audio.mostly 23

EMBODIED SOUND IN THE VIRTUAL

A CONFERENCE ON INTERACTION WITH SOUND

Program of the
18th International Audio Mostly Conference

Edinburgh Napier UNIVERSITY

30th AUGUST - 1st SEPTEMBER 2023

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Welcome to Audio Mostly 2023

Audio Mostly is an interdisciplinary conference on design and experience of interaction with sound that prides itself on embracing applied theory and reflective practice. Its annual gatherings bring together thinkers and doers from academia and industry that share an interest in sonic interaction and the use of audio for interface design.

With this year's conference theme *Embodied Sound in the Virtual,* we intended to inspire new thoughts at the intersection of sound design and embodied interactions in virtual environments (AR/VR/MR/XR). Sound design can play a crucial role in supporting immersive experiences and fostering seamless 'natural' embodied interactions with the virtual and real world. Interactions with the virtual are fostered through the continuous development of devices (wearables and hearables) and their applications in interactive experiences (games, exhibitions, installations, tours, etc.). Although technologies enable interaction with the virtual through bodily gestures, there is a paucity of auditory feedback to fully support these interactions at the intersection between the real and the virtual. How do we support these interactions through sound? How does sound impact our virtual experience and presence?

This year we received over 95 submissions from 27 countries around the world, and 29 high-quality papers were accepted as oral presentations (25 long and 4 short papers). Were also accepted: 4 demos, 9 music performances, 9 installations and 3 workshops. Each contributed submission was rigorously peer-reviewed through a double-blind review process by 92 reviewers who were drawn from a large pool of technical committee members as well as other international reviewers in related fields.

The success of AM '23 depends on the contributions of many individuals and organisations. With that in mind, we thank all authors who submitted work to the conference. The quality of submissions this year remains high, and we are satisfied with the quality of the results procedure. We are grateful to all chairs and reviewers, who voluntarily sacrificed valuable time to evaluate the manuscripst and provide authors with useful feedback.
We would also like to thank all volunteers, Edinburgh Napier University's School of Computing, Engineering and the Built Environment (SCEBE), the Music subject group, the Conference team, Applied Informatics Business and Support, the Leadership team, Facility and Estates team for their constant support in organising this conference.

We are grateful to our sponsors SICSA for having supported fees for Scottish Students, Nemisindo and Cycling '74 for providing the awards' prizes.

Finally, no conference will succeed without the strong support of its participants. We would like to thank all the authors and attendees for participating in the conference. We wish you have a stimulating and fruitful time at the conference, and a memorable experience in Edinburgh, United Kingdom.

Balandino Di Donato

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Program Schedule

9:00 am	9:30 am	10:00 am	11:00 am	12:00 pm	1:00 pm	2:00 pm	3:00 pm	4:00 pm	4:30 pm	5:30 pm	6:00 pm	7:00 pm
Tuesday, 29th August												
Registration / Coffee		Workshop 1			Lunch	Workshop 2						
Wednesday, 30th August												
Reg. / Coffee	Welcome	Keynote 1 E. Young	Paper session 1 / Installations		Lunch	Paper session 2 and Demos / Installations						Concert
Thursday, 31st August												
Reg. / Coffee	Paper session 3 / Installations			Keynote 2 S. Pauletto	Lunch	Paper session 4 / Installations			Break	Keynote 3 S. Benford		Gala Dinner
Friday, 1st September												
Reg. / Coffee	Paper session 5 / Installations			Keynote 4 Drake Music Scotland	Lunch	Awards / Closing						

Getting around

The conference and workshops are hosted at Edinburgh Napier University's Craiglockhart and Merchiston campuses.

- Workshops: room 02/05 (Level 2)
- Welcome and Keynote speeches, Lindsay Stuart Lecture Theatre (Level 2)
- Paper presentations: Lindsay Stuart Lecture Theatre (Level 2)
- Paper QA / Poster / Demo sessions: Main Entrance Hall
- Installations: rooms 01/06, 01/09 and 01/10 (Level 1)
- Lunch: River Suite (Level 1, old part of the building)
- Concert: Glassroom, Merchiston campus
- Prayer Room: Room 04/32 (Level 4, old part of the building)

The gala dinner will be hosted at The Caves (see page 26).

Please, for any query, visit the Audio Mostly website, ask at the registration desk or to any of the volunteers wearing a red Audio Mostly 2023 T-shirt.

Welcome speech

Wednesday 30th August, 9:30 am – Lindsay Stuart Lecture Theatre (Level 2)

Balandino Di Donato (Edinburgh Napier University)
Stuart Cunningham Stuart (University of Chester)

Keynotes

Emma Young (BBC R&D)
Wednesday 30th August, 10 am – Lindsay Stuart Lecture Theatre (Level 2)

Biography

Dr Emma Young works at BBC R&D developing ideas for new technologies and future media experiences for BBC audiences whilst facilitating internal and external relationships to support technology innovation and research in R&D and the wider BBC. Emma presents the public-facing YouTube series 'BBC R&D Explains' and speaks at a wide range of external events in academia and industry. Passionate about diversity and inclusion, Emma leads the BBC Women in STEM (WiSTEM) network as Chair of the Board.
Before joining the BBC in 2018, Emma worked in innovation and digital consultancy roles; received a MSci (Hons) in Information Technology and Media Communications; and an interdisciplinary MRes and PhD in Digital Innovation from Lancaster University's schools of Design, Computing and Management, merging her interests and expertise in design thinking with technology innovation.
Prior to changing focus to a career in tech in 2008, Emma studied Audio Engineering at the SAE Institute in Sydney; and worked in a broad range of production environments including Film, Games, Live TV, Theatre and Live Music. She has been a Lead Producer for many creative media projects over the years and in 2020, produced 'No Audience with Jon Richardson & Friends' - a live charity fundraiser that reached over 250,000 viewers on the RTS award-winning United We Stream platform.
Emma sits on the Steering Committee of the Audio Mostly conference and on the Industry Advisory Board at Lancaster University's School of Computing and Communications. Her research interests include participatory and user-centred design, design fiction and immersive media, including VR, AR and spatial audio.

Unplanned - Designing sound for sustainability and wellbeing

Sandra Pauletto (Associate Professor at KTH)
Thursday 31st August, 12 pm – Lindsay Stuart Lecture Theatre (Level 2)

Abstract

Sustainability concerns have rapidly increased in recent years. While on the one hand we are pushed to take personal responsibility and change ingrained behaviours, on the other we are given little opportunity to easily grasp what is really happening in our close environment and how we feel towards it, as data and information about consumption, waste or resource savings are often difficult to understand, invisible or inaccessible. In this talk, I will discuss how, through a research journey starting from interests in science, technology, music, cinema, I came to focus on the relationship between sound, sustainability and wellbeing. I'll discuss several sonic interaction designs I developed over the years that utilise sound as the medium to develop a more embodied understanding of sustainability and wellbeing, as well as participatory sound design workshop methods developed within the Sound for Energy project. Since this research journey has been all but linear, I will also highlight some of the many unplanned twists and turns in the hope that my personal experience might be of use to those among us who, like me, are interested in interdisciplinarity and unlikely connections.

Biography

Sandra Pauletto is Associate Professor in media technology and Docent in sound and music computing at the Department of Media Technology and Interaction Design at KTH Royal Institute of Technology, Sweden. Her main research interests relate to sound and music computing, media production, sound design creative process, often in connection with sustainability and health. Currently she is the primary investigator of the Sound for Energy Project (https://soundforenergy.net) funded by the Swedish Energy Agency, which aims to develop sonic interaction design research to support energy efficiency. She also leads the project *Personalizing Sonic Interactions* funded by the Swedish research council, and is the Swedish PI for the EU MSCA Doctoral Network *Lullabyte* (https://lullabyte.de). Additionally, Sandra is Associate Director for Mobility for the Digital Futures research centre (https://www.digitalfutures.kth.se).

Glitching the Body

Steve Benford (University of Nottingham)

Thursday 31st August, 5:30 pm – Lindsay Stuart Lecture Theatre (Level 2)

Abstract

Musicians often seek out the glitches in music technologies as a source of inspiration, innovation and improvisation. They also often talk of their bodies as if they were instruments. A focus on bodily interaction with digital technologies during embodied musicking leads me to consider how musicians might glitch their own bodies. I will reflect on a series of artist-led projects that pushed the boundaries of embodied interaction to reveal strategies for glitching the body such as sensory misalignment, surrendering control and uncomfortable interactions. I will consider how emerging methods such as soma design enable us to defamiliarisie bodily experience and help design technologies that reveal the musical glitches in our own bodies.

Biography

Steve Benford is the Dunford Professor of Computer Science at the University of Nottingham where he co-founded the Mixed Reality Laboratory. His research explores artistic applications of digital technologies through performance-led methods that engage artists in creating, touring, and studying unique interactive experiences. In turn, these have inspired fresh perspectives on interaction such as trajectories and uncomfortable interactions. He directs the EPSRC-funded Horizon Centre for Doctoral Training and the University's newly founded Cobot Maker Space that is exploring human interaction with robots. He was previously an EPSRC Dream Fellow, and is also a keen musician.

Equivalence: Towards a fully accessible instrument

Chris Jacquin, Ali Gillies and Pete Sparkes (Drake Music Scotland)

Friday 1st September, 12:00 pm – Lindsay Stuart Lecture Theatre (Level 2)

Abstract

Disabled Musician Chris Jacquin has been working with Drake Music Scotland for over ten years using music technology to create and perform new music. He is a founder member of the award-winning Digital Orchestra. In this session he will discuss recent artistic projects and outline some of the key challenges of working with and adapting existing technology. He will be joined by Ali Gillies, Associate Musician who works closely with Chris and Pete Sparkes, Artistic Director of Drake Music Scotland. Ali will discuss how they both adapt software and off-the-shelf hardware to enable Chris to work alongside a wide range of other musicians.
Chris will also perform some of his music live.

Biographies

Chris is a composer and musician from Edinburgh, Scotland. He composes and performs using an instrument called The Brain, which uses brainwave technology, Brainfingers, in addition to Ableton Live and PreSonus' Notion. A founding member of Drake Music Scotland's Digital Orchestra, he has also worked with the National Youth Orchestra of Scotland and the Hebrides Ensemble.

Ali is a freelance multi-instrumentalist and studio-based composer based in Edinburgh. He holds a BA(Hons) and an MMus from Newcastle University. As an Associate Musician, he runs 1:1 sessions, and works with the Digital Orchestra and Equilibrium ensembles. He also helps deliver technology training sessions to other charities and organisations. His current interest lies in finding new ways for musicians with disabilities to engage with a wide variety of music software to practice, compose and perform their music.

Pete was appointed as Artistic Director in December 2009. He joined the team at Drake Music Scotland as a freelance associate musician in 2005, leading projects in Glasgow, Edinburgh, and Stirling. In 2007 he was appointed as Education & Training Officer and spent a busy few years training teachers and musicians to use music technology in a variety of different settings. He is completely convinced that making music is fun, good for us in many ways, and we should be doing more of it – all of us! He was Education Officer of the Scottish Chamber Orchestra from 2002-2005. As a freelance project leader, he has led creative projects with many different participant groups for various organisations including: Drake Music Scotland, Scottish Book Trust, Scottish Chamber Orchestra, BBC Scottish Symphony Orchestra, Artlink Central, and Jessie's Fund.

Workshops

SuperCollider MIDI synthesizers for music and sonification

Niklas Rönnberg (Linköping University)

Tuesday 29th August, 10 am – Room: 02/05 (Level 2)

This workshop will give an introduction to various sound synthesis approaches for coding MIDI synthesizers in SuperCollider. The workshop will be a blend of presentation, coding sessions, and discussions, giving the workshop participants the basic knowledge to code their own MIDI synthesizer for music and sonification. More details and info: https://www.itn.liu.se/~nikro27/am2023_ws/

Binaural development in Max

Marta Rossi (Abertay University)

Tuesday 29th August, 2 pm – Room: 02/05 (Level 2)

Binaural development in Max/MSP" is a hands-on workshop on how to work in binaural format in Max/MSP using the IRCAM Spat library. The audience will learn how to set up binaural decoding for headphones in Max/MSP, how to encode sound sources in the 3D object-based ambisonics space, how to extract the sound sources' position and automate them, how to use 3D panning or a Boids algorithm to create dynamic panning, and how to use the Spat main reverb. The interactive workshop will be preceded by a brief technical explanation of ambisonics and binaural format, so the audience will have the theoretical tools to understand how they work in general and how they are used in Max/MSP. The audience will have time to explore the various techniques shown during the workshop and will walk out with a working patch that can be applied to any project.

This is a beginner-friendly workshop, so Max/MSP previous knowledge is welcomed but not essential because Max/MSP UI and basic functions will be explained at the beginning of the workshop. The users will need their own laptop and headphones, either in-ear or over-ear.

Prior to the workshop, if you don't have them already, please download the 30-day full working Max/MSP free trial here: https://cycling74.com/downloads - and the Spat library from the IRCAM Forum website: https://forum.ircam.fr/projects/detail/spat/ - Spat is completely free but you will need to sign up and log in to download it. Max/MSP is installed through the installer, while the Spat folder needs to be copied into ../Documents/Max8/Packages on both MacOS and Windows.

Paper session 1 - Music

Wednesday 30th August, 11 am – Lindsay Stuart Lecture Theatre
Session Chair, Rod Selfridge (Edinburgh Napier University)

Instrumental Agency and the Co-Production of Sound: From South Asian Instruments to Interactive Systems

Omar Shabbar and Doug Van Nort (York University)

In this paper, we will look at sympathetic resonance as seen in South Asian instruments as a source of complex performer-instrument interaction. In particular, we will compare this rich tradition to the various types of human/machine interactions that arise in digital instruments endowed with computational agency. In reflecting on the spectrum of agency that exists between the extremes of instrumental performance and machine partnership, we will arrive at two concepts to help frame our study of complex interactions in acoustic instruments: the co-production of sound and material agency. As a case study, we asked musicians of these South Asian instruments questions about their perceived relationship with their sympathetic strings. Building upon this, we designed and created an interactive system that models the phenomenon of performing with sympathetic strings. We then asked musicians to interact with this new system and answer questions based on this experience. The results of these sessions were examined both to uncover any similarities between the two sets of interviews, and to situate this entangled performer-instrument interaction with respect to markers of perceived control, influence, co-creation, and agency.

Stringesthesia: Dynamically Shifting Musical Agency Between Audience and Performer Based on Trust in an Interactive and Improvised Performance

Torin Hopkins, Emily Doherty, Netta Ofer, Suibi Che Chuan Weng, Peter Gyory, Chad Tobin, Leanne Hirshfield and Ellen Yi-Luen Do (University of Colorado Boulder)

This paper introduces Stringesthesia, an interactive and improvised performance paradigm. Stringesthesia uses real-time neuroimaging to connect performers and audiences, enabling direct access to the performer's mental state and determining audience participation during the performance. Functional near-infrared spectroscopy (fNIRS), a noninvasive neuroimaging tool, was used to assess metabolic activity of brain areas collectively associated with a metric we call "trust". A visualization representing the real-time measurement of the performer's level of trust was projected behind the performer and used to dynamically restrict or promote audience participation: e.g., as the performer's trust in the audience grew, more participatory stations for playing drums and selecting the performer's chords were activated. Throughout the paper we discuss prior work that heavily influenced our design, conceptual and methodological issues with using fNIRS technology, and our system architecture. We then describe feedback from the audience and performer in a performance setting with a solo guitar player.

Affective Conditional Modifiers in Adaptive Video Game Music

Tyler McIntosh, Orlando Woscholski and Mathieu Barthet (Queen Mary University of London)

This paper presents an application of affective conditional modifiers (ACMs) in adaptive video game music – a technique whereby the emotional intent of background music is adapted, based on biofeedback, to enforce a target emotion state in the player, thus providing a more immersive experience. The proposed methods are explored in a bespoke horror game titled "The Hidden", which uses ACMs to enforce states of calmness in

stressed players, and states of stress in calm players, through the procedural adaptation of background music timbre and instrumentation. These two conditions, along with a control condition, are investigated through an experimental study. Due to the low number of participants, the results of the user study provide limited insight into the effectiveness of the proposed ACMs. Nevertheless, the experiment design and user feedback highlight a number of important considerations and potential directions for future work. Namely, the need for consideration of the individual affective profile of the player, the audio-visual and narrative cues that may reduce the impact of affective audio, the effects of game familiarity on affective responses, and the need for ACM thresholds that are well-suited to the context and narrative of the game.

Inner City in the Listener's Auditory Bubble: Altering the Listener's Perception of the Inner City through the Intervention of Composed Soundscapes

Hedda Lindström (Dalarna University), Tanja Jörgensen (Dalarna University) and Rikard Lindell (Mälardalen University)

This paper describes the effect on the listeners' experience of headphone listening to a music composition including inner-city sound while being in an inner-city environment, using a research through design approach. The study focuses on the listeners' described experiences through the lens of Berleant's aesthetic sensibility and Bull's phenomenon of the auditory bubble. We produce a composition which participants listen to in an urban context and discuss the two main themes found, soundtrack and awareness, together with the indications of the possibility to direct listeners' attention and level of immersion by including inner-city ambience and sound in music when listening with headphones in an urban environment.

An Interactive Tool for Exploring Score-Aligned Performances: Opportunities for Enhanced Music Engagement

Caitlin Sales, Peiyi Wang and Yucong Jiang (University of Richmond)

Music scholars and enthusiasts have long been engaged with both performance recordings and musical scores, but inconveniently, these two closely connected mediums are usually stored separately. Currently, digital music libraries tend to have fairly traditional user interfaces for browsing music recordings, and more importantly, performance recordings are organized separately from their musical scores. In recent years, however, the same technological advances that have made vast troves of sound recordings and musical scores more widely available have also created tremendous potential for innovative new interfaces that can facilitate enhanced engagement with the music. In this paper, we present a web-based prototype tool that allows users to navigate classical piano recordings interactively.

Examining the Correlation Between Dance and Electroacoustic Music Phrases: A Pilot Study

Andreas Bergsland (Norwegian University of Science and Technology) and Sanket Rajeev Sabharwal (University of Genoa)

In this paper, we will present a pilot study that explores the relationship between music and movement in dance phrases spontaneously choreographed to follow phrases of electroacoustic music. Motion capture recordings from the dance phrases were analyzed to get measurements of contraction-expansion and kinematic features, and the temporal location of the peaks of these measurements was subsequently compared with the peaks of a set of audio features analyzed from the musical phrases. The analyses suggest that the dancers variably accentuate their movements to the peaks or accents in the music. The paper discusses the findings in addition to possible improvements of the research design in further studies.

Paper 2 & Demo sessions - Music Information Retrieval (MIR)

Wednesday 30th August, 2 pm – Lindsay Stuart Lecture Theatre
Session Chair, KC Collins (Carleton University)

MMM Duet System: New accessible musical technology for people living with dementia

Justin Christensen (University of Sheffield), Shawn Kauenhofen, Janeen Loehr, Jennifer Lang, Shelley Peacock and Jennifer Nicol (University of Saskatchewan)

Music offers a meaningful way for people living with dementia to interact with others and can provide health and wellbeing benefits. Enjoying shared activities helps couples affected by dementia retain a sense of couplehood and can support a spousal caregiver's mental health. This paper describes the development of the Music Memory Makers (MMM) Duet System, a prototype that has been developed as part of a qualitative, multi-phase, iterative research study to test its feasibility for use with people living with dementia and their spousal caregivers. Through the iterative process, the diverse individual needs of the participants directly led to the adding, adjusting, or removal of features and components to better fit their needs and to make the system require as little technical experience from the users as possible for quick and easy engagement. In line with our work of developing system hardware and software to meet users' needs, including 3D printed cases, coordination facilitation processes, a visual interface, and source separation tools to create familiar duets, participants found the duet system offered them an opportunity to enjoyably interact with one another by playing meaningful songs together.

How reliable are posterior class probabilities in automatic music classification?

Hanna Lukashevich (IDMT), Sascha Grollmisch (IDMT), Jakob Abeßer (IDMT), Sebastian Stober (University Magdeburg) and Joachim Bös (IDMT)

Music classification algorithms use signal processing and machine learning approaches to extract and enrich metadata for audio recordings in music archives. Common tasks include music genre classification, where each song is assigned a single label (such as Rock, Pop, or Jazz), and musical instrument recognition. Since music metadata can be ambiguous, classification algorithms cannot always achieve fully accurate predictions. Therefore, our focus extends beyond the correctly estimated class labels to include realistic confidence values for each potential genre or instrument label. In practice, many state-of-the-art classification algorithms based on deep neural networks exhibit overconfident predictions, complicating the interpretation of final output values. In this work, we examine whether the issue of overconfident predictions and, consequently, non-representative confidence values, is also relevant to music genre classification and musical instrument recognition.
Moreover, we describe cutting-edge techniques to mitigate this behavior and assess the impact of deep ensembles and temperature scaling in generating more realistic confidence outputs, which can be directly employed in real-world music tagging applications.

An Empirical Study on the Effectiveness of Feature Selection and Ensemble Learning Techniques for Music Genre Classification

Raad Shariat and John Zhang (University of Lethbridge)

Classical machine learning has long been utilized for classification and regression tasks, primarily focusing on tabular data or handcrafted features derived from various data modalities, such as music signals. Music Information Retrieval (MIR) is an emerging field that seeks to automate the management process of musical data. This paper explores the potential of employing ensemble learning techniques to enhance classification performance while assessing the impact of feature selection methods on accuracy and computational efficiency across three publicly available datasets: Spotify, TCC_CED, and GTZAN. The Spotify and TCC_CED datasets contain high-level musical features, such as energy, key, and duration, while the GTZAN dataset incorporates low-level acoustic features extracted from audio recordings. The empirical experiments and qualitative analysis reveal a significant performance improvement when employing ensemble learning techniques for handling high-level features. Furthermore, the findings suggest that applying appropriate feature selection methods can substantially reduce computational time. As a result, by strategically combining optimal feature selection and classification models, the performance can be boosted in terms of accuracy and computational time. This study provides insights for optimizing music genre classification tasks through the strategic selection and balancing of model performance, ensemble learning techniques, and feature selection methods, ultimately contributing to advancements of musical genre classification tasks in MIR.

Kiroll: A Gaze-Based Instrument for Quadriplegic Musicians Based on the Context-Switching Paradigm

Nicola Davanzo, Luca Valente, Luca Andrea Ludovico and Federico Avanzini (Università degli Studi di Milano)

In recent years, Accessible Digital Musical Instruments (ADMIs) designed for motor-impaired individuals that incorporate gazetracking technologies have become more prevalent. To ensure a reliable user experience and minimize delays between actions and sound production, interaction methods must be carefully studied. This paper presents Kiroll, an affordable and open-source software ADMI specifically designed for quadriplegic users. Kiroll can be played by motor-impaired users through eye gaze for note selection and breath for sound control. The interface features the infinite keyboards context-switching interaction method, which exploits the smooth-pursuit capabilities of human eyes to provide an indefinitely scrolling layout so as to resolve the Midas Touch issue typical of gaze-based interaction. This paper outlines Kiroll's interaction paradigm, features, implementation processes, and design approach.

Paraslap: Bass string instrument designed for the slap technique

Rotem Ifrach, Ezri Tarazi and Lior Arbel (Technion, Israeli institute of Technology)

Since its introduction by Leo Fender in the 1950s, the electric bass guitar has become immensely popular among musicians and fans alike. To this day it plays a significant role in modern western music in a wide range of musical genres and styles. The slap playing technique involves forcefully hitting the strings with the thumb. It has gained significant popularity over the years and has become the signature sound of many genres, such as jazz and funk. However, no instruments are specifically designed to accommodate the slap technique. This work describes the Paraslap, an electroacoustic string instrument specifically designed for slap playing. The instrument features eight open bass strings mounted on a central pillar, allowing both hands to slap the strings and produce more elaborate slap phrases.

A demonstration: real-time emotionally adaptive music in a VR immersive environment

Marta Rossi (Abertay University)

In this demo, the author will demonstrate how to develop a workflow to create an immersive autogenerative project in VR using Max/MSP and Unreal Engine 5. Although many have written and shown how to use immersive techniques for asynchronous VR projects, very little can be found on how to set up a real-time immersive VR space. Using EEG sensors on Arduino to generate emotionally adaptive music in Max/MSP and hardware modular synth, and encoding the sounds in HOA with the Max/MSP Spat library, the music is going to be generated and rendered in real-time in binaural format for the VR headset's headphones. The headset tracking data is gathered separately in Max/MSP and UE5 to reduce to a minimum the latency. The sensors data also modify, being sent to UE5 via OSC, the 3D environment and Niagara Systems in Unreal Engine 5 through bespoke referencing of Unreal blueprints. The audience will learn a method to integrate tools for the generativity and spatialisation of sound in real-time in Unreal Engine, and to create interactive VR installations that challenge the interaction between the user and the artwork, destabilising the subject-object hierarchy.

Paper session 3 - Sonification

Thursday 31st August, 9:30 am – Lindsay Stuart Lecture Theatre
Session Chair, John McGowan (Edinburgh Napier University)

Tuning Shared Hospital Spaces: Sound Zones in Healthcare

David Geary (University of York), Jon Francombe (Bang & Olufsen), Kristian Hentschel (BBC R&D) and Damian Murphy (University of York)

The problem of noise in hospitals is commonly tackled through noise abatement practices, which consider 'quietness' as a quality indicator. However, the influence of positive or negative subjective reactions to these sounds are rarely examined. Recent efforts emphasize the importance of considering the benefits of wanted sound while minimizing unwanted noise to reach a positive healthcare soundscape. The authors identified sound zones in shared hospital spaces as a means to achieve this through sound separation, noise masking and designed sound zone content. Listening evaluations were conducted to evaluate subjective responses of individuals from hearing a hospital soundscape across a variety of sound zone interventions. The authors conclude that sound zone interventions in shared hospital spaces offer subjective benefits that move beyond noise reduction. As an area for future work, sound zone interventions will be deployed in hospital settings to study potential long-term restorative effects on patients and better working conditions for staff.

Using design dimensions to develop a multi-device audio experience through workshops and prototyping

David Geary (University of York), Jon Francombe (Bang & Olufsen), Kristian Hentschel (BBC R&D) and Damian Murphy (University of York)

Designing audio experiences for heterogeneous arrays of multiple devices is challenging, and researchers have tried to identify useful design practices. A set of design dimensions have been proposed, providing researchers and creative practitioners with a framework for understanding the different design considerations for multidevice audio; however, they have yet to be used for scoping and developing a new experience. This work investigates the utility of the design dimensions for exploring and prototyping new multidevice audio experiences. Three workshops were conducted with audio professionals to see how the design dimensions could be used to form new ideas. Using the resulting ideas, a multi-device audio system combining loudspeakers and earbuds, and an experience based on that system, were created and demonstrated. The design dimensions were found to be useful for understanding multi-device audio experiences and for quickly forming new ideas. In addition, the dimensions were a helpful reference during experience development for testing different design choices, particularly for audio allocation.

An Interactive Modular System for Electrophysiological DMIs

Francesco Di Maggio (MSH Paris Nord), Atau Tanaka (MSH Paris Nord), David Fierro (CICM - Université Paris 8) and Stephen Whitmarsh (Sorbonne Université)

We present an interactive modular system built in Cycling '74 Max and interfaced with Grame's FAUST for the purpose of analyzing, processing and mapping electrophysiological signals to sound. The system architecture combines an understanding of domain-specific (biophysiological) signal processing techniques with a flexible, modular and user-friendly interface. We explain our design process and decisions towards artistic usability, while maintaining a clear electrophysiological data flow. The system allows users to customize and experiment with different configurations of sensors, signal processing and sound synthesis algorithms, and has been tested in a range of different musical settings from user studies to concerts with a diverse range of musicians.

The Air Listening Station: Bridging the gap between Sound Art and Sonification

Eric Larrieux and Mélia Roger (Zurich University of the Arts)

When developing auditory display systems, one must balance the tendency for sonification algorithms to produce potentially informative, but less engaging, direct representations of data, with more aesthetically pleasing transformations, where the underlying data is prone to obfuscation. In a scientific communication context, the successful navigation of this continuum becomes increasingly critical. As such, we take air quality data as a vehicle to explore this concept, with the ultimate goal of raising awareness of declining air quality in modern urban landscapes, in order to drive societal change in response. Employing an aesthetically driven, artistic practice-based approach, we transform field recordings into an ever-evolving soundscape using generative music and algorithmic composition methods. Specifically, we present a novel, real-time granular synthesis-based sonification method that draws upon auditory icon, parameter mapping, and model-based sonification concepts, to create an output that invites an emotional connection with the underlying data. Finally, we discuss the design implications and constraints of this approach, before challenging some fundamental assumptions and conventions of modern sonification practice, while advocating for a tighter integration between the worlds of traditional sonification and sound art.

Reflecting on qualitative and quantitative data to frame criteria for effective sonification design

Katharina Groß-Vogt (University of Music and Performing Arts Graz), Kajetan Enge (St. Pölten University of Applied Sciences) and Iohannes Zmölnig (University of Music and Performing Arts Graz)

When developing auditory display systems, one must balance the tendency for sonification algorithms to produce potentially informative, but less engaging, direct representations of data, with more aesthetically pleasing transformations where the underlying data is prone to obfuscation. In a scientific communication context, the successful navigation of this continuum becomes increasingly critical. As such, we take air quality data as a vehicle to explore this concept, with the ultimate goal of raising awareness of declining air quality in modern urban landscapes in order to drive societal change in response. Employing an aesthetically driven, artistic practice-based approach, we transform field recordings into an ever-evolving soundscape using generative music and algorithmic composition methods. Specifically, we present a novel, real-time granular synthesis-based sonification method that draws upon auditory icon, parameter mapping, and model-based sonification concepts, to create an output that invites an emotional connection with the underlying data. Finally, we discuss the design implications and constraints of this approach, before challenging some fundamental assumptions and conventions of modern sonification practice, while advocating for a tighter integration between the worlds of traditional sonification and sound art.

The Sound of the Future Home Workshop: Ideating Sonic Prototypes for Sustainable Energy Consumption

Yann Seznec, Sandra Pauletto, Cristian Bogdan and Elina Eriksson (KTH Royal Institute of Technology)

This paper describes an ideation workshop aiming to explore the intersection of sonic interactions and energy use. As part of a larger research project exploring the role that sound can play in efficient energy behaviours, the workshop encouraged users to look for overlaps between their home resource use, potential sonic feedback and the feelings and emotions elicited by both. The workshop design was successful in providing non-experts with space and tools to reflect on the complex relationship between household, sound, energy and our feelings

towards them. On a more practical level, 15 “hotspots” were identified where sound and energy concerns could be potentially addressed with sonic interventions, and four speculative prototypes were developed during the workshop each one revealing original considerations and relationships between sound and energy to be developed further in future work.

Towards a Framework of Aesthetics in Sonic Interaction

Stuart Cunningham (University of Chester), Iain McGregor (Edinburgh Napier University), Jonathan Weinel (University of Greenwich), John Darby (Manchester Metropolitan University) and Tony Stockman (Queen Mary University of London)

As interaction design has advanced, increased attention has been directed to the role that aesthetics play in shaping factors of user experience. Historically stemming from philosophy and the arts, aesthetics in interaction design has gravitated towards visual aspects of interface design thus far, with sonic aesthetics being underrepresented. This article defines and describes key dimensions of sonic aesthetics by drawing upon the literature and the authors’ experiences as practitioners and researchers. A framework is presented for discussion and evaluation, which incorporates aspects of classical and expressive aesthetics. These aspects of aesthetics are linked to low-level audio features, contextual factors, and usercentred experiences. It is intended that this initial framework will serve as a lens for the design, and appraisal, of sounds in interaction scenarios and that it can be iterated upon in the future through experience and empirical research.

Paper session 4 - Artificial Intelligence (AI) and Machine Learning (ML)

Thursday 31st August, 2 pm – Lindsay Stuart Lecture Theatre
Session Chair, Stuart Cunningham (University of Chester)

FM Tone Transfer with Envelope Learning

Franco Santiago Caspe (Queen Mary University of London), Andrew McPherson (Imperial College London) and Mark Sandler (Queen Mary University of London)

Tone Transfer is a novel deep-learning technique for interfacing a sound source with a synthesizer, transforming the timbre of audio excerpts while keeping their musical form content. Due to its good audio quality results and continuous controllability, it has been recently applied in several audio processing tools. Nevertheless, it still presents several shortcomings related to poor sound diversity, and limited transient and dynamic rendering, which we believe hinder its possibilities of articulation and phrasing in a real-time performance context. In this work, we present a discussion on current Tone Transfer architectures for the task of controlling synthetic audio with musical instruments and discuss their challenges in allowing expressive performances. Next, we introduce Envelope Learning, a novel method for designing Tone Transfer architectures that map musical events using a training objective at the synthesis parameter level. Our technique can render note beginnings and endings accurately and for a variety of sounds; these are essential steps for improving musical articulation, phrasing, and sound diversity with Tone Transfer. Finally, we implement a VST plugin for real-time live use and discuss possibilities for improvement.

A Free Verbalization Method of Evaluating Sound Design: The Effectiveness of Artificially Intelligent Natural Language Processing Methods and Tools

Kc Collins and Hannah Johnston (Carleton University)

Research on sound design evaluation methodologies relating to connotation, or the evocation of mental imagery is limited. Prior tools for data analysis have fallen short, making the process time consuming and difficult. We explore here a variety of new AI powered Natural Language Processing tools to evaluate the data. Results showed that free verbalization is a fruitful method to answer some research questions about sound, giving rise to many interesting insights and leading to further research questions.

Supervised Contrastive Learning For Musical Onset Detection

James Bolt and György Fazekas (Queen Mary University of London)

This paper applies supervised contrastive learning to musical onset detection to alleviate the issue of noisy annotated data for onset datasets. The results are compared against a state-of-the-art, convolutional, cross-entropy model. Both models were trained on two datasets. The first dataset comprised of a manually annotated selection of music. This data was then augmented with inaccurate labelling to produce the second data set. When trained on the original data the supervised contrastive model produced an F1 score of 0.878. This was close to the cross-entropy model score of 0.888. This showed that supervised contrastive loss is applicable to onset detection but does not outperform cross-entropy models in an ideal training case. When trained on the augmented set the contrastive model consistently outperformed the cross-entropy model across increasing percentage inaccuracies, with a difference in F1 score of 0.1 for the most inaccurate data. This demonstrates the robustness of supervised contrastive learning with inaccurate data for onset detection, suggesting that

supervised contrastive loss could provide a new onset detection architecture which is invariant to noise in the data or inaccuracies in labelling.

Onset Detection for String Instruments Using Bidirectional Temporal and Convolutional Recurrent Networks

Maciej Tomczak and Jason Hockman (Birmingham City University)

Recent work in note onset detection has centered on deep learning models such as recurrent neural networks (RNN), convolutional neural networks (CNN) and more recently temporal convolutional networks (TCN), which achieve high evaluation accuracies for onsets characterized by clear, well-defined transients, as found in percussive instruments. However, onsets with less transient presence, as found in string instrument recordings, still pose a relatively difficult challenge for state-of-the-art algorithms. This challenge is further exacerbated by a paucity of string instrument data containing expert annotations. In this paper, we propose two new models for onset detection using bidirectional temporal and recurrent convolutional networks, which generalise to polyphonic signals and string instruments. We perform evaluations of the proposed methods alongside state-of-the-art algorithms for onset detection on a benchmark dataset from the MIR community, as well as on a test set from a newly proposed dataset of string instrument recordings with note onset annotations, comprising approximately 40 minutes and over 8,000 annotated onsets with varied expressive playing styles. The results demonstrate the effectiveness of both presented models, as they outperform the state-of-the-art algorithms on string recordings while maintaining comparative performance on other types of music.

A Plugin for Neural Audio Synthesis of Impact Sound Effects

Zih Syuan Yang and Jason Hockman (Birmingham City University)

The term impact sound as referred to in this paper, can be broadly defined as the sudden burst of short-lasting impulsive noise generated by the collision of two objects. This type of sound effect is prevalent in multimedia productions. However, conventional methods of sourcing these materials are often costly in time and resources. This paper explores the potential of neural audio synthesis for generating realistic impact sound effects, targeted for use in multimedia such as films, games, and AR/VR. The designed system uses a Realtime Audio Variational autoEncoder (RAVE) model trained on a dataset of over 3,000 impact sound samples for inference in a Digital Audio Workstation (DAW), with latent representations exposed as user controls. The performance of the trained model is assessed using various objective evaluation metrics, revealing both the prospects and limitations of this approach. The results and contributions of this paper are discussed, with audio examples and source code made available.

Paper session 5 - Spatial Audio

Friday 1st September, 9:30 am – Lindsay Stuart Lecture Theatre
Session Chair, Emma Margetson (University of Greenwich)

Impact of an audio-haptic strap to augment immersion in VR video gaming: a pilot study

Antoine Bourachot (Cedric - CNAM), Tifanie Bouchara (LISN, U. Paris Saclay, CNRS) and Olivier Cornet (G4F)

With the development, for the general public, of haptic devices allowing to transform audio signals into vibrations, the question of their capacity to immerse users or players more is raised. This study aims to evaluate how haptic feedback associated with audio reinforces our immersion in a virtual space, more specifically, in VR video games. A preliminary study was carried out with an haptic belt: the Woojer's Strap Edge. 17 participants had to play two VR shooting games, with and without haptic feedback, and then answer questionnaires between each session. A post-hoc questionnaire was proposed to get free feedback from the participants. Results show no significant differences between with and without haptic feedback conditions in the between-session questionnaires, however the final questionnaire reveals a very strong inter-subject variability when it comes to the perception and appreciation of haptic feedback.

Audiodice: an open hardware design of a distributed dodecahedron loudspeaker orchestra

Nicolas Bouillot (Lab148, CIRMMT and SAT), Thomas Piquet and Pierre Gilbert (Society for arts and technology)

We present a new speaker array composed of five spherical speakers with 12 independent channels each. The prototype is open source and design choices are motivated here. It is designed to be a flexible device allowing a wide range of use cases, as described in more detail in the paper: simultaneous rendering with surround speaker arrays, artistic installations and acoustical measurements. The sources in the repository include filter impulse response for frequency response correction. The measurement methodology, based on sine sweeps, is documented and allows the reader to reproduce the measurement and correction. Finally, the paper describes several use cases for which feedback is provided, and demonstrates the versatility, mobility, and ease of deployment provided by our proposed implementation.

Invoke: A Collaborative Virtual Reality Tool for Spatial Audio Production Using Voice-Based Trajectory Sketching

Thomas Deacon (University of Surrey) and Mathieu Barthet (Queen Mary University of London)

VR could transform creative engagement with spatial audio, given affordances for spatial visualisation and embodied interaction. But, issues exist addressing how to support collaboration for spatial audio production (SAP). Exploring this problem, we made a VR voice-based trajectory sketching tool, named Invoke, that allows two users to shape sonic ideas together. In this paper, thematic analysis is used to review two areas of a formative evaluation with expert users: (i) video analysis of VR interactions; and (ii) analysis of open questions about using the tool. Implications present new opportunities to explore co-creative VR tools for SAP.

Rhythmic Accuracy of 3D Spatial Interaction for Digital Music

Timothy Arterbury, G Michael Poor and Ana Arguelles (Baylor University)

This paper describes and evaluates the use of 3D spatial in-air body movement interaction for human control of music software. This technique was implemented, prior to this work, in an input device prototype, MoveMIDI,

which allows users to initiate rhythmic musical events by hitting zones of 3D geometry in a virtual environment using position-tracked motion controllers. This work evaluates MoveMIDI's spatial interaction strategy for music in a usability study measuring timing accuracy of participants performing rhythms using MoveMIDI in comparison to two other input devices. The study revealed spatial unsureness of participants using MoveMIDI due to visualization and haptic shortcomings. While results for the MoveMIDI prototype are not positive, points of improvement are revealed, and our methodology provides a novel comparison for input devices in the context of rhythmic performance accuracy.

FASS: Firefighter Audio Safety Systems

Alan Elliot (Seneca College) and Iain McGregor (Edinburgh Napier University)

A series of auditory cues were designed to assist firefighters with navigation and general safety in a fire emergency. Firefighters must maintain situational awareness at all times and this can be lost with disorientation, which is one of the main causes of injury and even death. Disorientation can be caused by restricted vision due to heavy smoke, a lack of familiarity with the surroundings as well as hearing and communication difficulties caused by the intensity of the fireground sounds. Five professional firefighters were interviewed to identify ways in which auditory affordances could be used to support their work. Existing sounds from both the emergency environment and those generated by firefighting equipment were assessed to determine their importance in maintaining situational awareness. Noise reduction technology was investigated, to assess its potential use in limiting the levels of noise exposure experienced. A series of auditory cues were designed to address the issues that were found using binaural spatialization and Augmented Reality methods. A prototype system was presented to firefighters to determine its effectiveness. The firefighters found that noise reduction would be effective in improving their situational awareness and ability to communicate effectively. Additionally, the firefighters found that spatially placed auditory cues had the potential to be effective in navigation and orientation in a fire emergency. The findings suggest that the use of noise reduction and auditory affordances have the potential to improve situational awareness for firefighters, increase safety and potentially save lives.

Barriers for Domestic Sound Zone Systems: Insights from a Four-Week Field Study

Rune Møberg Jacobsen, Kasper Fangel Skov, Mikael B. Skov and Jesper Kjeldskov (Aalborg University)

The term impact sound as referred to in this paper, can be broadly defined as the sudden burst of short-lasting impulsive noise generated by the collision of two objects. This type of sound effect is prevalent in multimedia productions. However, conventional methods of sourcing these materials are often costly in time and resources. This paper explores the potential of neural audio synthesis for generating realistic impact sound effects, targeted for use in multimedia such as films, games, and AR/VR. The designed system uses a Realtime Audio Variational autoEncoder (RAVE) [2] model trained on a dataset of over 3,000 impact sound samples for inference in a Digital Audio Workstation (DAW), with latent representations exposed as user controls. The performance of the trained model is assessed using various objective evaluation metrics, revealing both the prospects and limitations of this approach. The results and contributions of this paper are discussed, with audio examples and source code made available.

Study of auditory trajectories in virtual environments

Juan Camilo Arevalo Arboleda and Julián Villegas (University of Aizu)

A tool to study the apparent trajectories evoked by sounds (auditory trajectories) is presented. This tool is built with the aim of easing the task of the experimenters (building and analyzing interventions) and the task of the participants (reporting their opinions). By using infrared tracked controllers in a Virtual Reality environment, participants can freely describe the three-dimensional path evoked by a stimulus. The implemented tool also assists participants in recording trajectories by providing additional visual cues and feedback on the recorded data. A mock-up study is presented to demonstrate the benefits of the proposed system. Results from this study show that participants are able to accurately report elicited trajectories. While the implemented tool has limitations, such as the number of available blocks (only practice and main blocks), it could cover the needs of several laboratories. The tool is a valuable resource for researchers seeking to explore the perception and processing of auditory stimuli.

Concert

Wednesday 30th August, 7:00 pm – Glassroom, Merchiston Campus, Edinburgh Napier University, 10 Colinton Road, Edinburgh, EH10 5DT. A bus service will leave Craiglockhart at 6:30 p.m. The bus does not make intermediate stops.

ScoreCraft: Fall

Goni Peles (Bath Spa University) and Yuval Adler (McGill University)

ScoreCraft is a multiplayer music game exploring online music making mediated through gameplay. Each player controls the game by producing sounds, therefore, by playing the game the players are making music. ScoreCraft is structured as a modular environment consisting of a collection of mini games and scenarios. Mini games require the players to produce a particular set of sounds in order to interact with the game, shaping musical material. Scenarios determine how the mini games are arranged, organising the musical material into larger musical forms. We present a performance of the ScoreCraft scenario 'Fall', which is based on the mini game 'Gaps'. The scenario consists of a series of race tracks, each containing barriers with gaps in them, which the players should pass through in order to reach the bottom of the track and complete it. Whenever a player completes a track, all the players move to the next track. The player who passed through the highest number of gaps by the end of the scenario wins.

Isochrone

Emma Margetson (University of Greenwich)

A work combining close-up microphone recordings of a bicycle and field recordings from the Elbe Tunnel in Hamburg, a 426m tunnel for pedestrians, bikes, and cars. Drawing on the cyclic, continuous nature of the material, the evolving sounds reference the never-ending structures found within such spaces. This is a 3D spatial composition composed for 16 loudspeakers. The immersive spatial environment subtly transitions and morphs between the two sound sources: the bicycle and the tunnel. This immersive environment, with spatial transitions takes the listener on a journey to different places drawing on the philosophy of reality tunnels and the poem by Atticus:

"Life is a tunnel
not a cave
keep walking
and you will find again
the light
you left behind."

Gravity | Density

Anthony T. Marasco (University of Texas Rio Grande Valley) and Jesse Allison (Louisiana State University)

gravity | density is a work for cyber-hacked devices and web audio applications. Our goal is to develop systems that merge repurposed and hacked pieces of hardware into the networked world of web art. While the electronic sophistication of mobile devices and the flexibility of web applications allow artists to create immerse audiovisual environments without the use of traditional music hardware, we believe that digital artists should

not cast aside the tools of the past, but rather find new and creative ways of modifying them so that they can inform the ways in which we explore and create with new digital, web-based tools. Through these new hybrid systems, we can both embrace the limitations and push the boundaries of any hardware we use for the purpose of creating collaborative sonic environments.

In gravity|density, we begin by manipulating fixed-audio sources through the performance of hacked CD players. The sonic results of this mangled audio are sampled and then distributed to the audience's mobile devices in both passive and interactive manners. Passive distributions allow us to create an intricately spatialized rhythmic interplay between the glitching CD players and the blanket of overlapping samples dispersed throughout the networked audience. Active distributions enable the audience to join in our performance; by choosing small portions of the audio sent to them and sending these selected samples back to us, we string this audio together and feed it into a cyber-controlled distortion pedal before sending it back to the audience for more manipulation. This results in overlapping cycles of control and audio generation between performer, audience, network, and machine.

VRitual AV: Tactile Micro Interface

Steve Gibson (Northumbria University)

Continuing the motion-based work of Virtual VJ and Opto-Phono-Kinesia I have developed VRitual AV. In response to the limitations introduced by the COVID-19 pandemic, I utilised a more portable and simpler interface than the room-scale GAMS motion-tracking system used in the above projects. The key aim is to create a tactile micro interface that is easy to use and most importantly is easy to transport. The interface serves as a solution for older body-based performers (including myself), who may physically struggle with larger-area interaction. A secondary aim to provide a model for gestural control of mixed media (sound, light, video) in a single form that is both repeatable, but complex enough for genuine expert performance. VRItual AV is a body-based audio-visual performance that deliberately diverges from much live audio-visual work in which the performer sits behind a desk and controls audio-visuals by interacting with a traditional computer interface. The computer itself is deliberately hidden and the interface is the contained within the gestural actions and movements of the performer's body.

Myogram Modular

Atau Tanaka (Goldsmiths, University of London)

Myogram is a concert work for performer and the EAVI bio-electrical interface as musical instrument. The sensors capture electromyogram (EMG) signals reflecting muscle tension. The system renders as musical instrument the performer's own body, allowing him to articulate sound through concentrated gesture. A direct sonification of muscle activity where we hear the neuron impulses of muscle exertion as data. Throughout the piece, the raw data is first heard, then filtered, then excite resonators and filters in a modular synthesizer system.

Installations

Throughout the conference

The Sonic-Optical Unconscious

Paul Goodfellow (Abertay University)

The traditional model of the real-time visualist is the music controlling or directing visuals through the transmission of midi signals or through direct and intuitive manipulation by the artist in response to the music data or experience. This project inverts this model, and the images are created and manipulated in real-time by the artist and this visual data, in the form of pixel values, is used as information to drive signals to produce the audio.

Deep Space Game

Yoichi Nagashima (Shizuoka University of Art and Culture)

This work is a multimodal interactive sound installation(game) with special interface: eight rubbing/tactile sensors. Experience visitor controls sounds and 3D graphics with this interface in realtime, immerse oneself in the output multimedia (virtual space). In addition to that, the rubbing/tactile sensors return to fingers with real physical reaction which sensory reminds about the real and virtual. The game has two modes, first a "practice" mode with static graphics to understand the relationship between sensor control and the generated sound/3D graphics, and then a "challenge" mode with dynamic graphics to control the sensors for a state of deep space immersion.

This system is as a "Serious Game", for "MCI prevention" (activating the brain through the sense of touch at the fingertips in conjunction with hearing and vision). According to the theory of Interoception, the rubbing/tactile sensor operation and soft physical reactions of this system are closely related to human Emotion/Feeling, etc. By paying attention to all eight fingers, applying and relaxing pressure to gently and evenly press the sensor, and experiencing the accompanying sound and 3D graphics biofeedback, humans involuntarily smile and experience a sense of wellness with gentle feeling. Professionals who experienced this installation work (nursing, caregiving, therapy) gave it high marks for its significance as a serious game effective for rehabilitation.

NeuroMostly: An Homage to Lucier

G. Douglas Barrett (Syracuse University)

This interactive audio installation provides a wearable alternate controller interface that sonifies a participant’s brainwaves to create an evolving melodic soundscape. Technologically, NeuroMostly uses a modified Muse 2 Sensing Headband, a consumer device designed to measure brain activity to aid in meditation and sleep analysis. A laptop running Max reads OSC messages from the device that corresponds to Alpha, Beta, Delta, Theta, and Gamma (ABDTG) waves, raw EEG data, and head position. Musically, the Max patch uses list operations to construct an algorithm that converts the approximate differences between the ABDTG waves into members of a pre-selected musical scale. The averaged raw EEG data is used to continuously alter the tempo of an object that plays through this scale, providing a dream-like rubato feel. Conceptually, the author conceives NeuroMostly an homage to the late experimental composer Alvin Lucier (1931–2021) and the pioneering use

of neurofeedback in his 1965 work Music for Solo Performer.
A demo preview video of NeuroMostly is available here: https://vimeo.com/824519611

ScoreCraft: Fall

Goni Peles (Bath Spa University) and Yuval Adler (Bath Spa University)

ScoreCraft is a multiplayer music game exploring online music making mediated through gameplay. Each player controls the game by producing sounds, therefore, by playing the game the players are making music. ScoreCraft is structured as a modular environment consisting of a collection of mini games and scenarios. Mini games require the players to produce a particular set of sounds in order to interact with the game, shaping musical material. Scenarios determine how the mini games are arranged, organising the musical material into larger musical forms. We present a single player installation version of the ScoreCraft scenario 'Fall', which is based on the mini game 'Gaps'. The scenario consists of a series of race tracks, each containing barriers with gaps in them, which the player should pass through in order to reach the bottom of the track and complete it. The scenario is over once all the tracks have been completed.

The Unbearable Lightness of Words

Jaeyoung Elsa Park (Independent Artist)

'If we could measure the weight of words – be it positive or negative - and that measurement was audible, how would we react to one another?'

'The Unbearable Lightness of Words' is an interactive, web-based sound cinema installation, exploring 'one's sound of mind' based on sonification of South-Korean family story with violent language and psychological data of Korean adult's language experiences in 2019-2022. It is a sound-documentary to record the collective memory of people in Korea today as well as to explore emotionally communicative channel that listeners can share their own 'weight of words' in auditory set.
In the sound cinema, listeners can interact with the installation by responding to each character's use of words. With the "sound objects" representing the characters, it lets listeners actively commune with characters by changing the sonic texture by their moods like filtering and reverberation as a conductor.
The distinctive sound produced by the character's chunks of sound features not only spoken words, but also sonification that demonstrate what is happening inside the 'characters' minds' and how internal family relationships affect their outlook. The sound captures of the characters are made up of field recordings, sequences from whole tone scales to juxtapose discordant family relationship and a Korean traditional rhythm utmori ("uneven") based on the psychological data and the emotional line of the story.
Therefore, 'ULW' invites listeners on an ever-changing audio journey into the psyches of characters born out of the collective memory of people who had experienced positive or negative language.

More info: http://www.elsapjy.com/soundcinema-eng

Gala Dinner

The Caves, 8-10 Niddry Street South, Edinburgh, EH1 1NS. A bus service will leave Craiglockhart at 6:30 p.m. The bus does not make intermediate stops.

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