks is an altogether different matter but, for some artists, this too is critical to how they pursue the further development of the artworks. Whether the focus is on the interactive work or the audience behavior, being able to explore the 'interaction space' involves some form of observation or evaluation.

Almost all systems, whether natural or artificial, interact in someway, and there are many dimensions and levels to the kind of inter-connected relationships that characterise interaction. A two-way exchange of information between people or between people and computers is interaction of a simple kind. However, when that communication consists of feedback on something one person has said or written that affects the thinking or behavior of the other person (or artifact or event) in some way, then the nature of that interaction is quite transformed. If we take an action and some one, or something, responds to it in such a way as to exhibit change in themselves and that in turn affects us, then a deeper level of interaction has occurred.

Interaction and the Art System

An interactive artwork can be described in terms of its behavior, the mechanism by which it operates and the means of its construction. It can be helpful to see the interactive artwork in systems terms (Cornock and Edmonds. 1970). A system is a collection of elements, or objects, that relate one to another: a change in one implies changes in others according to the relevant relationships. A static system is one in which nothing changes. An artwork, such as a painting, is essential a static system. We say " essentially" because, of course, the nature of light that falls on a painting, the color of the wall on which it is hung, and so on, certainly change how it looks. Physically, however, it is fixed. By Art System, we mean an artwork that consists of a system that changes within itself and where that change is apparent to an observer. The physical art system itself can also be seen as an element of a larger system that includes the audience, which was referred to as 'The Matrix' in the Cornock and Edmonds paper discussed in my book chapter 'Art, Interaction and Experience' (Edmonds. 2011).

Art Systems are systems of interrelated and interacting parts that change either by virtue of their internal mechanisms or because they are responding to the environment around them. The distinction between an art system that has an internal rationale that alone determines how it responds or 'behaves' and one that is affected or stimulated by external factors such as the degree of light or the presence of a moving human being, is an important one for the purposes of this exhibition. An art system is a system of the last kind if it has the *potential* to interact with the world, whether or not that happens.

There are two primary kinds of art system. The first is known as a 'closed' system and is one that is not subject to any external influence. It is like a clockwork mechanism that moves and changes within itself according to its own logic. The second is known as an 'open' system in which at least some of the elements can be changed by external forces, be they the wind or human intervention, for example. In respect of art systems, it is helpful to distinguish between open systems that are influenced by the general environment, such as wind or temperature, and those that are (or are also) influenced by the audience. 'Kinetic' works that respond to wind or temperature change, are at one end of a spectrum and interactive installations at the other. In the first case, the works do not depend on the context for them to realize their full potential, as in the Duchamp works mentioned above. By contrast Gina Czarnecki's Silvers Alter installation makes sense only with human participation:

> *"The installation takes the form of a large scale back-projection on which human forms 'live'. These figures are changed by the audience's presence and movement within the space. Interactivity is very physical. It encourages a social, physical and verbal interaction between people before the interaction with technology." (Czarnecki, 2005)*

By Interactive Art System we mean the category where human actions, or measurements from human bodies such as heart rate, affect the behavior of the system. In this article, the term "art system" will be used to refer to this interactive case. By contrast, the term "artwork" is used to refer to a static art object.

For an interactive art system, as distinct from a static artwork, certain basic criteria apply for it to be defined as such:

- It must have the capability of responding to an input of some kind, perhaps many diverse inputs, from the environment in which it exists.
- Its behavior must be 'dynamic' in some way, by which is implied a visible or tangible or observable or traceable response.

As audience participation is essential for a fully interactive art system, digital components are usually required for its construction. Computer technology is fundamentally general purpose and at the same time readily adaptable for whatever form of interaction is required. Today, almost any interactive system from a washing machine to a car to an art system is controlled by computers and realized through software.

The use of the computer as a control device that handles interactions according to complex and possibly changing rules has transformed participative art. By programming the computer with the rules that define the artwork's behavior, the artist is able to build significant dynamic interactive art systems that would otherwise have been impossible to construct and very difficult to conceive in the first place.

The complexity of computer programs that act as controllers of interactive art is such that considerable effort is required in understanding just what they imply in terms of behavior in all of the expected and unexpected circumstances that might arise. This means that research is of increasing significance to the interactive artist because of the need to acquire new knowledge and skills in the constantly changing world of digital technologies.

Early Interactive Art

It is possible to debate at great length about the origins off interactive art but, for the purpose of this introduction, I will start with Marcel Duchamp. In 1913, excited perhaps by the new technology in bicycle wheel hubs, he took a wheel, fixed it on a stool and placed it, upside down in his studio. A replica is now seen as a work of art, but Duchamp said:

> *"Please note that I didn't want to make a work of art out of it. The word "readymade" did not appear until 1915, when I went to the United States. It was an interesting word, but when I put a*

bicycle wheel on a stool, the fork down, there was no idea of a "readymade" or anything else. It was just a distraction." (Cabanne, 1971:47)

Part of the distraction was in spinning it, so, art or not, it was interactive in the simplest sense. When, later on, he made *Rotary Glass Plates*, this work was intended to be an artwork. It was also interactive in an extremely simple sense: the viewer had to turn it on, and hope not to be injured it seems! According to Duchamp, the first version "nearly killed Man Ray" when he started it and the glass shattered (Naumann and Obalk, 2000).

Much later in the century, John Cage composed 4.33, his famous 'silent' piano piece. Although not exactly interactive, this work was, like the Duchamp pieces, incomplete without the actions and attention of the audience. 4.33 encouraged the audience to listen to the ambient sounds around them. Then, in 1953, Yaacov Akam started making what he called *Transformable Reliefs*. These were artworks that could be rearranged by the audience. He also made other pieces that were play objects of a sort, that had to be stroked or touched in some other way for the audience to experience them as intended. His interest, according to Günter Metken was "... to release the creativity of the art public, to encourage people to enter into the spirit oh his work and change it according to their tastes" (Metken, 1977). This interest, put this way, probably captures the intention of many artists who explored interaction in the early days. Akam went on, beyond the transformable works, to try many other ways in which the audience could participate in the creative act.

The kind of work that Duchamp, Cage, Akam and others were making became know as "open works" once Umberto Eco's 1962 essay on the subject became known (Eco, 1989). Based largely on an analysis of modern music (but not mentioning Cage) this paper articulated a growing concern for "an open situation, in movement. A work in progress."

Eco is concerned to argue that an open work is not one to which the audience can do what they like.

> *"The **possibilities** which the work's openness makes available always work within a given **field of relations**. As in the Einsteinian universe, in the 'work in movement' we may well deny that there is a single prescribed point of view. But this does not mean complete chaos in its internal relations. What it does imply is an organizing rule which governs these relations."*

Eco distinguished between a performer and a member of the audience, "an interpreter", but argues that in the context of an open work, they are in much the same situation. Looking at, listening to or interacting with an artwork is in essence a performance in his terms.

A significant pioneer was Nicolas Schöffer, who developed the concept of cybernetic sculpture through a series of innovative works. For example, in 1956 he presented *CYSP 1*, a dynamic sculpture that interacted

with a dancer and the environment, using photoelectric cells and a microphone as sensors (Schöffer, 1963). Another early innovator in interactive art was Robert Rauschenberg. In 1959 he made the combine painting *Broadcast*, which had three radios built into it that members of the audience were free to tune as they wished[1]. It was not his only excursion into interaction. John Cage recounts:

> *"(I cannot remember the name of the device made of glass which has inside it a delicately balanced mechanism which revolves in response to infrared rays.) Rauchenberg made a painting combining in it two of these devices. The painting was excited when anybody came near it. Belonging to friends in the country, it was destroyed by a cat." (Cage, 1961: 106)*

Possibly the cat's reaction was an early example of behavior in relation to interactive art that did not conform to the artist's expectation, although it might have pleased Cage.

As electronics developed, the opportunities for making interactive art increased. A significant sculptor using new technology was Edward Ihnatowicz. His work *SAM* was shown in Cybernetic Serendipity (Reichart, 1968). *SAM* looked rather like a flower mounted on a short backbone. It used hydraulics to move its parts in response to sound detected by four microphones in the 'flower-like' head. *SAM* was more sophisticated in the way it interacted than most of the earlier work in that it only responded to certain levels of sound, not to quiet and not too loud. Also at Cybernetic Serendipity was Gordon Pask's *The Colloquy of Mobiles* (Pask, 1968). This was a work based on Pask's cybernetic principles in which a set of five mobiles that interacted with one another, communicating through light in a kind of sexual dance aimed at reaching some kind of stable state of satisfaction. Although it was primarily based on interactions between the mobiles, the public was able to use lights and mirrors to influence the behaviors and so it was a true pioneering example of interactive art. Also in 1968 the Museum of Modern Art, New York, mounted the exhibition The Machine, which included Lillian Schwartz's piece *Proxima Centauri*, made with Per Biorn. It was sensitive to the proximity of spectators and tempted them to peer into the work by creating a red glow as they approached, which slowly sunk into the work (Schwartz and Biorn, 1969).

After he showed *SAM*, Edward Ihnatowicz went on to build *The Senster* (Figure 1), which was possibly the first interactive sculpture driven by computer. It was a very large lobster arm like construction that detected sound and movement in response to which it moved, rather in the same way that *SAM* did, but with a much more sophisticated appearance. In fact, as with *SAM*, it seems that the algorithms used to drive the behavior were relatively simple. It was the complexity of change in the environment and certain rules within the algorithm (such as ignoring very loud noises) that led to this sophisticated appearance. In Ihnatowicz's work it is clear that how a sculpture looked was of relatively little importance. What mattered was how it behaved and, in particular, how it responded to the audience.

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[1] This was the first interactive art work that I encountered. I saw it in the 1964 Rauschenburg exhibition at the Whitechapel Gallery, London.

At the same time that Ihnatowicz was developing *The Senster*, Stroud Cornock and I were using a computer to develop another interactive artwork, **Datapack*. Interestingly, but perhaps not surprisingly, we used a very similar machine to Ihnatowicz. We used a Honeywell DDP-516[2] and he used a Philips machine that was very similar and, possibly, a re-badged version of the same computer.

From the early days of experimental interactive art, it was seen that the computer could have an important role in managing interactions. This role is quite different to the computer as a means of producing graphic art images. By 'managing', was meant that the computer controls the way an artwork performs in relation to its environment including its human audience. Because the role of the computer was envisaged as critical to the experience, some speculated that such work could transform the artist from an art specialist in creating artworks to a catalyst for creativity. So the audience was seen as the new really important element in the artwork. Indeed, in my Communications Game works of the early 1970s the artwork consisted of people communicating with one another (Edmonds and Franco, 2013).

Jack Burnham saw the importance of understanding artworks in their environment and that all things "which processes art data,...are components of the work of art" (Burnham, 1969). So, by that definition, the audience is part of the artwork. By 1966, Roy Ascott had developed a view in which participation and interaction between the audience and the artwork was central (Ascott, 1966). He later gave up the practice of making art objects all together: "In California in the 1970s, introduced to the computer conferencing system of Jacques Vallée, *Informedia*, I saw at once its potential as a medium for art and in 1979 abandoned painting entirely in order to devote myself wholly and exclusively to exploring telematics as a medium for art" (Ascott, 1998). Ascott has become one of the most active figures in the community, as a teacher, speaker, writer and conference organizer, as well as a practicing artist.

In other art forms, such as Happenings[3], participation was also prevalent. Kirby described rather basic examples of participation in Allan Kaprow's *Eat*: "Directly in front of the entrance, apples hung on rough strings from the ceiling. If the visitor wished, he could remove one of the apples and eat it or, if he was not very hungry, merely take a bite from it and leave it dangling" (Kirby, 1965b). Participation in the artwork, by becoming part of the art system and interacting with whatever the artist provided, was becoming a familiar experience, whether it was typing at the keyboard or eating the apple.

Stephen Willats has worked on participation in art since the 1960s and is one of the most consistent artists in this respect. He explains that the function of his work is:

> *"to transform peoples' perceptions of a deterministic culture of objects and monuments, into the possibilities inherent in the community between people, the richness of its complexity and self-organization. The artwork having a dynamic, interactive social function." (Willats, 2011)*

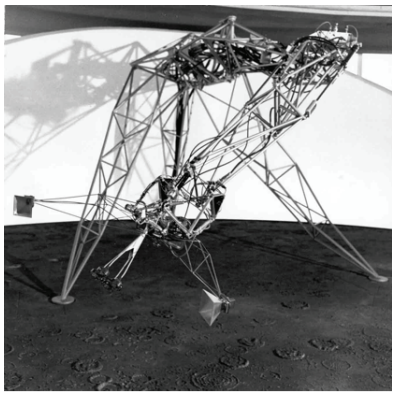

Figure 1. The Senster, Edward Ihnatovitz

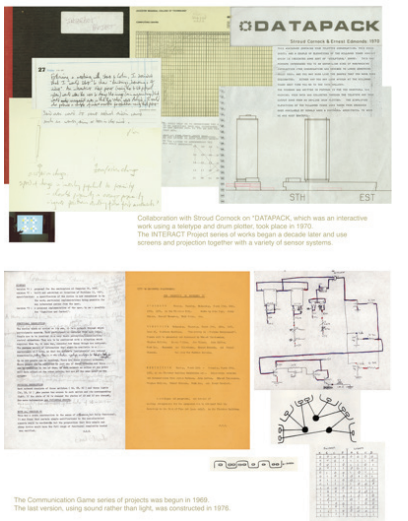

Figure 2. Documentation of Interactive works 1968-1976. Ernest Edmonds.

[2] See http://www.old-computers.com/museum/computer.asp?c=551 (accessed 17.4.2011)

[3] Happening: a form of theatre, performed 'in the street', sometimes confused with Fluxus. See Kirby (1965b)

In 1965 Willats published the first issue of Control Magazine, which has included many contributions on socially situated, participative, art and on interactive art systems. In the first issue[4] he states that the artist provides a starting point for the observer[5] and:

> *"The observer is given restrictions inside these restrictions are variables, with which he determines his own relationship." (Willats, 1965)*

This captures a significant aspect of many artists' attitude to their work at that time. The artist set up a system, with restrictions, that the participant could operate in a way that led to there own completion or resolution. For some, like Willats, going beyond those restrictions was also welcomed, so that the possibilities become "limitless".

The development of interactive art was a geographically wide phenomenon with significant activity, for example, in Australia. The Sydney collective 'Optronic Kinetics' were committed to 'responsive artworks' and they made such a work (unnamed) around 1969.

> *"It consisted of a dark room in which was placed a cathode ray screen controlled by a radio frequency device sensitive to movement. As one moved about the room a wave pattern changed form on the screen and a sound of varying pitch was emitted from a device called a Theremin." (Davis Smith, of Optronic Kinetics, quoted by Stephen Jones in his book on early art and technology in Australia (Jones, 2011: 164))*

The Growth of Interactive Art

Once the personal computer and the individual workstation appeared, the pace of change in interactive art accelerated significantly. Computers had been interactive and people had developed human-computer interaction before these machines appeared, but their new availability brought access to interactive computing out of specialist laboratories. Although artists did not necessarily restrict themselves to using personal computers, the availability of such machines certainly caused a significant growth in interest and activity. A few examples will suffice in order to present a picture of the scope of the developments.

Karl Sims is a technically highly competent artist who developed a strong line of work around the notion of evolution in artificial life-like systems, implemented in his case, as for many others, by the use of cellular

[4] Roy Ascott was one of the contributors to Control Magazine

[5] Today we would be more likely to use the term 'participant' rather than 'observer'

automata . A cellular automata system is a matrix of simple on/off elements (cells) that have an effect on their near neighbors at each step in a step by step process (each step being called a 'generation'). All kinds of rules may be invented to determine the effect, for example a cell might be set 'on' at the next step if it has two neighbors that are on. Artists, such as Sims, produce graphical representations of such evolving processes as time based artworks, sometimes using random variation in the rules and a selection algorithm that decides which alternative next generation to go with. Karl Sims has made works where he has turned such systems into interactive artworks by replacing the selection algorithm by human choice, a process that he called 'perceptual selection' (Simms, 1992).

Simms work *Galápagos*, from 1997, exemplifies this approach. The work consists of twelve screens on stands driven by a network of twelve Silicon Graphics workstations. Pads on the floor are used for participant actions. They are used in two ways. When there is a set of displays on the screens a participant can stand in front of the one they 'like best' and so make the 'perceptual selection'. Other pads are provided that will activate the development of the next generation of the system. As Sims put it:

> *"Twelve computers simulate the growth and behaviors of a population of abstract animated forms and display them on twelve screens arranged in an arc. The viewers participate in this exhibit by selecting which organisms they find most aesthetically interesting and standing on step sensors in front of those displays. The selected organisms survive, mate, mutate and reproduce... Although the aesthetics of the participants determine the results, the participants do not design in the traditional sense. They are rather using selective breeding to explore the "hyperspace" of possible organisms..." (Sims, 1998)*

The interaction is simple, but the computational complexity that it drives is quite high.

Christa Sommerer and Laurent Mignonneau have a substantial history of collaborating on interactive art works based on artificial life (Sommener and Mignonneau, 2009). Indeed, as early as 1992 they made a work, *Interactive Plant Growing*, that used **real** plants as the interface that participants touched or approached.

A classic example of there work is *Life Spaces II*, which was created in 1999. Physically, the work consists of a laptop computer on a stand in front a large projection screen. Virtual creatures, appear, grow and move on the screen using artificial life concepts. Participants are invited to type text into the laptop and, as they do, the text is used by the computer to generate new virtual creatures that enter the space, and so on. Participants can also type in text that becomes food for the creatures to feed on.

Figure 3. Life Spaces II by Sommener and Mignonneau

"The creature's lifetime is not predetermined, rather it is influenced by how much it eats...a creature will starve when it does not eat enough text characters and ultimately die and sink to the ground...

Written text ... is used as genetic code, and our text-to-form editor translates the written texts into three-dimensional autonomous creatures whose bodies, behaviors, interactions and survival are solely based on their genetic code and the users' interactions." (Sommener and Mignonneau, 2009: 107,8)

Many artists have explored artificial life in various ways. In his article "Twenty years of artificial life", Simon Penny provides a brief survey of those developments (Penny, 2011). He cautions us to remember the vast changes in technology when we look at early examples of this (and implicitly other) kind of art. As he says, however. "... there is still much grist for the mill in the application of these ideas in emerging cultural forms."

A successful interactive artwork that uses a direct relationship between the input and aspects of the output is *Iamascope*. As the designers of this system describe it:

"The Iamascope is an interactive kaleidoscope, which uses computer video and graphics technology. In the Iamascope, the performer becomes the object inside the kaleidoscope and sees the kaleidoscopic image on a large screen (1701) in real time. The Iamascope is an example of using computer technology to develop art forms. As such, the Iamascope does not enhance functionality of some device or in other words, do any thing a, rather, its intent is to provide a rich, aesthetic visual experience for the performer using it and for people watching the performance." (Fels and Mase, 1999)

The idea is that one member of the audience acts as 'performer'. An image processing system detects certain body movements that they make (typically, waving their arms) and uses that to generate both kaleidoscopic type image transformations of them and music. It is also intended to be interesting to other members of the audience who just watch the action, and it is!

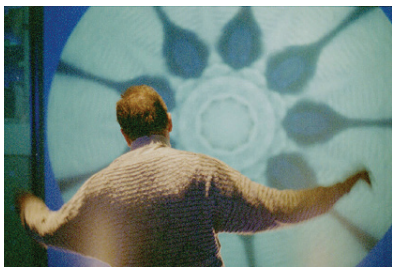

Figure 4. Iamascope by Fels and Mase

Some artists have placed much more emphasis on the physical, one might say sculptural, qualities of their interactive art works and the interaction process. Jeffrey Shaw, for example, has made many such artworks. A well known early work of his is *The Legible City*, 1988-91. In this work a:

"...bicycle with a small monitor on the handlebars is mounted in front of a big projection screen. When the observer pedals, a projection is activated and he can move through three different simulated representations of cities (Manhattan, Amsterdam and Karlsruhe). The architectural landscape of streets is formed by letters and texts... Jeffrey Shaw presents a poetic image of the

architecture of different cities, and leaves the discovery of the virtual information structure to the observer on the bicycle... The illusion is successful because riding, looking and reading compel the observer to dive into the picture. The rider looses himself in total immersion." (Schwarz, 1997: 149)

The works in this exhibition generally give direct and more-or-less immediate feedback to the audience. Some of the work is ambient in the sense that the audience influences the art system through sensor systems that they do not directly touch. However, there is no simple formula that they all follow. 'Interactive art' is not simply one kind of art. There are many different ways of taking an interest in interaction forward: investigating the aesthetic implications of an interconnected human and art systems and developing new forms of audience engagement with the art. Interaction as a key element in art still has many developments ahead of it but this exhibition points to some of the key directions in which artists are today exploring this relatively new art form.

— Ernest Edmonds

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The History of Interactive Art

The ***History of Interactive Art*** is represented in the exhibition by videos of the early work of:

- Gina Czarnecki – *SilversAlter*, 2002
- Sidney Fels and Kenji Mase – *Iamascope*, 1997
- Edward Ihnatowicz – *The Senster*, 1970
- Lillian Schwartz - *The Artist and the Computer*, 1976
- Jeffrey Shaw - *Legible City, Responsive Environment*, 1988-91
- Nicolas Schöffer – *Cyspe*, 1959
- Christa Sommerer and Laurent Mignonneau – *lifespacies*, 1997

by a documentation print of:

- Ernest Edmonds – *Interaction and Communications Game*, 1969-76

and by an upturned bicycle wheel, in memory of the contribution of Marcel Duchamp.

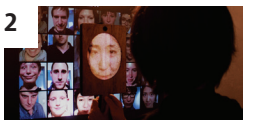
Art.CHI 2016 Interactive Media Works

Section 1 ArtCHI 2016 **Art Exhibition** Curated by Ernest Edmonds and Jason Challas

1 

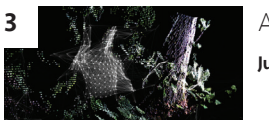
BrightHearts

George (Poonkhin) Khut

2 

idMirror

Maša Jazbec

3 

Avian Attractor

Judith Doyle

4 

Flown

Esther Rolinson
Sean Clark

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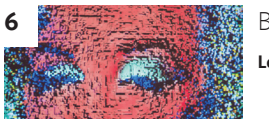
eBee

Celia Pearce, Gillian Smith, Jeanie Choi, Isabella Carlsson

6 

Breaking AndyWall

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This is Not Private

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Alerting Infrastructure

Jonah Brucker-Cohen

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San Carlos Lantern Relay

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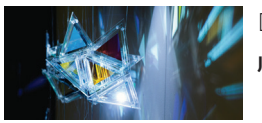
Oscillations

Garth Paine



Dichroic Wade

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Crafted Logic: Towards Hand-Crafting a Computer

Irene Posch, Ebru Kurbak

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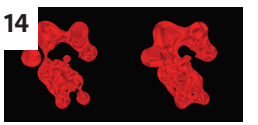
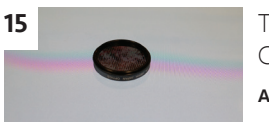
Distractions

Anıl Çamcı

14 

Rainforest

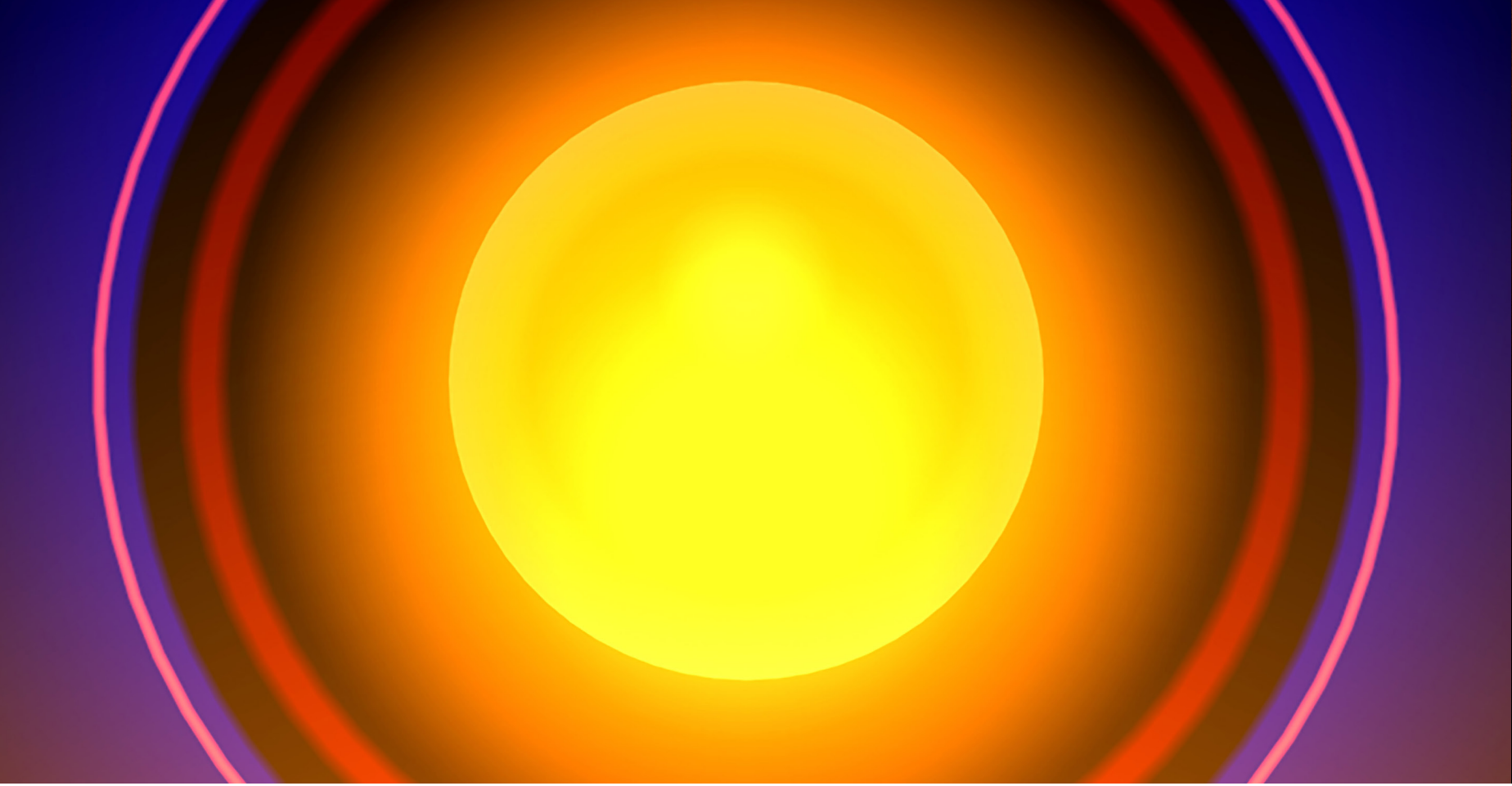
Peter Beyls, André Perrotta

15 

The Rest is Construction

Anna Weisling

Section 2 ArtCHI 2016 **Workshop** Organized by David England, Celine Latulipe and Nick Bryan-Kinns



BrightHearts

George (Poonkhin) Khut
Artist, Academic, Interaction-designer,
UNSW Art & Design, Sydney

The *BrightHearts* app is an interactive artwork that responds to changes in heart rate. The goal of the interaction is to shift the background color from orange, through to yellow, then green and eventually blue – and 'play' a series of bell sounds that descend in pitch, using a combination of gentle relaxation and slow breathing to voluntarily lower their average heart rate. As a user's average heart rate gets slower, the circles contract – drawing in new layers of circular imagery from beyond the edge of the screen – toward the centre. My aim with these biofeedback artworks is to provide people with an aesthetic experience of their psychophysiology – embodied in real-time – within the dynamics of the work.

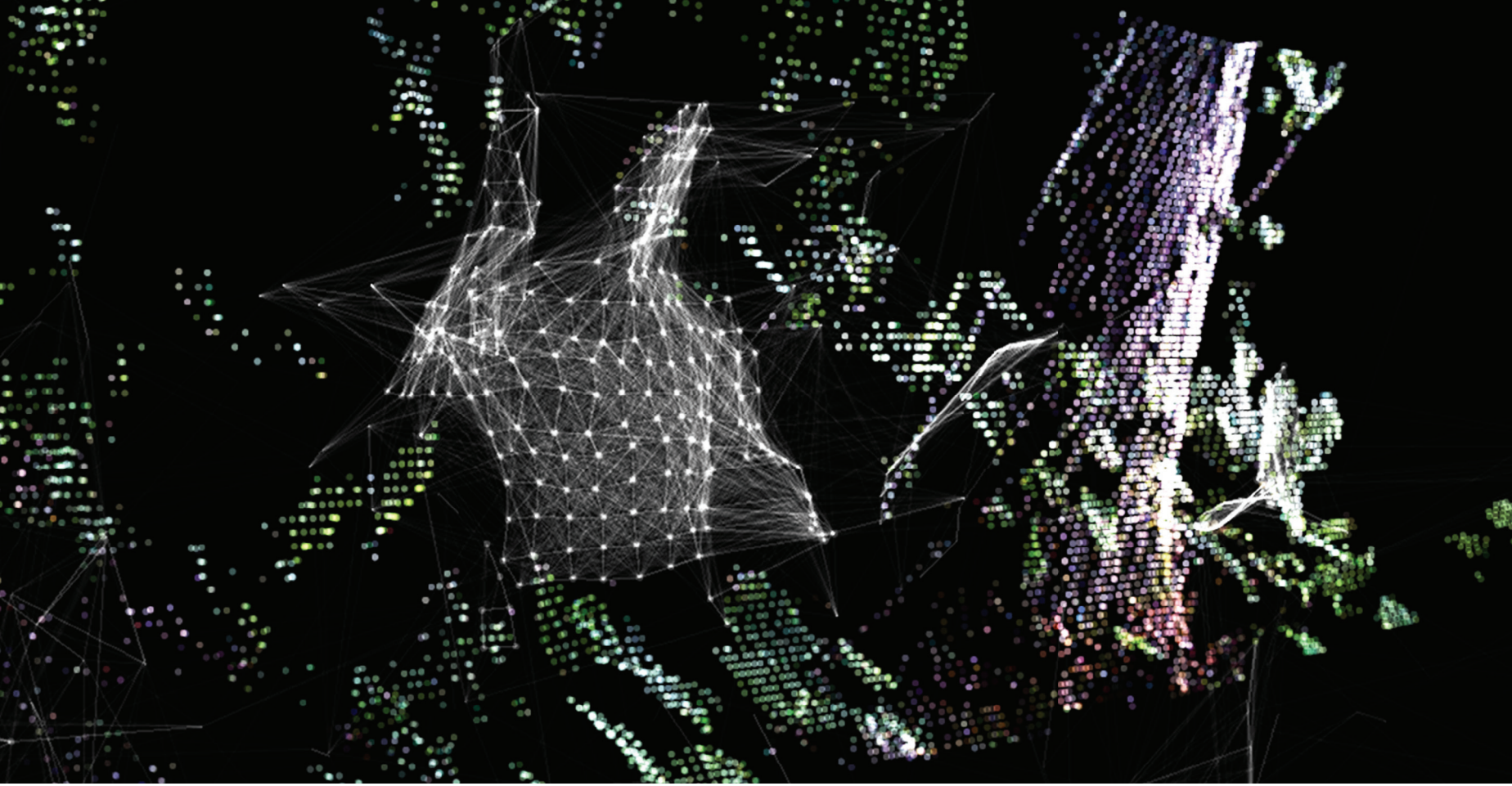
▲ *BrightHearts* – heart rate controlled app, showing red-orange background at the start of the interaction, and blue halo contracting into the center, triggered by slow exhalation.

idMirror

Maša Jazbec
PhD candidate at Empowerment Informatics of Tsukuba University, Japan

idMirror is an artistic project that investigates how social networks and mobile technologies have changed the perception of human identity. A handle mirror which consists of a tablet computer with newly developed android app uses face recognition to detect the location of the face of the user relative to the device. Based on this it renders a computer graphic at the location of his or her reflection. When a person positions himself/herself in front of the device he/she can see his/her own face in the mirror,metaphorically presenting his/her identity. The image in the mirror slowly becomes distorted like fluid in networks and thus becomes an exposed subject to its permanent manipulation.

▲ When a face is detected, the *idMirror* application stretches the user's face to fill the screen.



Avian Attractor

Judith Doyle
Artist and Associate Professor of Integrated Media, OCAD University, Toronto

Avian Attractor is a sculptural projection mixing depth images of viewers with pre-captured ones of birds in natural and architectural environments. Depth footage is captured using emerging cameras repurposed from their initially intended applications as game controllers. Still somewhat unfixed, these cameras afford opportunities for artistic experimentation, revealing depth perspectives and viewpoints previously hard to record in the field. We developed a camera system to capture and project surface impressions of viewers, combining with urban birds and procedural agents that extend their flight paths and trajectories. Inspired by a feeder in a cold city, *Avian Attractor* is a hub or turning point for gesture, a hybrid place where post-human embodiment is explored and expanded.

▲ **Depth image shot in Quetico Park / Superior National Forest Wilderness area merged with live viewer.**

Images: Judith Doyle. Programming: Naoto Hieda, 2015.

Flown

Esther Rolinson
Artist at Rolinson Craig

Sean Clark
Visiting Research Fellow, De Montfort University, Leicester, UK

Flown is a sculptural installation by artist Esther Rolinson commissioned for Illuminating York Light Festival 2015. It is a cloud-like form of hand-folded acrylic constructed through a drawing process and animated with programmed LEDs. *Flown* is a scalable kit of parts that can be reconfigured to its location. At ArtCHI 2016 a small-scale version will be shown appearing as a geometric haze molding into the gallery architecture. It will include an experimental development using generative programming and addition of an interaction design made in collaboration with Sean Clark.

Through the inclusion of sensors *Flown* will be influenced by atmospheric nuances in temperature and moisture. An intention is to further a sense of subtle connection between the viewer, work and environment.

▲ ***Flown* is a sculptural light installation constructed from hand folded acrylic, LEDs and atmospheric sensors.**

eBee

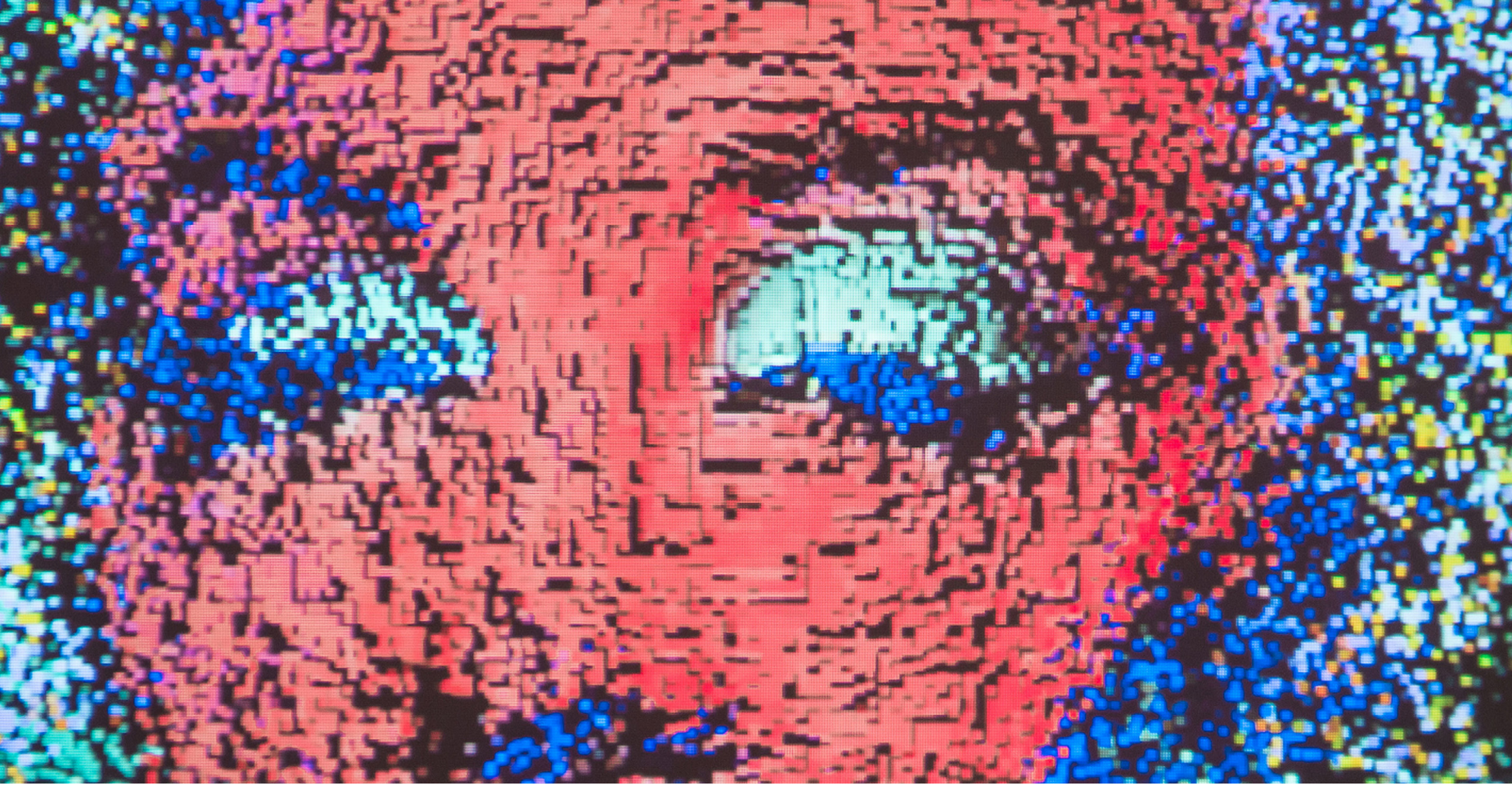
Celia Pearce, Gillian Smith
Associate Professors of Game Design, Northeastern University

Jeanie Choi
Interdisciplinary MFA Student, Northeastern University

Isabella Carlsson
Undergraduate, Northeastern University

eBee is a strategic board game that merges quilting, e-textiles and game design to bridge the gender, ethnic and generation gap in electronics. The game revolves around placing quilted tiles embedded with conductive fabric on a hexagonal grid. The goal is to complete a circuit by laying a path of conductive fabric between a centralized hub or power source, and satellite islands that illuminate when the circuit is completed.

▲ ***eBee*** **provides opportunities for rich, emergent gameplay, while teaching players principles of electricity.**

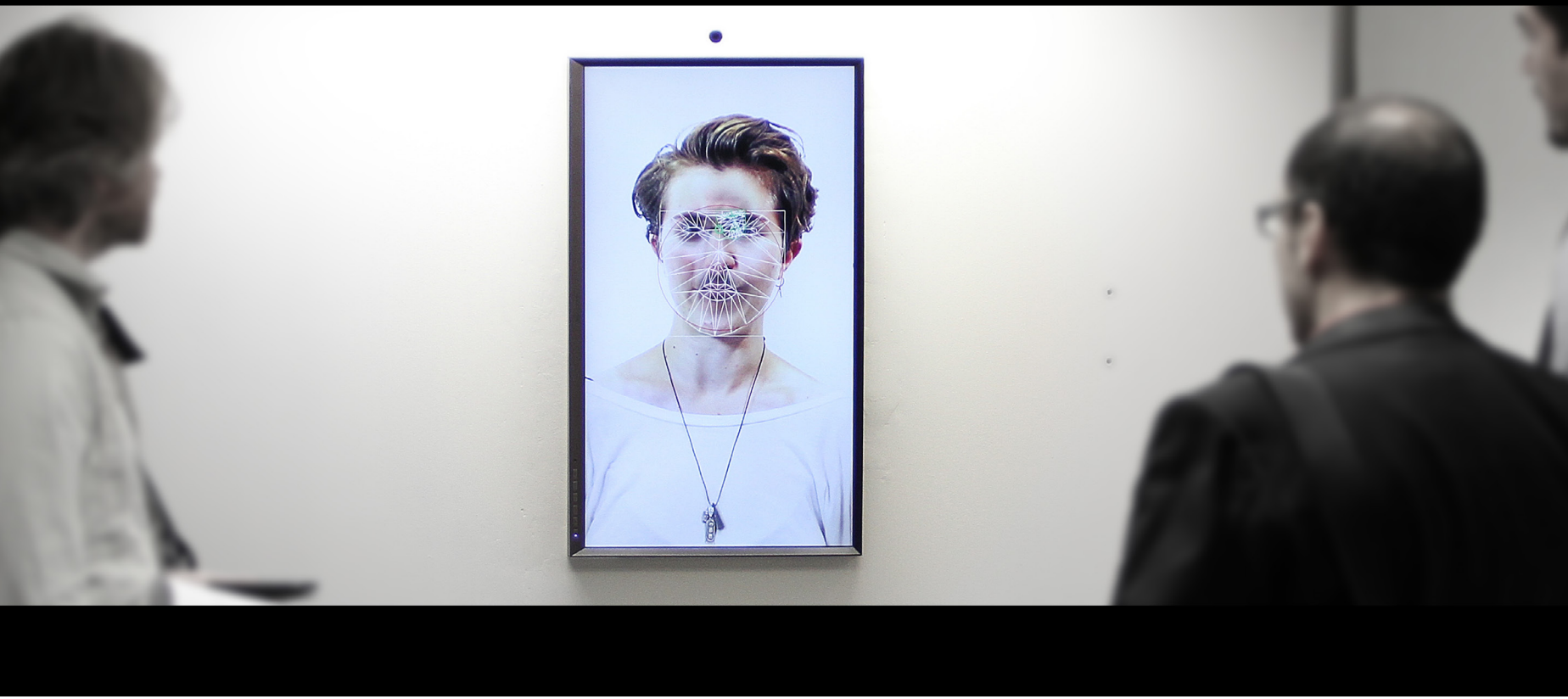


Breaking AndyWall

Leo (Laewoo) Kang
PhD candidate, Information Science, Cornell

Breaking AndyWall is an interactive art installation in which participants can destroy various art pieces that are socially considered as 'great art'. As participants enter the site, they find Andy Warhol's Marilyn Monroe projected on a big canvas. Several wooden hammers are on the floor, and by smashing the canvas with the hammer, participants can gradually break down the art piece. Through the same interaction, participants can destroy several famous artworks in transgressive but playful ways. This project provides an experiential space to contribute to the discussion on the dynamic roles of users in art and design. By invoking an actual experience of destruction and reconfiguration of iconic art pieces, this project challenges the understandings around creativity and design.

▲ Andy Warhol's Marilyn Monroe projected on a big canvas. Several wooden hammers are used to smash the canvas, allowing participants to gradually break down the art piece.



This is Not Private

Antonio Daniele
Visual and Media Artist, @Letitbrain

This Is Not Private is an interactive empathic portrait, which explores the possibilities of empathy as a meta-language through the most powerful physical interface which is our face. The face is a part of ourselves which is not visible to us without the use of an external tool. Dedicated entirely to the "other", it becomes our window to the world and the world's window to ourselves. My challenge with this work is inducing in the viewer a sort of "identity-displacement", which invokes the phenomenon of empathy. An algorithm tracks and calculates the empathic level between the actor and the viewer. The more the viewer empathizes with the actor, the more the two faces merge into a new identity.

▲ The debug lines of the face tracking show, in a visual way, what the algorithm is doing in real time.

Alerting Infrastructure

Jonah Brucker-Cohen
Assistant Professor of Digital Media and Networked Culture, Department of Journalism, Communication, Theatre, Lehman College, CUNY

Alerting Infrastructure is a physical hit counter consisting of a mechanical jackhammer or drill that translates hits to the web site of an organization into interior damage of the physical building that web site or organization represents. The focus of the piece is to amplify the concern that physical spaces are slowly losing ground to their virtual counterparts. The amount of structural damage to the building directly correlates to the amount of exposure and attention the website gets, thus exposing the physical structure's temporal existence. The project has been exhibited in ten countries to date.

▲ **Installation shot, Brussels, Belgium, 2004.**

▲ [Left] ***San Carlos Lantern Relay* at dusk.**
[Right] **Close up of 'Crosswalk' Style Relay button.**

San Carlos Lantern Relay

Steve Durie
Artist and Lecturer, San Jose State University
Bruce Gardner
Artist and Network Analyst, San Jose State University

The *San Carlos Lantern Relay* is a permanent public artwork comprised of eight six-foot tall lanterns placed along poles on East San Carlos Street in downtown San Jose. Each lantern contains LED light elements, sensors and a wireless network that is programmable. At the base of each lantern pole is a 'pedestrian crosswalk' button that passers-by can push, allowing them to transmit a light pattern to other lanterns. This simple messaging interaction allows people to engage with others up and down the street. The project is designed to invite the public to interact through the art work with other people in a location and on a scale they normally would not give themselves permission to do.

Oscillations

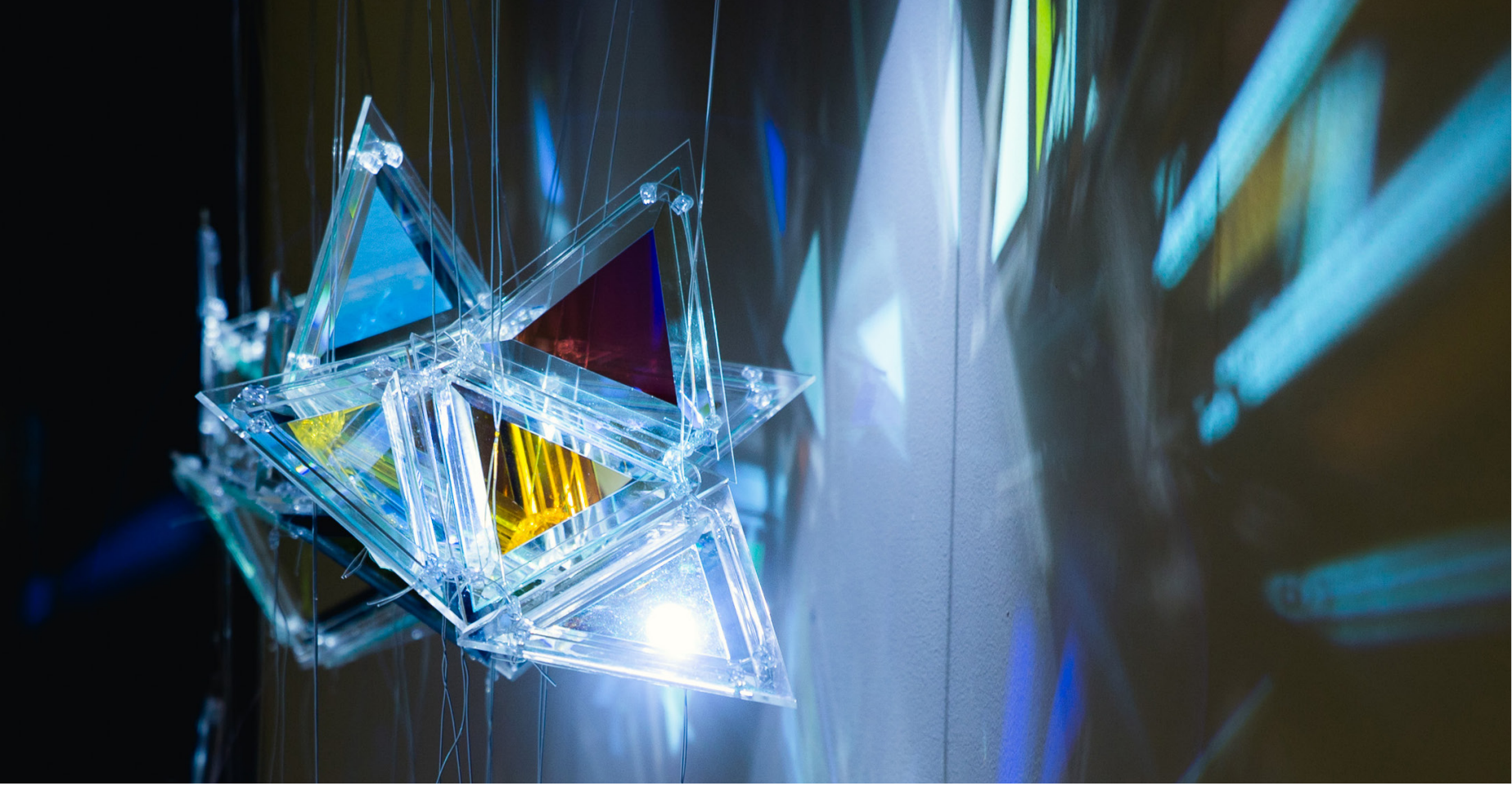
Garth Paine
Associate Professor Digital Sound and Interactive Media, School of Arts, Media + Engineering, Associate Professor Composition, School of Music, Arizona State University

Oscillations is an installation featuring Tibetan singing bowl robots. Sitting on Xbee mesh network, each robot carries two singing bowls that produce pure sustained tones marking out a meditative and immersive sound field. These robots are controlled by virtual player and striker agents which move through a virtual exhibition space using Brownian motion, weighted by video tracking of the presence of listeners in the gallery.

The combined effect is a set of beautifully made suspended objects, that magically produce an immersive, ever evolving, meditative, omnipresent, harmonic sound field.

The robots can also be taken down and used for perambulatory or gorilla style performances.

▲ ***Oscillations*** **robot close up – containing two singing bowl robots attached to motors with a central ringer stick and separate strikers.**



Dichroic Wade

Jen Seevinck
Artist, lecturer, Queensland University of Technology, Australia

The interactive artwork *Dichroic Wade* responds to human presence and weather conditions in the San Francisco Bay to create a kaleidoscope of colored light on the gallery walls. The light is manipulated in a painterly way. It is also a means to evoke the sensation of light reflecting from the surface of water currents. Approaching the work creates a tremor in the glass tiles and reflections of light. This is overlaid on a turbulence of movement driven by streamed San Francisco wind data. The work provides a distinctive, conceptually integrated, visual form to the data networks that surround us, and an opportunity to reconnect with the natural world.

▲ Glass and acrylic tiles reflect colored light on the gallery walls.

Dichroic Wade interactive artwork
© Jen Seevinck 2016

Photo © Anthony Hearsey 2016

Crafted Logic:
Towards Hand-Crafting a Computer

Irene Posch
Researcher, University of Applied Arts Vienna,
PhD Candidate, Vienna University of Technology

Ebru Kurbak
Principal Investigator, University of Applied Arts Vienna

Crafted Logic is an interactive installation realized as part of a larger research into creating electronic components from scratch. It is a speculative artifact and process as means to reflect on the creation of digital systems that surround us, as well as on how this shapes our interaction with them. The piece consists of fundamental logic gates that are created by various textile-crafting techniques. In replicating the basis of digital electronics in novel forms and through unconventional materials, our intention is to imagine alternatives to existing realities of computational technologies.

Users can interact with *Crafted Logic* in making the textile elements compute the result of different logic operations on the inputs they define.

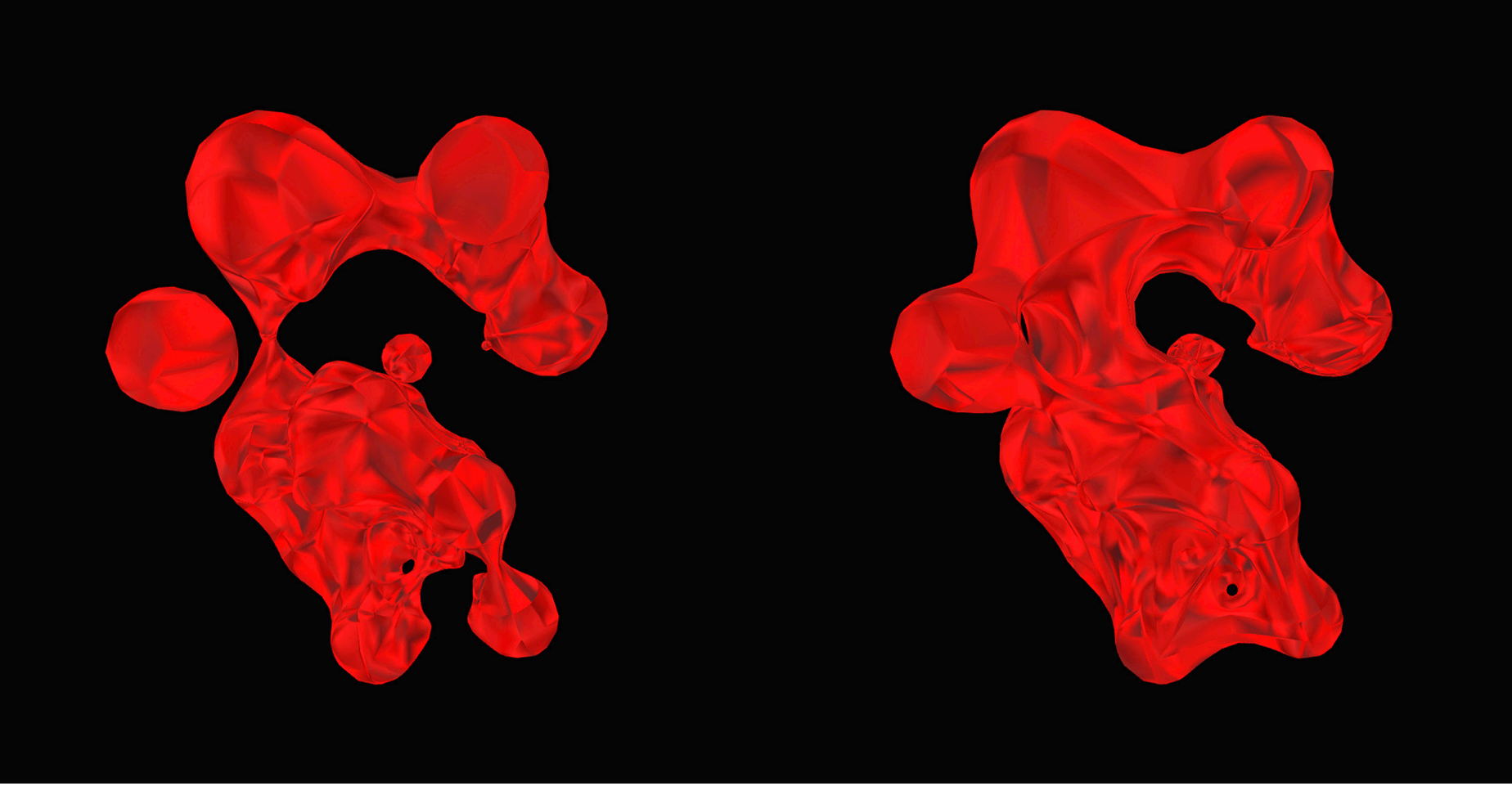
▲ Close-up of crochet relays: Magnetic Hematite beads at the center of the crochet elements that incorporate an electromagnetic coil.

Distractions

Anıl Çamcı
Postdoctoral Research Associate, University of Illinois, Chicago

Distractions brings invisible and inaudible signals into the kinetic domain. By picking up the electromagnetic waves in the exhibition space, it visualizes the signals communicating with the mobile devices that are brought into this space by the visitors. Such signals, which would go unnoticed by human perception, represent some of the most prevalent sources of distraction in our everyday lives. The work comments not only on the artist's process, which is inherently plagued with such distractions, but also on the relationship between modern audiences and exhibition spaces. Relying exclusively on digital computing techniques, such as depth imaging, signal processing, audio synthesis and numeric milling, *Distractions* visualizes data, without using computer displays, through infrasound vibrations that activate a point cloud of the artist's head.

▲ ***Distractions*** **is a kinetic sculpture that interactively visualizes data using infrasound vibrations.**

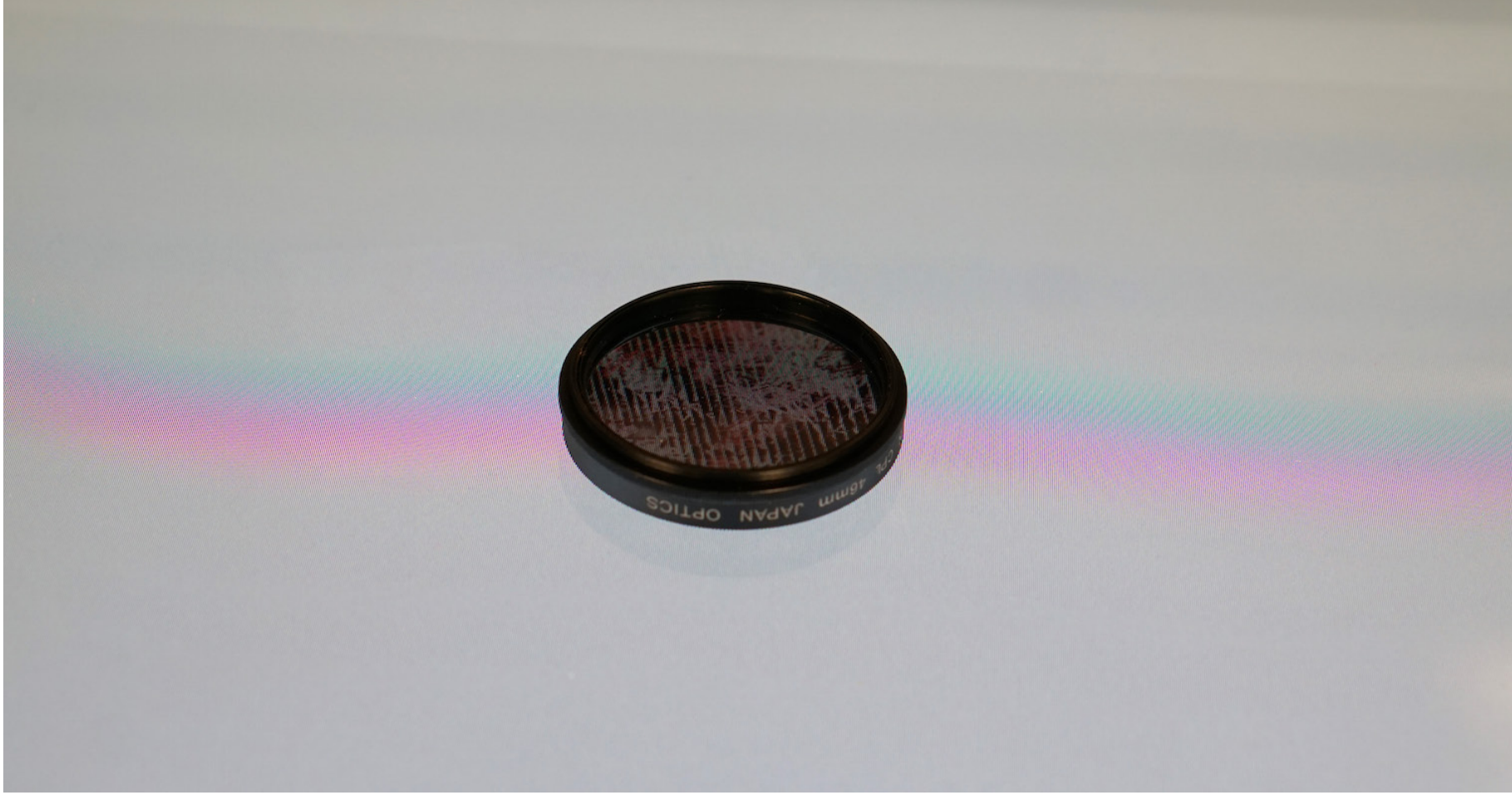


Rainforest

Peter Beyls
Research Professor, CITAR, UC Porto
André Perrotta
Assistant Professor, Researcher, UC Porto

Rainforest is conceived as a large-scale self-regulating audiovisual ecosystem; its morphological and behavioral evolution over time blends internal motivations and external pressure from exposure to the external world. In other words, *Rainforest* interfaces spontaneous natural behavior in the tangible world of everyday life with artificial life in a parallel synthetic universe. *Rainforest* consists of simple, locally interacting particle objects. However, particles coalesce into larger, more complex structures, complexity that echoes in the emergent sound produced by the installation. *Rainforest* features a machine-learning component; it aims to optimize the aesthetic experience by coordinating artificial life in relation to audience response captured by computer vision.

▲ ***Rainforest* snapshots: complex objects emerge from interacting particles.**



The Rest is Construction

The Rest Is Construction combines relatively minimal and straightforward technologies with hand-crafted objects in order to produce an intimate, interactive experience and evoke the somatic and cognitive impact of anxiety. The viewer is encouraged to engage physically and emotionally with a world that lies on the other side of a white screen, one that only they can see, by looking through a specialized viewing device. What they take from the stillness, or the movement, or the scene unfolding in front of them is unknown to the rest of the world.

▲ **Installation close-up.**

Anna Weisling
PhD Candidate, Georgia Tech

realsnailmail.net

Vicky Isley, Paul Smith
Artists, National Centre for Computer Animation, Bournemouth University, UK

realsnailmail.net is a project by boredomresearch, reversing the most enduring and ubiquitous social economic paradigms of speed and efficiency. boredomresearch offer a slow alternative to speed obsessed email, providing a communication system that exploits the charismatically slow inefficiency of snails to challenge the paradox of time impoverished contemporary culture.

Transferring emails across physical space with snails, they make it possible to communicate from anywhere in the world at a snail's pace. The snails, equipped with miniaturized electronic circuit and antenna, can be assigned messages. Sent messages travel at the speed of light before collection by a technologically enhanced snail. Snails then carry messages until they chance by a drop off point and forward messages to their final destination.

▲ **Real Snail Mail detail of installation.**

Soft Control: Art, Science and the Technological Unconscious exhibition, Slovenia, 2009
©boredomresearch

Whorl:

An Immersive Dive into a World of Flowers, Color, and Play

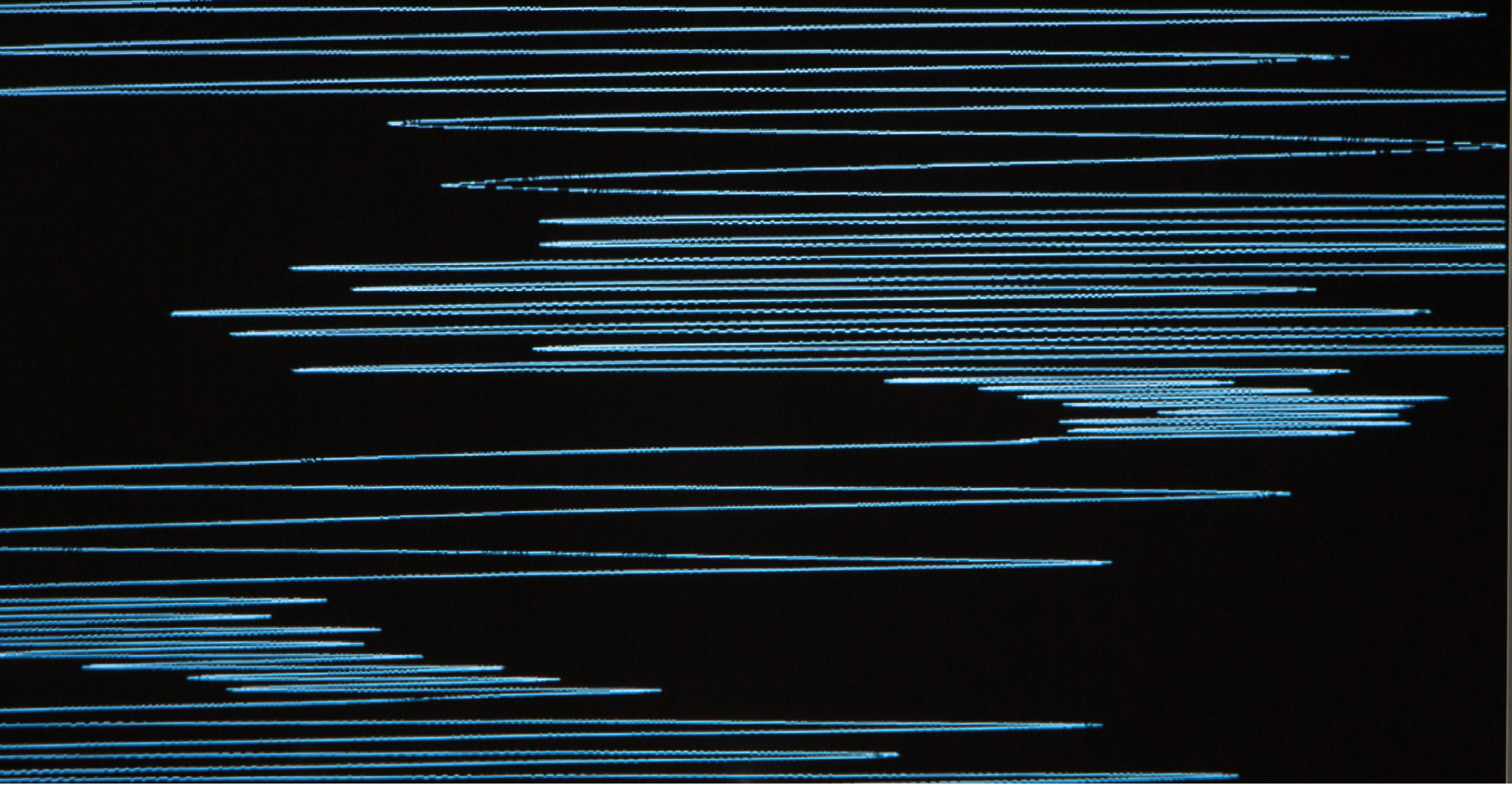
Eitan Mendelowitz *Assistant Professor of Computing and the Arts, Smith College, Massachusetts*

Damon Seeley *Designer, Google*

David Glicksman *Creative Technologist, Positron LLC*

Whorl, a multi-participant interactive media art installation, is an immersive dive into a world of flowers, color, and play. As visitors enter the installation space their presence is acknowledged by a garden of animated flora projected onto three walls. Flowers grow, bloom, spin, and contract in relation to people's movements and locations. 3D modeled flowers are animated in TouchDesigner. The flowers respond to people's movements as detected via OpenPTrack, a new open source computer vision based person tracking system. In *Whorl*, body motion and play reveals one's spatial connection to networks of flora and their enigmatic behaviors.

▲ In *Whorl*, hundreds of flowers are animated independently each with their own individual behaviors.



A Falling Line

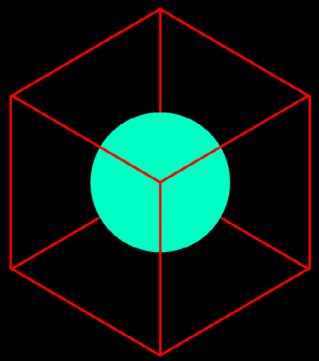
In this experiment, the audience draw a fine line in a virtual space using a computer mouse. The line starts from the bottom of the gallery and accumulates in the black wall of oblivion. Then, the accumulated drawing is precisely converted into the vibration of the speaker generating sound. This drawing action continues through the whole exhibition. We have only one chance to draw. No modification is allowed. With only one trial, we get only one result. Can we manage to make any meaningful sound from this experiment?

▲ Installation view Walk The Line.

New Paths of Drawing
(26 Apr - 16 Aug 2015), Kunstmuseum Wolfsburg.
Dimensions variable, courtesy Byungjoo Lee.

Photo: Marek Kruszewski.

Byungjoo Lee
Artist



Killbox

Joseph DeLappe *Artist/Activist, Professor, Department of Art, University of Nevada*

Malath Abbas *Game designer, Artist, Producer*

Tom deMajo *Digital artist, Electronic musician, Sound designer*

Albert Elwin *Artist, Programmer*

Killbox is an online game and interactive installation that critically explores the nature of drone warfare, its complexities and consequences. It is an experience which explores the use of technology to transform and extend political and military power, and the abstraction of killing through virtualization. *Killbox* involves audiences in a fictionalized interactive experience in virtual environments based on documented drone strikes in Northern Pakistan. The work is an international collaboration between U.S. based artist/activist, Joseph DeLappe and Scotland-based artists and game developers, Malath Abbas, Tom Demajo and Albert Elwin.

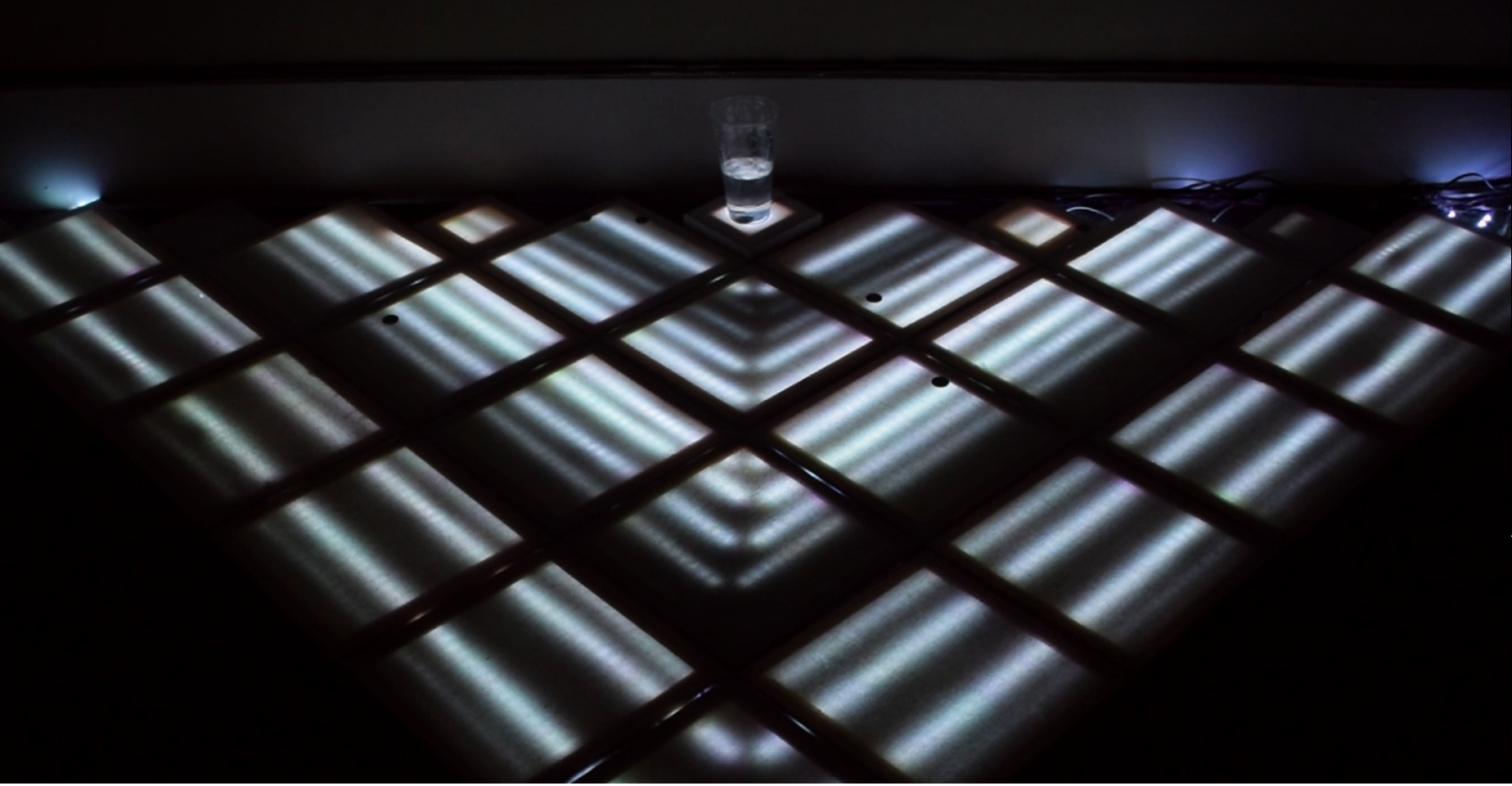
▲ ***Killbox* – A game about drone warfare.**

Digital Buddha

He-Lin Luo
Interaction artist, Taiwan

The new media artwork *Digital Buddha* combines 3D Printing and camera mapping. This work was created by 3-D deformable modeling through a computer, then transforming the model into a sculpture using 3D printing, and then remapping the materially produced sculpture back into the camera. Finally, it uses the already known algorithm to convert the model back into that of the original non-deformed sculpture. From this creation project, in the real world, audiences will see a deformed, abstract sculpture; and in the virtual world, through camera mapping, they will see a concrete sculpture (Buddha). In its representation, this piece of work pays homage to the work TV Buddha produced by video art master Nam June Paik.

Using the influence television possesses over people, this work extends into the most important concepts of the digital era, "coding" and "decoding," simultaneously addressing the shock and insecurity people in the digital era feel toward images.



Endless Ripples

Byeongwon Ha
PhD Candidate, Virginia Commonwealth University

Endless Ripples is a growing participatory pond. It consists of white LED strings under tiled canvases and a cup with water in the middle of a pond. When visitors come in the dark space, LEDs under the cup emit dim lights to attract them to throw their coins into the cup. If they are successful, ambient noises from speakers disappear and instead, visitors see bright ripples through the canvases. The coins will be donated to the nearest public facility. The coins that fall outside the cup will be used for growing and duplicating the project to provide more opportunities for audiences to take part in. Both outcomes will contribute to helping local areas.

▲ ***Endless Ripples*** **installation.**

iMorphia

Richard Brown
PhD candidate, Mixed Reality Lab, Horizon CDT, Nottingham University

iMorphia creates the illusion of a three dimensional character mapped onto the body of a performer.

A computer generated character is projected onto the body of the performer; through body tracking, the virtual character follows the movements of the performer. Video glasses enable the performer to see their transformed body from the perspective of the audience. This shift in perspective, 'the embodied performative turn' challenges conventional screen based modes of interaction into performative interaction directed at an audience.

Play and improvisation are facilitated by the transformation of two performers and projected interactive backdrops and props, whilst the video feedback enable the performers to convincingly interact with the projected illusions.

▲ Video stills illustrating a range of projected body masks, the lower images are of two transformed performers interacting and improvising.

American Derivation:
Three Kings (Fair Use Portrait #1-#3)

Hiroki Nishino
Research fellow, Imagineering Institute, Iskandar, Malaysia
Adrian David Cheok
Director, Imagineering Institute, Iskandar, Malaysia
Chair Professor of Pervasive Computing, City University, London

American Derivation: Three Kings (Fair Use Portrait #1-#3) aims to embody the concept of fair use in the form of a digital musical instrument. Its appearance and sound output are derived from copyrighted audio and visual materials, which are transformed according to the guidelines of fair use to avoid copyright infringement.

As fair use is a concept originated in the United States, we utilized the materials by three American iconic singers (Elvis Presley, James Brown, and Michael Jackson). The digital instrument associates each physical pixel made of a Nanoblock™ in low resolution portraits of the singers with a 'microsound' (short sound fragment) taken from their songs. Each microsound is utilized to perform granular synthesis, when the user touches the physical pixel.

▲ Low-resolution portraits built by NanoBlocks™.

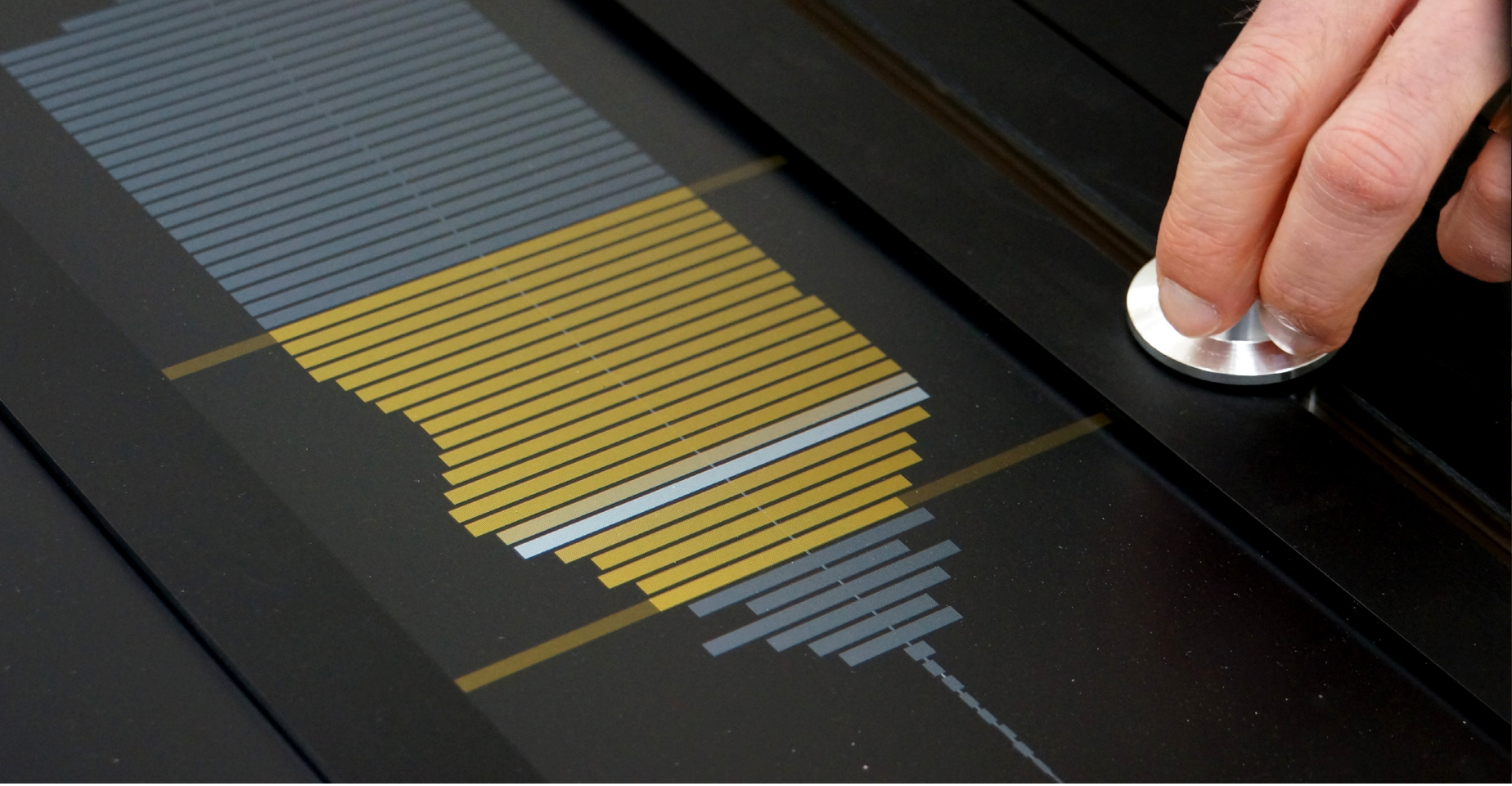
Tango Apart:
Moving Together

Sean Clark
Visiting Research Fellow, De Montfort University, Leicester, UK

Ernest Edmonds
Professor of Computational Art,
De Montfort University, Leicester, UK

Tango Apart: Moving Together is an interactive digital art system that has two or more communicating parts in different locations. Although each part is able to work independently, they also operate together, connecting the different locations and providing an aesthetic communication channel and creative participation. In particular, the work will connect CHI2016's Interactivity with its Art Exhibition and a location in Leicester, UK. Through the addition of mobile phone components, CHI participants will be able to join and experience the work throughout the conference, out and about in San Jose and back home afterwards.

▲ **Stills from *City Tango 2*: Connecting Sau Paulo and Leicester in 2015.**



Collidoscope

Ben Bengler
Postdoctoral research associate in interaction design and physical computing, University College, London

Fiore Martin
Postgraduate research associate, Centre for Digital Music, Queen Mary University, London

Collidoscope is an interactive, collaborative sound installation and musical instrument that allows participants to record real-world sounds, which they then can creatively explore, manipulate, and perform in real-time. Unlike traditional instruments, *Collidoscope* enables participants to play with real-world sounds in a direct and immediate way which allows for both musical and explorative interaction. *Collidoscope* reveals the sounds' inner structures through minimal visualizations which bind sound, people, and interaction together. *Collidoscope* favors the creative process over technical mastery, and in doing so emphasizes musics most visceral objective - communication between human beings.

▲ ***Collidoscope* musical instrument.**

Matières Sensibles

Matières Sensibles (Sensitive Matters) is a series of sculptures made of very thin and delicate wood veneer sheets. These sheets of wood have distinct sonorous touch zones that follow the natural veins of wood. The researchers of Scenocosme have enabled the artists to develop an artistic and technical process, invisible and delicate. A meticulous and invisible design work gives the artists the ability to define a musical score spread over different areas of the wood. They have invented this process that they call 'interactive marquetry'.

By design, the wood sculptures look like instruments that reveal themselves through various kinds of sounds when touched.

▲ Sound Sculpture on wood – Interactive marquetry.

Gregory Lasserre, Anais met den Ancxt
Artist couple working under the name Scenocosme