

SoniHED Guests

ROBERTO BRESIN

TITLE

Sonification of physical quantities: a review of the most used mapping strategies, with examples in health and environment applications

ABSTRACT

In a recent study we have reviewed and analysed 179 scientific publications related to sonification of physical quantities. We identified about 495 mappings that we organised into conceptual dimensions and higher-level categories belonging to both physical and auditory domains. Pitch resulted to be by far the most used auditory dimension in sonification applications, and spatial auditory dimensions are almost exclusively used to sonify kinematic quantities. As a result of our study, we propose a mapping-based approach for characterizing sonification. Examples of sonification of physical quantities in health and environment applications will be presented.



BIOGRAPHY

Roberto Bresin is Professor of Media Technology at the Department of Media Technology and Interaction Design (MID), School of Computer Science and Communication (CSC) since January 2014. Prior to that, Roberto was a researcher at the Department of Speech Music and Hearing (TMH) since August 1996.

Roberto's main research interests are expressive music performance, sound in interaction, sonification and emotion in sound and music performance. Roberto has been a member of many sonification-related projects including SOM on the sonification of human movements and SONEA on the sonification of elite athletes.

ALISTAIR EDWARDS

TITLE

Sonification of biological cells

ABSTRACT

Cervical screening relies on visual inspection of cells under a microscope. If the visual representation of the cells were accompanied by a sonification of the cells that might support the work of the cytologist. In other words they would be receiving complementary information on the different sensory channels, hopefully leading to better, more reliable results.



A project investigating this approach has been carried out. A variety of auditory representations were tried which will be demonstrated. Different versions as to what should be sonified were also explored.

Results confirm the fact that it is difficult to find appropriate sounds which carry the required information – and are pleasant to listen to. These results suggest that this is indeed a viable approach – but that the problem is rather broader than anticipated.

BIOGRAPHY

Dr Alistair Edwards received a PhD in Educational Technology from The Open University in 1987 and currently is a Senior Lecturer in the Department of Computer Science of the University of York.

His research interests include multi-modal human computer interfaces, adaptation of interfaces for blind users, tactile interaction and use of speech and non-speech sounds in interaction.

TIM CROUDACE

TITLE

Modelling complexity and uncertainty in psychometric data

ABSTRACT

“Most of my research involves models for measurements. Subjective responses are key to understanding health variations.

Psychometric models are highly suitable for modelling such data and have a long history in other related areas e.g. education and biostatistics. I will explore some of the avenues and issues in modelling of psychometric data that offer alternatives for sonification efforts. This will include considerations of complexity (representation of dimensionality) and uncertainty (representation of error) as well as some specifics related to current work.”



BIOGRAPHY

Tim Croudace is Professor of Psychometric Epidemiology at the Department of Health Sciences (University of York).

Tim's research interests span two related disciplines: epidemiology and psychometrics. Tim combines these interests to produce innovative research using state of the art longitudinal data-analysis and 'new' approaches to measurement theory.

KEVIN HICKS AND PATRICK BUKER

TITLE

The Sonification of Impacts of Ground-Level Ozone on Human Health and Ecosystems

ABSTRACT

Ground-level ozone is formed in the atmosphere by the interaction of sunlight with primary air pollutants (such as nitrogen oxides and volatile organic compounds), which are directly emitted by the industry, motor vehicle exhausts, gasoline vapours and chemical solvents. Beside these emission sources related to human activities, vegetation (forests, grasslands) can also emit gases that contribute to the production of ozone. This talk will describe the impacts that ozone can have on human health and plant yields /food security, potentially creating a financial burden for national economies in developed and developing countries. Ground level ozone concentration, and the severity of its impact, varies across the globe from location to location. We will discuss how sonification of ozone data can be used to create awareness of the spatial and temporal dimension of the problem, while at the same time creating music.

BIOGRAPHIES

Kevin Hicks is the Deputy Centre Director and a Senior Research Associate, at the Stockholm Environment Institute at York, Environment Department, University of York. His current research interests cover air pollution impacts on terrestrial ecosystems, linkages between air pollution and climate change, and the transfer of scientific information to the policy process.

Patrick Bükér is a plant ecologist and environmental modeller at the Stockholm Environment Institute/Environment Department of the University of York. His main research is on interactions between the atmosphere and biosphere with a focus on assessing interrelated effects of various air pollutants and changes of the Earth's climate on forest and crop growth in developed and developing countries.



ANDY HUNT

TITLE

Sonification in Pervasive Medical Computing

ABSTRACT

In just over 25 years of studying Human Computer Interaction for audio I have seen some great changes, but they have tended to be quite slow and incremental. In the early days it seemed that we spent a few years here and there increasing the usability of a 'mouse', refining how menus operated, or responding to Apple or Microsoft's latest desktop interface etc. Musical / sonic interfaces were the preserve of a small set of researchers developing our own equipment and being limited to work in our own labs. Suddenly in the last few years something huge seems to have been occurring and it shows no signs of stopping. We are witnessing the arrival and development of mass-market portable (and often wearable) devices capable not only of real-time audio and graphics processing, but with increasingly sophisticated multi-touch or even gesture-based control systems. This talk will summarise the use of sonification and interaction in health monitoring, and present some thoughts about the latest systems and the potential for future pervasive health monitoring.



BIOGRAPHY

Andy Hunt is a Senior Teaching Fellow in the Audio Lab at the University of York UK. His research interests include human-computer interaction for audio and music, interactive sonification, and new musical instruments. He is co-founder, with Thomas Hermann, of the Interactive Sonification Workshop series (Bielefeld 2004, York, 2007, Stockholm 2010 and Fraunhofer, Erlangen 2013). He co-edited The Sonification Handbook with Thomas Hermann and John Neuhoff. He teaches Interfaces for Audio Interaction, Pervasive Computing, Time Management, Musical C Programming and Music for the Media. He enjoys playing in jazz and rock bands, writing music for film and TV, and developing interactive music Apps for iOS.

ROBERT WATT

BIOGRAPHY

Robert Watt is SEI's Director of Communications, with responsibility for SEI's global communications, both internal and external.

He and his team of communications experts work closely with SEI researchers to bridge science to policy and raise the profile of SEI. In addition, Rob is in demand as a public speaker on the science and policy of environment and development for large conferences businesses and business leaders and the public sector.



Rob is not only a practitioner; he is also interested in understanding the science of science communication. In particular, the tension of timescales (the urgency of policy-making, the time lag of implementation and the slow variables of environmental and social change), creating the policy/science interface, and the role of storytelling.

GUILLAUME LEMAITRE

TITLE

Auditory perception of the actions causing the sounds: a basis for the design of sonic interaction

ABSTRACT

Research in sound perception generally focuses on a few specific auditory attributes (pitch, loudness, sharpness, roughness, etc.) and their corresponding acoustic properties. Similarly, a common approach in data and interface sonification is to map such attributes to different pieces of information to be decoded by the listener.

However, when asked to report what they hear, lay listeners spontaneously describe what has caused the sound (i.e. the sound sources) rather than some attributes of the sound itself. Even highly-trained sound experts encounter difficulties to abstract a sound from its source and focus on acoustics properties, when they recognize the sound sources. This distinction between musical listening (focusing on acoustic properties) and everyday listening (identifying the sources of the sounds) was formalized by seminal sound design researcher William Gaver, who for instance proposed to rely on the semantics of identified everyday sounds (e.g. throwing something to the garbage can) in his design of the sounds of an interface for Apple computers.

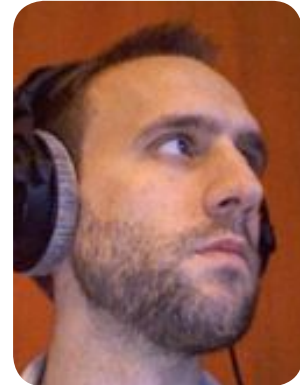
But what do we perceive exactly from the sound sources ? I will argue in this presentation that auditory perception may actually be better suited for the perception of the actions and events that cause the sounds rather than the properties of the objects set in vibration. For instance, despite auditory perception of material has been extensively studied, results show that material identification is only moderately accurate and only in certain circumstances. On the contrary identification of different actions causing the sounds (e.g. tapping, scraping) is always accurate, no matter the objects on which the actions are executed.

Recent research shows that the binding of auditory perception and action execution is even more pronounced. Studies in neuroscience has recently shown that listening to action sounds (and in particular the sounds of tool manipulation) activates brain area involved in motor planning and execution. At a behavioral level, we have shown that listening to a sound associated with an action can prime executing that action.

These results are expected to provide a basis for the design sonic interaction and sonification in a number of domains such as sport training and motor rehabilitation. For instance, I will report results that show that adding a complex sonic feedback to a tangible interface allowed users to learn how to adjust the fine parameters a target gesture and better control the interface.

BIOGRAPHY

Dr. Guillaume Lemaitre (Ircam, Sound Perception and Design group, Paris, France)
Guillaume's research interests include auditory perception and cognition, auditory neurosciences, and applications to sound design and product sound quality. He has worked with the department of Psychology at Carnegie Mellon University (Pittsburgh, PA), the Interaction group the University IUAV of Venice (Italy), and Genesis Acoustics, a company that specializes in the sound quality of industrial products in Aix-en-Provence (France). Over the years, Guillaume has been involved in several projects with Ircam. His current European-funded project (SkAT-VG) aims at developing sound sketching tools using vocal and gestural imitations of sounds.



ARTISTS

RADEK RUDNICKI

BIOGRAPHY

Radek is a composer, sound artist and performer who focuses on using improvised material in multidisciplinary projects. He is founder of Space F!ght and co-founder of RPE Duo, Kirki Project and UUCMS, he regularly performs in Europe and USA.

Radek will work together with music ensemble Space F!ght to create a performance based on environmental data provided by NASA (time series of black carbon/particulate matter and tropospheric ozone), which are correlated to air pollution and health related issues.

spacefight.eu



MARK FELL

BIOGRAPHY

Mark is a multidisciplinary artist based in Sheffield (UK). In 1998 he initiated a series of critically acclaimed record releases, featuring both collaborative and solo works, on labels including Mille Plateaux, Line, Editions Mego, Raster Noton and Alku. Fell is widely known for combining popular music styles, such as electronica and techno, with more academic approaches to computer-based composition with a particular emphasis on algorithmic and mathematical systems.

Many International institutions have presented Mark's works: from large super clubs such as Berghain (Berlin), to Hong Kong National Film archive and many others. Fell has received commissions from prestigious institutions including Francesca Von Habsburg's Thyssen-Bornemisza Art Contemporary (Vienna) with a premier at Seville Biennale of Art, and the National Ballet of Madrid have performed to his works. He has been recognised by ARS Electronica (Linz) with an Honorary mention in the digital music category, and was shortlisted for the Quartz award for his contribution to research in digital music.

www.markfell.com

