

The background of the image consists of several concentric circles centered in the middle, creating a target-like or ripple effect. The circles are light gray and fade out towards the edges of the frame.

• S113



# • S113

**NTU/ADM Symposium on  
Sound and Interactivity 2013**

*14 – 16 November 2013  
Singapore*

**PerMagnus Lindborg**

*Symposium Chair, Proceedings Co-Editor*

**V. Somasundram**

*Proceedings Co-Editor*

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*Nanyang Technological University  
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School of Art, Design, Media  
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# Welcome



**Vibeke Sorensen**  
Professor and Chair

School of Art,  
Design and Media  
Nanyang Technological  
University, Singapore

It is with pleasure that I welcome you to the Symposium on Sound and Interactivity 2013. This event brings together experts from Singapore and abroad to discuss current research and practice in a dynamic and expanding terrain that ranges from musical performance, creative interactive multimedia and installation art, to cognitive and computer science, acoustics, perception, and beyond. It furthers our School's longstanding engagement with interdisciplinary, creative innovation and scholarly research in multisensory multimedia, including sound and interactivity, and reinforces our School, College and University's deep commitment to NTU's Five Peaks of Excellence, particularly New Media. I am sure you will find the talks and presentations both informative and insightful, and that they will inspire many new conversations and creative collaborations. Enjoy!



**PerMagnus Lindborg**  
S113 Symposium Chair

On behalf of the S113 organisers, it is a great pleasure to welcome researchers, artists, scholars, students, and interested parties to the NTU/ADM Symposium on Sound and Interactivity. We hope it will be an enjoyable and stimulating experience.

One of our aims is to continue in the spirit of last year's Symposium on Visual Music held at ADM, and bring together researchers at the cutting edges of new technical development with artists working creatively with such technologies. The theme at S113 is Sound and Interactivity, indicating a broad, inclusive approach. You will find that concert pieces and exhibited artworks as well as proceedings papers aim to connect different sensory modalities: hearing, proprioception, sight, taste, touch, and so forth. The fluency of sound, its invisible and intangible nature, and because it can only happen inside time, seems key to an understanding of the human condition - brain, body and soul. In numerous fields of application, sound integrates with other media, often in a supportive but essential capacity. The Symposium puts a focus on sound in itself and its relation to other media, enabling interactivity.

We are thrilled to have Roger T. Dean and Diemo Schwarz as keynote speakers. Diemo embodies the computer scientist who is also a software developer and laptop musician. Roger unites empirical research in performance physiology with musicianship in unique ways. We are delighted to welcome all the symposium participants, and to those of you travelling from far-away places, we extend our warmest greetings and wishes for a pleasant stay in Singapore.

Thanks to staff, students, and colleagues who have helped in preparations, and to the College's Centre for Liberal Arts and Social Sciences, without whose support this event would not have been possible. Last but not least, thanks to all the authors and artists for sharing your work at S113 and thereby contributing to our creative communities.

# Committee & Reviewers

## Organising Committee

PerMagnus Lindborg, Chair  
V. Somasundram  
Poh Zhuang Yi  
Muhammad Mustajab Bin Mohamad

## Reviewers

Roger T. Dean, PhD  
Pete Kellock, PhD  
Joyce Beetuan Koh, PhD  
PerMagnus Lindborg  
Diemo Schwarz, PhD  
V. Somasundram

## Proceedings Co-Editors

PerMagnus Lindborg  
V. Somasundram

## Documentation

V. Somasundram  
Gel ST

## Exhibition Manager

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## ADM and CLASS Staff

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Arifin Bin Ami  
Ang Wee Li



● Getting  
There

## Location of School of Art, Design and Media



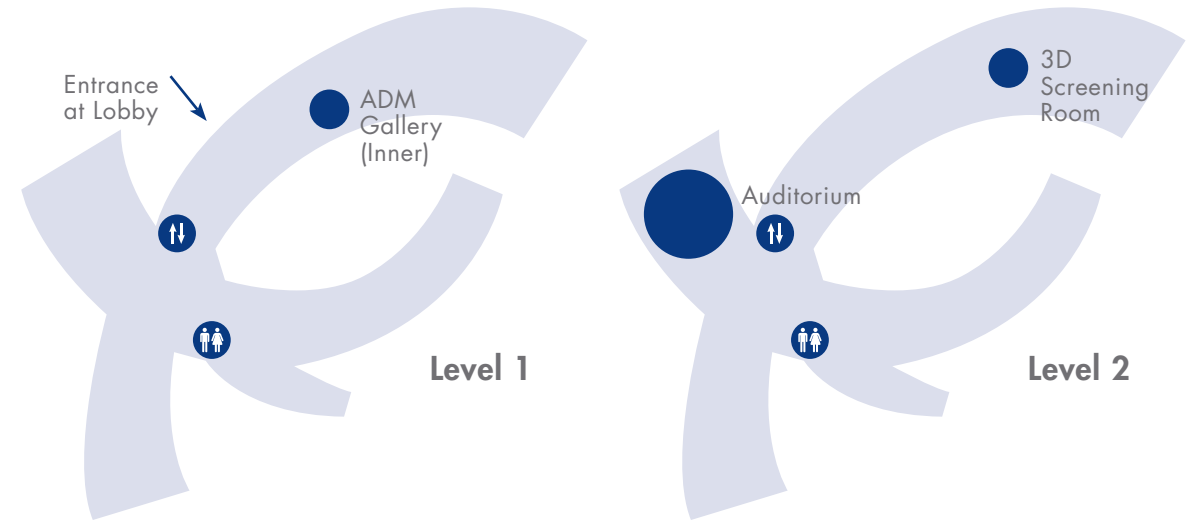
### Bus Stops within Vicinity

**A** **Blk 41**  
Nanyang Drive  
Bus Available: 199

**B** **Canteen 2**  
Nanyang Drive  
Bus Available: 179

**C** **Hall 8**  
Nanyang Drive  
Bus Available: 199

## Location of Symposium Venues in School of Art, Design and Media



Legend  
 Lifts Toilets

## Directions for Getting to School of Art, Design and Media from Boon Lay Bus Interchange

**Bus Service 199**  
Board at Boon Lay Bus Interchange. Alight at Blk 41, Nanyang Drive, 14 stops later. Cross the road to School of Art, Design and Media.

**Bus Service 179**  
Board at Boon Lay Bus Interchange. Alight at Canteen 2, Nanyang Drive, 9 stops later. Walk 370m to School of Art, Design and Media.

**Address**  
Nanyang Technological University  
School of Art, Design and Media  
81 Nanyang Drive,  
Singapore 637458

# Schedule

## Thursday, 14 November

### 1900 SI13 Concert

ADM Auditorium  
School of Art, Design and Media Level 2

## Friday, 15 November

### 1300 Introduction

Welcome Address by ADM Chair  
*Vibeke Sorensen*

Opening Notes by Symposium Chair  
*PerMagnus Lindborg*

### 1330 Keynotes

Interactive Sound:  
Generative Approaches from  
Computation and Cognition  
*Roger T. Dean*

Interacting with a Corpus of Sounds  
*Diemo Schwarz*

### 1530 Break

### 1600 Session 1: Performance & Aesthetics

Integrating Live Performance, Poetry,  
Sound, and Video in a Multimedia  
Theatre Production of T.S. Eliot's  
*The Waste Land (1922)*  
*Joyce Beetuan Koh & Steve Dixon*

A Pragmatic Aesthetics of Interaction  
in Live Coding  
*Renick Bell*

One at a Time by Voice: Performing with  
the Voice-Controlled Interface for Digital  
Musical Instruments  
*Stefano Fasciani & Lonca Wyse*

### 1800 Dinner

\*All Sessions will  
take place at the  
3D Screening  
Room,  
ADM Level 2

See previous page  
for location map.

## Saturday, 16 November

### 1000 Coffee

### 1030 Session 2: Sound in Multimedia

V I E: An Automata Sequencer  
*Jingyin He, Jordan Hochenbaum  
& Ajay Kapur*

Why call them video games?  
Investigating the Relative Importance  
of Audio in Video in Computer Games  
*Rachel Chen Siew Yoong  
& PerMagnus Lindborg*

Playing The Archive: Transforming Cross-  
Disciplinary Research Through Visual  
and Sonic Immersion  
*Candice Ng*

### 1230 Lunch

### 1330 Session 3: Interactive Sound

Interactive Sound Synthesis Mediated  
through Computer Networks  
*Kameron Christopher, Jingyin He,  
Ajay Kapur & Dale Carnegie*

An Agent Based Performance System  
*Michael Spicer*

### >> Session 3 continued

Symbolic Representation of Tonal  
Progressions for Rule-based Evaluation  
*Eddy Chong, Ding Qin, Zhenyu Yu  
& Ruitao Jia*

### 1530 Break

### 1600 Session 4: Sound & Perception

Defining the Dominance Axis of the 3-D  
Emotional Model for Expressive Human  
Audio Emotion  
*Simon Lui*

Investigations on Sonic Narratives of  
Future Spaces of Human Being  
*Mriganka Mdhukaillya & Siddhant Yadav*

Foodfrequency: a food and sound cross-  
modal immersive experience.  
*Sara Lenzi & Gianpaolo D'Amico*

### 1730 Closing Notes

Closing Notes  
*PerMagnus Lindborg*

# Concert

## Programme

1

**Serial Collaborations 2**  
Live Audio Performance  
*Roger T. Dean*

4

**One at a Time by Voice**  
Live Audio Performance  
*Stefano Fasciani*

7

**The Fire Sermon  
(part 3 from The Waste Land)**  
Audiovisuals and Actor  
Performance by Steve Dixon  
*Steve Dixon & Joyce Beetuan Koh*

2

**Playing the Sound Space**  
Live Audio Performance  
*Diemo Schwarz*

5

**Live Coding Improvisation**  
Live Audiovisuals Performance  
*Renick Bell*

8

**Sound Engineer**  
*Yong Rong Zhao*

3

**Duo**  
Live Audio Performance  
*Roger T. Dean  
& Diemo Schwarz*

6

**...and everything he touched,  
was turned into Gold...**  
Game as Performance  
*Luis Hernandez-Galván*



Concert



# Artists and Performance



**Roger T. Dean**  
*UK/Australia*

Dean is a composer/improviser, and a researcher in music cognition/computation. He founded the ensemble australYSIS, which has performed in 30 countries. His performing experience as double bassist, pianist and computer artist ranges from the Academy of Ancient Music to the London Sinfonietta; his improvising collaborations range from Ted Curson to Evan Parker. Dean's work is on >50 commercial audio cds, and in many digital multimedia and installation pieces (in collaborations with artists such as Keith Armstrong, Will Luers, and Hazel Smith). His creative work centres on keyboard/ensemble improvisation, and computer music composition. Improvisation and computer-interaction merge in his solo MultiPiano Event (live acoustic grand piano, real-time audio processing, generative piano, and electroacoustic sound).

[www.australysis.com](http://www.australysis.com)

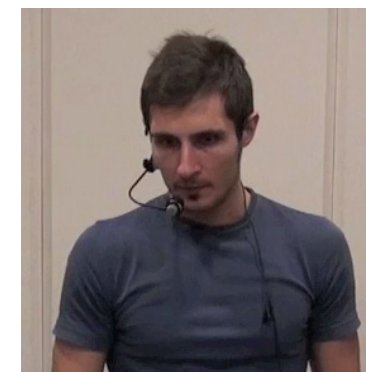


Image Credit: Shun Kambé

**Diemo Schwarz**  
*France*

Diemo Schwarz is a researcher and developer in real-time music interaction at Ircam, Paris, composer of electronic music, and musician. His compositions and live performances, under the name of his solo project Mean Time Between Failure, or improvising with musicians such as Frédéric Blondy, Victoria Johnson, Hans Leeuw, Emmanuelle Gibello, George Lewis, Evan Parker, or as member of the ONCEIM improviser ensemble, explore the possibilities of corpus-based concatenative synthesis to re-contextualise any sound source by rearranging audio into a new musical framework using interactive navigation through a timbre space, controlled by gestural input devices. He's composing for dance and installations, collaborating with artists such as Franck Leibovici, Cecile Babiolle, Christian Delecluse.

[diemo.concatenative.net](http://diemo.concatenative.net)



**Stefano Fasciani**  
*Italy/Singapore*

Stefano Fasciani graduated from the university of Rome „Tor Vergata,“ with a Bachelor (2003) and Master (2006) in Electronic Engineering. From 2006 until 2010 he joins the Atmel Advanced DSP Group in Rome, working in the team that developed the Diopsis 940HF. In 2010 he joins the National University of Singapore as a Research Fellow in the Multimodal Analysis Lab, developing audio analytical tools for social scientists. Later he joins the NUS Graduate School for Integrative Science and Engineering Ph.D. programme working on vocal control of sound synthesis and processing in the Arts and Creativity Lab. He is currently enrolled in the last year of his doctoral studies. His paper has been published in conferences such as NIME, ICMC and DAFX. He has been involved in performances, productions and DIY instruments since more than 15 years, with releases with independent recording labels in Italy, Singapore and US and gigs in local underground club scene.

[stefanofasciani.com](http://stefanofasciani.com)



**Renick Bell**  
*USA/Japan*

Renick Bell is a doctoral student at Tama Art University in Tokyo, Japan. His current research interests are live coding, improvisation, and algorithmic composition using open source software. He is the author of *Conductive*, a library for live coding in the Haskell programming language. Previously, he was a doctoral student at Tokyo Denki University. He has a masters degree in music technology from Indiana University and an interdisciplinary bachelors degree from Texas Tech University. He has performed in Australia, Austria, Japan, Taiwan, and the United States. He is from West Texas but has lived in Tokyo since 2006.

[www.renickbell.net](http://www.renickbell.net)



**Luis Hernandez-Galván**  
*Mexico/Singapore*

Luis Hernández-Galván has an academic background on Architecture and Media Studies. He works at the intersection of space, society and technology and his work ranges from installation to quasi-architecture to interactive 3D, mostly expressing himself by the means of game engines. He has had art shows, given conferences and workshops as well as given formal presentations and performances in Europe, America and Asia and has been resident artist in places in Europe and the American continent.

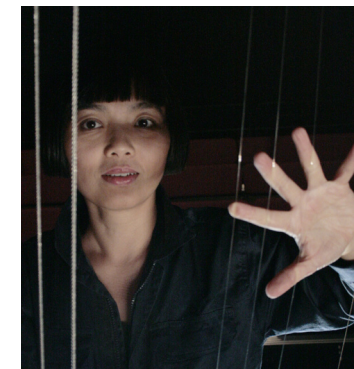
[ungravity.org](http://ungravity.org)



**Steve Dixon**  
*UK/Singapore*

Professor Steve Dixon is President of LASALLE College of the Arts in Singapore. He is a renowned multimedia theatre artist and Director of The Chameleons Group (since 1994), which produces innovative works for theatre, installation, and interactive media. His research focuses on the incorporation of media technologies in live performance, and he is co-founder and Advisory Editor of *The International Journal of Performance Arts and Digital Media*. His 800-page book *Digital Performance: A History of New Media in Theater, Dance, Performance Art and Installation* (MIT Press, 2007) has won two international book awards.

[en.wikipedia.org/wiki/Steve\\_Dixon\\_\(actor\)](http://en.wikipedia.org/wiki/Steve_Dixon_(actor))



**Joyce Beetuan Koh**  
*Singapore*

Joyce Beetuan Koh's artwork comprising concert music compositions, dance collaborations, and sound installations, have been performed widely in Europe and Asia. Key presentations include at World Stage Design (2013, Cardiff, UK), Birmingham Frontiers Festival, International Computer Music Conference (2011, Huddersfield UK) and (2013, Perth Australia), Singapore Arts Festival 2010, International Symposium on Electronic Arts (2009, Singapore), Biennale Musiques France (2004), and Melbourne Arts Festival (2001). Commissions and collaborations highlights are Arts Fission Dance Company, The Netherlands Nieuw Ensemble, Singapore Take Five, Ensemble Contemporaine de Montréal, Australia Song Company, BBC Symphony Orchestra, Hungarian Radio Orchestra, Norwegian Stavanger Symphony Orchestra, Hong Kong Chinese Music Virtuosi. Two piano works are published by ABRSM. Joyce holds a Ph.D in Composition (York, UK) and Post-graduate Diploma in Music Computing (IRCAM, Paris). After 20 years in Europe, she now works in Singapore. Her research interests are architecture, and interdisciplinarity.

[www.jbtkoh.net](http://www.jbtkoh.net)

## 1 Serial Collaborations 2

Roger T. Dean

The work is based on live keyboard performance, and interactive use of live algorithms. The algorithms are embodied in a software entity called the Serial Collaborator, written by Dean. This performs real-time transformations of sequential symbolic musical features (notably, pitch, but also potentially rhythm, timbre etc) based on the ideas of the 2<sup>nd</sup> Viennese School and the Total Serialists. However, it is susceptible to a variety of controls and perturbations which take its range of outputs outside the normal range of the ideas those groups developed. In this performance, its function will be concerned with pitch, and with generating a keyboardist which collaborates with the keyboard playing of the composer. It can operate on tonal as well as non-tonal thematic material, and in both contexts, it permits passing or 'grace' notes which are not necessarily bound by the serial principles. Two of the interesting aspects of using the Serial Collaborator as a keyboardist are: how its essentially monodic sequential symbolic output is converted into both melody and harmony, and how it responds to input pitch structures.

## 2 Playing the Sound Space

Diemo Schwarz

The piece is an exploration of different collections of sounds, made accessible by the technique of corpus-based concatenative synthesis, where sound segments are laid out in a multi-dimensional space of sound characteristics obtained from automatic audio descriptor analysis. Playing this

*"The performer re-combines prerecorded or live-recorded sound events into new rhythmic and timbral structures, simultaneously proposing novel combinations and evolutions of the source material."*

sound space means navigating through it with the help of gestural controllers that lets the performer reconquer the expressivity that has been lost in many laptop-based performances. Stroking an XY-pad, scratching contact-mic equipped surfaces, shaking a tablet computer are all possible gestural interactions that bring back the immediacy of physical action and sonic outcome. The performer re-combines prerecorded or live-recorded sound events into new rhythmic and timbral structures, simultaneously proposing novel combinations and evolutions of the source material. The metaphor for composition is here an explorative navigation through the ever-changing sonic landscape of the corpus being built-up from live recording. Despite the startling nature of some of these sounds, the use of corpus-based concatenative synthesis techniques in the performer's CataRT system makes it possible to compose smooth evolutions and soothing combinations of timbres, thereby reflecting on the inner qualities of these sounds that are richer than they appear when we just let them float by.

## 3 Duo

Roger T. Dean & Diemo Schwarz

This is an improvisation piece to be done through a live collaboration between Roger T. Dean and Diemo Schwarz.

## 4 One at a Time by Voice

Diemo Schwarz

This is a performance exclusively based on the Voice-Controlled Interface for Digital Musical Instruments (VCI4DMI), in which one instrument at a time is driven by the performer's voice and then looped, building up an improvised composition. The pool of instruments used in the performance is hosted in a DAW and it comprises eight synthesizers and four effects. These and the related vocal interface settings were selected to demonstrate the wide range of sonic interaction capabilities offered by the interface. The use of buttons is limited to the interface preset selection, while a led matrix provides visual feedbacks. The VCI4DMI is an alternate controller conceptually designed to be an extension to traditional touch-based musical interfaces. It allows simultaneous control of an arbitrary number of real-valued instrument parameter by variation of the performer vocal sound timbre, and optionally it can generate note messages as well. The generative and adaptive dual-layer mapping strategy makes an extensive use of unsupervised machine learning and dimensionality reduction techniques to compute hoc voice map for musical control. The aim is to maximize the breadth of explorable perceptual sonic space of specific digital musical instruments, providing dimensionality reduction of the instrument control space and adaptation to the vocal characteristics of the performer.

*"These and the related vocal interface settings were selected to demonstrate the wide range of sonic interaction capabilities offered by the interface."*

## 5 Live Coding Improvisation

Renick Bell

This performance of improvised programming generates percussive music emphasizing generative rhythms and their variations. A live coding performance consists of a network of potential percepts such as rhythms, timbres, event density, rate of change, programming libraries, projection contents, and performance space.

*A live coding performance consists of a network of potential percepts such as rhythms, timbres, event density, rate of change, programming libraries, projection contents, and performance space.*

A custom live coding system, a software programming library called Conductive, was written to deal with the time constraints of live coding. It triggers a simple custom software sampler built with the SuperCollider synthesizer and loaded with thousands of audio samples. That library and other prepared code are loaded into an editor, vim, and edited. New code is also written. Code is sent at will to the interpreter for the Haskell programming language, GHCi, where it is executed. Doing so, Bell manages multiple concurrent processes that spawn events, including the number of processes, the type of events spawned, and other parameters. Software abstractions can be directly perceived or indirectly felt through their influence on other percepts. Among these abstractions are those which represent generative processes, which in this performance are mostly related to rhythm. Sets of rhythmic figures are generated stochastically. From them, figures are selected at random and joined

to form larger patterns which are then processed to generate a stack of variations with higher and lower density than the original pattern. Simultaneously, patterns in which audio samples and other synthesis parameters are assigned to time intervals are generated. The concurrent processes read the generated data and use it to synthesize sound events. Bell's interaction largely involves generating such data and continuously reselecting which data to use throughout the performance. By watching Bell's interaction with the code and interpreter, which is projected on the screen, the audience can see to some extent how the generative processes are represented in code and employed to produce music.

**6** **...and everything he touched, was turned into Gold...**  
*Luis Hernandez-Galván*

"...and everything he touched, was turned into Gold..." is a relational artwork that will be produced specifically for this symposium, by the means of gamic art strategies. While interacting with the piece, the participant(s) will be able to explore a bit of unreality which is nonetheless grounded in current world affairs. Navigating through an abstract, noise-triggered soundscape whose three dimensional imagery has been built inside a game engine under the pretense of ludofforming (recreating 'real' places in 'virtual' space, or viceversa), the player will be able to freely experiment with audiovisual imageries which might trigger different experiential reactions. Although built inside a game engine, this project privileges paidia over ludus: That is playful, unstructured and spontaneous activities (i.e. attaining an aesthetical experience by the means of sheer exploration) against the structured ones which bear the implicit rules that we normally associate with videogames (loosing-

winning condition, increasing levels of difficulty etc). This project builds on contrasting pleasurable, soothing scapes to misophonic ones in the context of three dimensional spatial navigation within ~n degrees of freedom. The project is an immediate response to the WestGate mall affair, although the participants should not know in advance and let out to figure it out (or not) by themselves. This project does not try to pass any judgment or have any political understatement what so ever.

**7** **"The Fire Sermon (Part 3 of T.S. Eliot's The Waste Land)"**  
*Steve Dixon & Joyce Beetuan Koh*

T.S. Eliot's iconic 1922 poem is dramatically brought to life in a multimedia theatre collaboration between performer/filmmaker Steve Dixon and composer/sound artist Joyce Beetuan Koh. On stage, a man recites and begins to 'relive' modernism's greatest text, accompanied by an atmospheric and complexly layered soundscape. On a screen behind him, the poem's imagery unfolds in an increasingly breathless stream of visuals. Meanwhile, Eliot's bizarre characters appear as movie characters on screen, coaxing, seducing, and terrifying the man... [This performance is a section of a longer, 50 minute work, with stage direction by Tony Knight].

.....  
*"On a screen behind him, the poem's imagery unfolds in an increasingly breathless stream of visuals."*  
.....

● Paper Abstracts



## Interactive Sound: Generative approaches from Computation and Cognition

**Roger T. Dean**  
MARCS Institute, University of  
Western Sydney, Australia

roger.dean@uwe.edu.au

How can we usefully structure real-time interactive music generation systems? I am considering here two kinds of situation in which I and many others practice music-making. First, the juxtaposition of acoustic instruments (the piano in my own case) with computational sound generation processes. Second, purely electronic computer-interactive performance. In the first case, a key feature is that performer-generated or –realised musical strands feed into the performance, and potentially to the computer-interactive system. And here it is important that a performer who has considerable facility on their instrument (itself a kind of interface) can participate. In the second case, a musician can develop substantial facility with the computer-interactive interface itself, using gesture, controllers or voice, but only with the voice will their input be itself a musical stream, and one which can contribute immediately to the overall sound stream. In both situations, many real-time computational approaches are applicable; and a key distinction seems to me, as just implied, to be the nature of the input stream that the performer provides: whether primarily musical, or primarily a stream of generative or controller information. After the stage of musical stream input, the opportunities of the two situations are essentially identical, and these are my topic. So I focus on algorithms which may be used in acoustic, purely electronic/computational, or hybrid circumstance. I consider in particular ‘live algorithms’, those whose path can be perturbed in flight. One might say, those with chinks in their black-box armour. I make some contrasts with ‘live coding’, where there is at the outset generally little or no armour, no carapace, just a jelly of wobbling potential.

## Interacting with a Corpus of Sounds

**Diemo Schwarz**  
Institut de Recherche et  
Coordination Acoustique/  
Musique (IRCAM), France

schwarz@ircam.fr

Corpus-based concatenative synthesis (CBCS) is a recent sound synthesis method, based on descriptor analysis of any number of existing or live-recorded sounds, and synthesis by selection of sound segments from the database matching sound characteristics given by the user. It is used in various context of music composition, live performance, sound design, installations, and allows to explore a corpus of sounds interactively or by composing paths in the descriptor space, and to recreate novel timbral evolutions while keeping the richness and fine details of the original sound. CBCS can be seen as a content-based extension of granular synthesis, providing direct access to specific sound characteristics. While the previous phase of research focused mainly on the analysis and synthesis methods, and handling of the corpus, current research now turns more and more towards how expert musicians, designers, the general public, or children can interact efficiently and creatively with a corpus of sounds. After a brief definition and peeks into the history of CBCS, we’ll look at gestural control of the navigation through the sound space, where each combination of input device and synthesis mode redefines the

## >> continued

*Interacting with a Corpus  
of Sounds*

affordances of the interaction and thus a new digital musical instrument. When CBCS is controlled by descriptors analysed from audio input, it can be used to transform sound in surprising ways, to create augmented instruments, or to transcribe and re-orchestrate environmental sound. This special case of CBCS is commonly called “audio mosaicing”. For live performance, especially in an improvisation between a instrumental and a CBCS performer, recording the corpus live from the instrument creates a symbiotic relationship between the two performers, and creates a stronger and more direct coupling between them, compared to traditional improvisation where abstract musical ideas are exchanged. CBCS also found a very promising application in environmental sound texture synthesis for audio–visual production in cinema and games, and sound installations such as the Dirty Tangible Interfaces (DIRTI), that opens up discovery and interaction with rich sound corpora to the general public and children.

## Integrating live performance, poetry, sound, and video in a multimedia theatre production of T.S. Eliot’s The Waste Land (1922)

**Joyce Beetuan Koh**  
Independent composer

**Steve Dixon**  
LaSalle College of the Arts,  
Singapore

joyce@jbtkoh.net

This paper sets out to examine the interactions between the various modalities — poetry, stage acting, sound and video - in a new version of T.S. Eliot’s ‘The Waste Land’. It is a collaboration between Steve Dixon who produced, directed, acted, and created the video; and Joyce Beetuan Koh who composed the music and soundscape for the performance. Built on Eliot’s 434-line poem, organised in 5 parts, the production is an one-man multimedia theatre performance of 45 minutes’ duration, integrating live performance, poetry, sounds and video projections. On stage, a man recites and dramatically relives the poem while on a giant screen behind him, the poem’s imagery starts to unfold in an increasingly breathless stream of visuals. Meanwhile, Eliot’s characters – from clairvoyant Madame Sosostriis to Tiresias and Cleopatra – appear as movie characters on screen, coaxing, seducing, and terrifying the man. Musical references such as Richard Wagner’s ‘Tristan and Isolde’ and a Rag-Time were used in the poem. In the area of sound and interaction, these references were re-contextualised and manipulated. Eliot’s poem includes rhythmic usage of sanskrit words with strong assonance, such as ‘dharmyata, datta, dayadhvam’ and these suggested a particular musical treatment in the soundscape. We will focus on the interaction between the stream of visuals and the foreground and background layering of soundscapes. The relationship between images and sonic motives, formal organisation, as well as the motivation behind making these decisions will be discussed. The performance/ recitation of poems in theatrical setting has a long history. With the digital means of video projection and soundscaping, the performance is now multi-layered and possibly offers some new insight into the poem. This multimodal experience opens up ways of perceiving notions of time and space, and evoking symbolic images and metaphors.

## Considering Interaction in Live Coding through a Pragmatic Aesthetic Theory

**Renick Bell**  
Tama Art University, Japan

renick@gmail.com

Live coding is the interactive control of algorithmic processes through programming activity, a definition derived from Brown, Collins, and Ward. Live coding can be considered aesthetically with a pragmatic aesthetic framework based on Dewey's "Art as Experience". Through a revised framework, it can be seen that emotional states (affects) are experienced by audience members (affectees) as a result of experiencing a network of percepts (affectors). Value is assigned to the experience according to the context of the experience and the previous experience and knowledge of the affectee, and that evaluation is perpetually evolving with the apprehension of new knowledge. Live coding consists of a network of affectors such as the musical output, programming languages and libraries used, and projection contents. To the extent that affectees, including the performer as first audience member, are aware of the interaction, the interaction method becomes an affector in that network either indirectly as a result of its influence on other affectors or perceived as a primary element of the experience. It therefore affects the value assigned to the experience. An interaction method itself is a compound affector, consisting of various influencing aspects: usability, appearance, historical position, and so on. Interaction in live coding can be classified into two categories: an orthodox style and idiosyncratic styles. Though not perfectly uniform, the orthodox style involves a text editor and an interpreter, and it can be observed in live coding performances by McLean and Sorensen among others. Idiosyncratic styles may or may not involve the former, but they can include graphics, animation, or other interactive elements. Examples of idiosyncratic live coding interaction styles include performances and systems by Griffiths and Zmoelnig. The performer interacts with generative processes producing sound through abstractions and their notation, and that interaction is typically presented to the audience through a projection. It is also typically improvised to some extent. The focus on processes and improvisation places live coding in the field of experimental music as defined by Nyman, as opposed to what he calls the avant-garde. In doing so, a historical comparison with other experimental musicians and their methods of interaction can be informative. Using the aforementioned framework, live coders can make practical adjustments to performances in order to more effectively achieve performance goals. It is hypothesized that by considering exactly what a live coder is interacting with, how that interaction occurs, and who is observing the interaction, adjustments can be made to improve the aesthetic effect of performances. The adjustments follow from a consideration of purposes, including those of the performer and the audience. Audience purposes can range from dancing (as seen in algoraves) to deep consideration. Performers themselves have various purposes, including enjoying exploration, elucidating abstractions, or obfuscating data for the creation of mystery. One strength of the pragmatic aesthetic framework can be seen in its flexibility, which provides facility in dealing with these various intentions.

## One at a Time by Voice: Performing with the Voice-Controlled Interface for Digital Musical Instruments

**Stefano Fasciani  
& Lonca Wyse**  
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The Voice-Controlled Interface for Digital Musical Instruments is an alternate controller conceptually de-signed to be an extension to traditional touch-based musical interfaces. It allows simultaneous control of an arbitrary number of digital musical instrument parameter by variation of the performer vocal sound timbre. The generative and adaptive dual-layer mapping strategy makes an extensive use of unsupervised machine learning and dimensionality reduction techniques to compute hoc voice map for musical control. The aim is to maximize the breadth of explorable perceptual sonic space of specific digital musical instruments, providing dimensionality reduction of the instrument control space and adaptation to the vocal characteristics of the performer. Previous publications were mainly focused on the theoretical and technical aspects of the interface and of its sub-components, while in this paper we discuss application and user perspective of the interface, together with a high level overview of the system. We describe the necessary steps to train and setup the system as well as the available user options and their effects on the interface response and instrument interaction. Finally, we introduce a performance exclusively based on the Voice-Controlled Interface for Digital Musical Instruments, in which one instrument at a time is driven by the performer's voice and looped, building up an improvised composition. The pool of instruments and interface settings were specifically selected to demonstrate the wide range of sonic interaction capabilities offered by the interface. The performer uses a single button to change instrument interface preset, while visual feedback are provided on either a screen or a LED matrix.

## V I E: An Automata Sequencer

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V I E is a VST sequencer, driven by the notion of formalizing multiple depths of structure and musical time scales through the metaphorical representation of an organic systemization. Contrary to most Game of Life inspired sequencer that interprets the automata linearly (stepping through x and, or y-axis), V I E derives the time interval between each generation from tempo, enabling access to mapping options of up to 121 discrete notes in each generation. The main features of V I E include: Sync to external clock DAW's clock, quantization of length of each generation to note duration (up to 32nd-note), variable width and height of grid array (changeable dynamically in real-time), static and dynamic velocity, and automation for all parameters. V I E is open-source and realized in C++ programming environment, using JUCE library. The creation of V I E in a universal VST format encourages artists of all-levels to approach performance and composition in a different perspective. Furthermore, its open-source format allows informed users to modify V I E at a lower level according to their needs in stylistically individualized applications. Future implementations include internal independent clock, and

**>> continued***V I E: An Automata Sequencer*

a dynamic switching system that allows the user to choose either Game of Life, or one-dimensional cellular automaton. Video examples of V I E's prototype written in Chuck and Processing and its application in a live performance can be found at <http://vimeo.com/56225496> and <http://vimeo.com/55973717> respectively. A screen capture of the current version can be seen at <http://goo.gl/CiGBNx>.

## Why call them video games? Investigating the Relative Importance of Audio and Video in Computer Games

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This paper examines the role of audio in gameplay within computer games. We propose a framework for analysing the relative importance of audio and video as an essential measure for game classification. Audio plays an important role in commercially available console and computer games, and has always been vital to their success. A distinction between 'audio game' and 'game audio' must first be made. Audio that compliments video within gameplay is 'game audio', while games where audio is used as an essential element of play are 'audio games'. Investigating the frequency of game-related keywords using Internet search engines shows that "video game" is the most prevalent term with regard to commercially available games. Terms including "audio" are less frequent. However, computer game play is a multisensory experience. It therefore seems advantageous to seek meaningful classifications that reflect the relative importance of the various media involved. The proposed analytic framework introduces a single dimension along which a given game can be assigned a value. Tentatively labeled "Audio-Visual Balance", the dimension is anchored by 'audio only' and 'video only'. It is conceptually, albeit not practically, continuous. The paper will analyse games using this framework and discuss implications for further research.

## Playing The Archive: Transforming Cross-Disciplinary Research Through Visual and Sonic Immersion

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Playing the Archive is an interdisciplinary project undertaken by Studio|Lab's core research group - Nilam Ram, Brian Orland, Candice Ng, Michael Coccia, Matthew Kenney- and invited collaborators Simone Osthoff, Mark Ballora and visiting percussionists Robyn Schulkowsky and Joey Baron. Approaching nine different archives that consists of scientific data as well as historical and artistic data, the project brought together social scientists, artists and musicians to experiment with both digital and live sonification, visualization and materialization of data into new aesthetic forms. The hypothesis is that the interplay among musicians, visual artists, and data analysts—working together to simultaneously perform and display the archive in multiple formats and media—will enrich and shape the ways researchers render and engage information. Our experiments with multi-modal visualization and sonification are already changing our understanding of how and why we, as individuals

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and as a collective, approach archives, and more generally, our history, our work, and our world. These in return allowed for new ways of interpretation to form within these research inquiries. Being involved in the project as both an artist as well as a coordinator, this presentation at SI13 will include sharings on the outcome of the project and a small exhibition on iPads to discover the work.

## Interactive Sound Synthesis Mediated through Computer Networks

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Network music is the paradigm in which music is created through technology-mediated communication. In a world where we have become significantly dependent upon computer communication to relay and interact with affective information, methods of networking to generate music are becoming increasingly relevant to the way in which we communicate. The body of works in network music extends decades back to the music of The League of Automatic Music Composers. Still today, much of the work in network music has focused on the manipulation of parameters among group members, rather it be mediated through score, improvised, or arbitrary. The field of network music has yet to thoroughly explore the idea of using network as a tool for synthesis. Motivated in part by research into the microsonic components of sound creation, this paper presents the methodology of using network communication protocols for sound synthesis in live performances. A discussion of the authors' prior works highlights the considerations in software and hardware, and explains techniques that use the less-explored and intangible characteristics of network systems to generate sonic materials in a live performance setting.

## An Agent Based Performance System

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This paper describes the approach the author has adopted for creating real time systems whose musical output is created by the interactions of a human performer and an ensemble of software "improvisers". This approach has been used with notated compositions, free improvisation performances and for creating installations. The music produced typically consists of several distinct textural layers, where all the sounds produced are transformations of the sound made by the human performer. This type of system can be thought of as an "extended" instrument, where the performer effectively "plays" the ensemble. The design of the virtual performers is based on the concept of autonomous agents, a popular approach borrowed from Computer Science. One benefit of this approach is that it provides a unified way to encapsulate numerous algorithmic compositional techniques within one system. This system makes use of two broad categories of agent: performers and controllers. Performer agents transform the live sound

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Performance System*

in various ways, while controller agents' work at a higher structural level. They specify goal states and determine which agents are currently heard. Each performer agent has a way of transforming the audio input, and has its own internal strategies for determining what it does. The complexity of the performer agents' choice strategies ranges from simple harmony generators, to fairly complex algorithmic composition systems. This approach creates an environment where the human performer feels a sense of control over the entire ensemble while achieving a sense of collaboration with the system.

## Defining the Dominance Axis of the 3-D Emotional Model for Expressive Human Audio Emotion

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Speech emotion research has been a hot topic in recent years. It is now an age of information explosion, yet most information is presented in the text format. For example, the online search engine seeks for text information, social network platform shares information in text format (or picture and video with text tag), online music store presents music selection according to the text index information. On the other hand, a lot of high-level information is embedded in the text such as the thankfulness in a speech or the anger in a conversation, which are usually related to emotions. Hence understanding emotion is very important to explore into the world of information retrieval. Audio emotion research is useful for many different applications. For example, to understand the emotion of the speaker on the other side on a phone, to review and improve singers' performance technique by visualizing their expressive performance, or perform semantic music search according to information directly extracted from the audio file, etc. The traditional way of emotional classification involves using the two-dimensional (2D) emotional model by Thayer, which identifies emotion by arousal and valence. The 2D model is not fine enough to classify among the rich vocabularies of emotions, such as distinguish between disgusting and fear. Another problem of the traditional methods is that they don't have a formal definition of the axis value of the emotional model. They either assign the axis value manually or rate them by listening test. We propose to use the PAD (Pleasure, Arousal, Dominance) emotional state model to describe speech emotion in a continuous 3-dimensional scale. We suggest an initial definition of the continuous axis values by observing into the pattern of Log Frequency Power Coefficients (LFPC) fluctuation. We verify the result using a database of German emotional speech. The model clearly separates the average value of the 7 emotions apart (the neutral and big-6 emotion). Experiments show that the classification result of a set of big-6 emotions on average is 81%. We will further refine the definition of the axis formula, in order to reduce the overlapping between different emotions. Our ultimate goal is to find a small set of atomic and orthogonal features that can be used to define emotion in a continuous scale model. This work is the first step to approach this final goal.

## Symbolic Representation of Tonal Progressions for Rule-based Evaluation

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This paper presents a data representation system to encode musical chords used in a classical tonal context. Whilst a number of approaches to representing musical chords have been proposed for various computational or data retrieval purposes, the present project differs in its being motivated and shaped by music-pedagogical intentions, which include offering automated error feedback. Hence, instead of a data-driven pattern-discovery approach, we adopt a rule-based method using declarative rules. The music-theoretical underpinnings of the encoding system are formulated based on classical theory of functional harmonic voice leading. The ultimate aim is to develop a musically-intelligent interactive system that automates both the evaluation of tonal progressions and the provision of assessment feedback for the purpose of teaching western classical tonal theory. In a nutshell, the basic components for the system are chords drawn from the major-minor tonal system. Roman numerals with figured-bass indications (e.g. I<sup>6</sup>, vii<sup>o</sup>4/2) are the chord symbols to be encoded. The encoding reflects a number of pertinent theoretical elements: (i) the key context, (ii) the scale degree of the chord, (iii) the chord type, and (iv) the chord inversion. A rule-based system based on JBoss Drools and the Rete algorithm was then designed to evaluate chord progressions based on considerations of root motion, bass movement, and other tonal voice-leading factors. The musical intelligence of this system therefore simulates human musical thinking as encapsulated in a typical undergraduate theory of harmony.

## Investigations on Sonic Narratives of Future Spaces of Human Being

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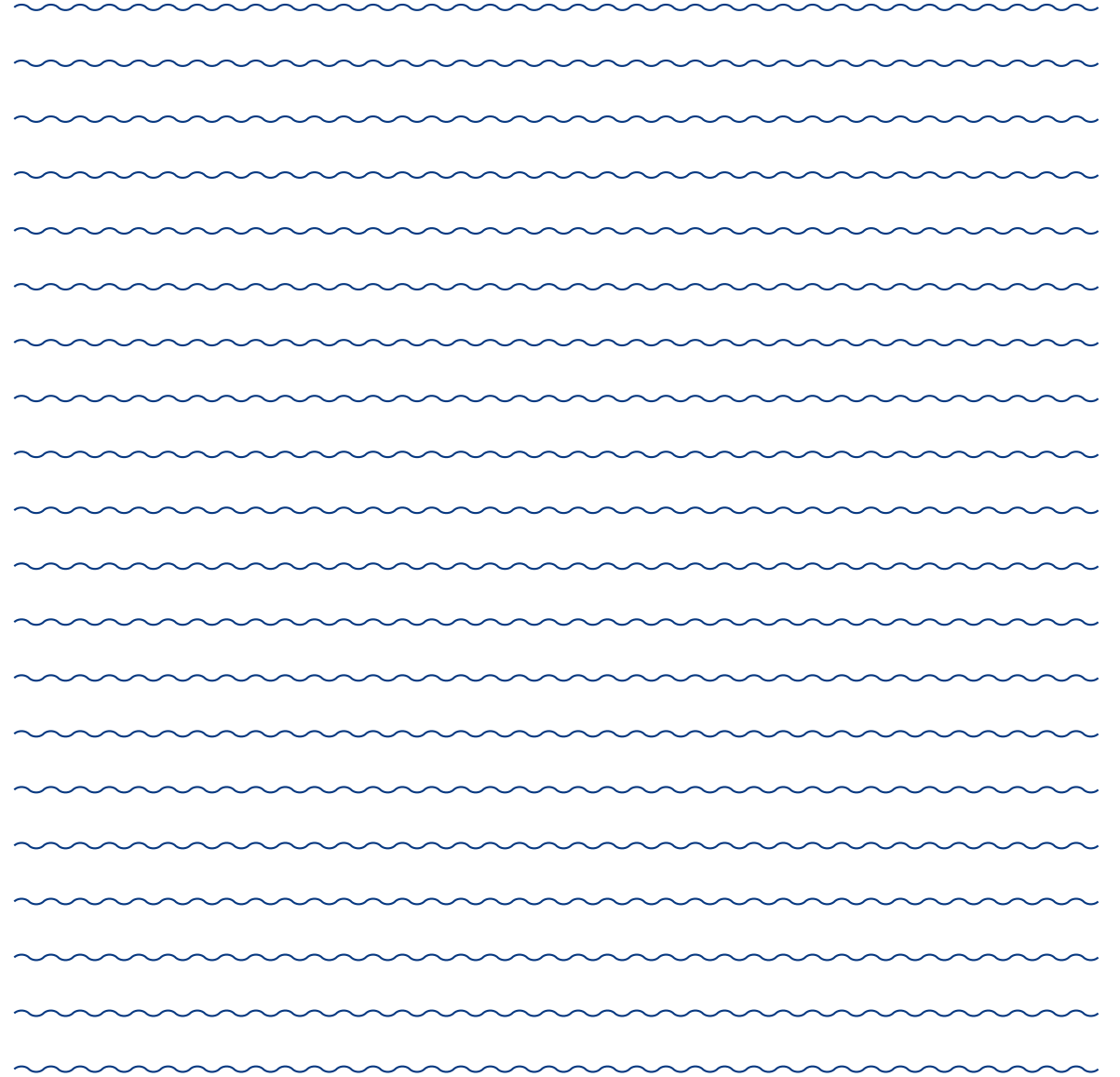
From an evolutionary perspective adopted by us as humans, Sound can be said to help living beings navigate in the flowfield of information represented by the objects in the phenomenal world. It is then a distinct mode on which a phenomenon is coded in part, (apart from other known/unknown modes) and made an object of human perception. Sound has a distinct modal power to shape the mental space human beings perceive themselves to be in. This distinct mental space formed by sonic sensory modality interacts with those formed by other sensory modalities viz. sight, kinaesthesia etc. and result is a formation of a space of being that beings perceive themselves to be in. Changes in its components can affect the overall space perception and hence the behaviour and performance of the beings. Composing a way in which these modes interact with each other in the formation of a behaviour space, can be thought of as a practice of design, being investigated through ages, whose manifestations are in the built environments around. For instance this medium here concerning the transmission of this very information in a human context is a manifestation of the investigation of optimization of transmission of information. On similar lines, this paper attempts an investigation of taking control over a phenomenon, Sound, which affects our human way of life and investigate its commensurately optimum use in the practices of the design of future spaces of human being. (Note that 'human' is used here as adjective.)



## Foodfrequency: A Food and Sound Cross- modal Immersive Experience

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This paper describes the background and development of Foodfrequency, a sound installation which involves attendees to live a multi-sensory experience based on food tasting and soundscape deep listening. The audience participates in a new but quite engaging way: eating and drinking during a special dinner. Each moment of the culinary experience is guided by binaural soundscapes and auditory cues, which are played respectively via headphones and a multichannel sound system, in order to provide information and suggestions about the cultural identity and the origin of food. Thus attendees become part of a collective performance in which the perception of flavour and taste is enhanced by the listening of specific soundscapes. Each soundscape is recorded on purpose to match each dish. The sound artists and the chef work closely together. The proposed recording technique is binaural recording. This technique allows for a more immersive experience, with a 360° reproduction of the aural space. The binaural soundscapes become the means of communicating the cultural significance of food, through the immediate representation of the territory of origin and the identity of each dish. At the same time, the use of soundscapes connected to a specific taste and flavors have proved to positively affect and enhance the gustatory experience. Different tests have been performed with some attendees in order to evaluate the effectiveness of the proposed experience.



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