Music Mind Machine Launch Event
Tuesday 27th November 2012
14:00-17:30

Music Mind Machine

Programme & Abstracts
Music Mind Machine in Sheffield

Word of welcome

*Music Mind Machine in Sheffield* is a continuation of the successful interdisciplinary research group “Music Mind Machine” (MMM), established in 1992 at the Radboud University Nijmegen, The Netherlands. Its aim was to combine expertise and methodologies from music theory, psychology and computer science to investigate cognitive processes underlying the perception and performance of music. The new research centre also promotes interdisciplinary research on music by fostering communication between researchers and students with varying backgrounds, by supporting experimental and computational research facilities, and by creating an active research environment with opportunities for researchers at any stage of their career. The unifying denominator is the aim to improve insight in music as perceived, performed and experienced through state of the art methodologies, focusing on research with a potential for applications.

At the Launch Event, we bring together researchers and students from Sheffield, South Yorkshire and surrounding regions, who investigate music from an interdisciplinary perspective. The response was larger than expected. We have a great number of presentations from various departments of the University of Sheffield, including Music (Yuko Arthurs, Hannah Beezer, Stephanie Bramley, Henrique Meissner, Stephanie Pitts, Andrea Schiavio, and Mark Summers), Philosophy (Tom Cochrane), Architecture (Ming Yang & Jian Kang), and Computer Science (Charles Fox and Guy Brown). The University of Leeds is also very well represented at the Launch with five members of staff presenting their work (Karen Burland, Alinka Greasley, Alex McLean, Kia Ng, and Luke Windsor). In addition, we are pleased to welcome presenters from the Royal Northern College of Music (Jane Ginsborg), University of Birmingham (Mark Elliott, Alan Wing and collaborators), University of Derby (Peter Lennox), University of Hull (Colin Wright), University of Liverpool (Saul Mate-Cid and Eduardo Coutinho), and University of Teesside (Noola Griffiths). This representation of presenters highlights the growing interest in interdisciplinary music research and its establishment in Northern England.

We also have some special guests from the Netherlands. Peter Desain, Makiko Sadakata, Rebecca Schaefer, and Marieke Sweers will attend the event with a poster and demo presentation. As founding father of Music, Mind, Machine and as (former) members of the MMM group, their attendance presents an important continuation of research direction and research collaboration with the original MMM initiative.
We hope that the afternoon will be an inspiration to all attendees, fruitful in the sense of exchange and development of ideas, and successful in strengthening ties between individuals, groups and institutes. Participants in the launch event include two representatives from the Department of Audiovestibular Medicine, Sheffield Teaching Hospitals (Harriet Crook and Claire Tozer). This signals the longer-term intention for Centre activities to exchange knowledge with interested parties outside the university. Planned future events have a thematic focus: in January, we host a seminar on “Cross-modal perception of music” and, in July, we present an international summer school on “Musical understanding: Philosophical, psychological and neuroscientific approaches”.

To conclude, a note of gratitude: We are sincerely grateful to our Psychology of Music MA students – Margaret Barnes, Ioanna Filippidi, Marianne Fraser, Kunshan Goh, Yiqing Mao, Katharine Robinson, Eva Schurig, Sieow Phey Wong, and to Julian Cespedes, who have helped realise the event by their very effective efforts. Thanks as well to the Faculty of Arts & Humanities for financial support and the Department of Music for organisation support. Finally a very special thanks to Peter Desain & Henkjan Honing for their inspiration, and Luke Windsor for his much appreciated keynote presentation.

Renee Timmers & Nicola Dibben
Directors of “Music Mind Machine in Sheffield”
## Contents

<table>
<thead>
<tr>
<th>Schedule</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maps</td>
<td>7-10</td>
</tr>
</tbody>
</table>

### Keynote Presentation: Music, mind and machines in the ‘real world’ (HRI Institute)
*Luke Windsor*

### Demonstrations: Jessop Building

D1. The presence, experience, and influence of background music in gambling situations (Music Psychology Room 1 - G.11)
*Stephanie Bramley*

D2. The mood organ (Renee Timmers’s office - 1.11)
*Tom Cochrane*

D3. Together in time: measuring group movement synchrony using wireless inertial measurement units (Ensemble Room 2 - G.04)
*Mark Elliott, Juliane J. Honisch, Dagmar S. Fraser, Alan M. Wing*

D4. Musical composition and recognition with hierarchical structures (Nicola Dibben’s office - 2.11)
*Charles Fox*

D5. Fluid dynamics: demonstration (Postgraduate Room 2 - 1.08)
*Peter Lennox*

D6. A practice space demo: learning to fluently play piano trills (Music Psychology Room 2 - G.12)
*Makiko Sadakata, Alex Brandmeyer, Renee Timmers & Peter Desain*

D7. The effects of long exposure photography on musical improvisation (Music Seminar Room - 2.07)
*Mark Summers & Guy Brown*

### Posters: HRI Building

P1. Perception of augmented and diminished triads in different harmonic functions
*Yuko Arthurs*

P2. Cognition during musical improvisation: using reaction times on a secondary task to assess the effects of improvisational experience and different improvisational tasks on levels of controlled processing during musical improvisation
*Hannah Beezer*

P3. The presence, experience and influence of background music in gambling situations
*Stephanie Bramley*
<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>P4. Ambisonic 3-D sound composition tools for artificial auditory-and-visual environments</td>
<td>Michael Brown &amp; Bruce Wiggins</td>
</tr>
<tr>
<td>23</td>
<td>P5. Coughing and clapping: investigating audience experience</td>
<td>Karen Burland &amp; Stephanie Pitts</td>
</tr>
<tr>
<td>24</td>
<td>P6. Psychoacoustic cues to emotion in speech prosody and music</td>
<td>Eduardo Coutinho &amp; Nicola Dibben</td>
</tr>
<tr>
<td>25</td>
<td>P7. Models of music cognition &amp; implications for cochlear implants</td>
<td>Harriet Crook</td>
</tr>
<tr>
<td>26</td>
<td>P8. Mix tapes and turntablism: DJs’ perspectives on musical shape</td>
<td>Alinka Greasley &amp; Helen Prior</td>
</tr>
<tr>
<td>27</td>
<td>P9. The effect of appearance style on perceptions of female solo violinists’ professional characteristics</td>
<td>Noola Griffith</td>
</tr>
<tr>
<td>28</td>
<td>P10. Composing space: the ecology of artificial auditory environments</td>
<td>Peter Lennox</td>
</tr>
<tr>
<td>29</td>
<td>P11. Perception and learning of relative pitch in the vibrotactile mode</td>
<td>Saul Maté-Cid, Robert Fulford, Carl Hopkins, Gary Seiffert, Jane Ginsborg</td>
</tr>
<tr>
<td>31</td>
<td>P13. Interdisciplinary scientific research in music</td>
<td>Kia Ng &amp; Alex McLean</td>
</tr>
<tr>
<td>32</td>
<td>P14. Motor knowledge and the development of musical expertise</td>
<td>Andrea Schiavio</td>
</tr>
<tr>
<td>33</td>
<td>P15. How a melodic theme should continue: a new rule for the Melody Generator II</td>
<td>Marieke Sweers, Louis Vuurpijl &amp; Makiko Sadakata</td>
</tr>
<tr>
<td>34</td>
<td>P16. Music and hearing aids: a review of literature and clinical recommendations</td>
<td>Claire Tozer &amp; Harriet Crook</td>
</tr>
<tr>
<td>35</td>
<td>P17. The issues raised in an analysis of the views of professional and semi-professional musicians on the value of aural skills</td>
<td>Colin Wright</td>
</tr>
<tr>
<td></td>
<td>P18. Natural and urban sounds in soundscape</td>
<td>Ming Yang &amp; Jian Kang</td>
</tr>
</tbody>
</table>
## Schedule

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.00-14.45</td>
<td>Welcome, MMM past, present and future</td>
</tr>
<tr>
<td>14.45-15.30</td>
<td>Demonstrations</td>
</tr>
<tr>
<td>15.30-15.45</td>
<td>Coffee &amp; Tea</td>
</tr>
<tr>
<td>15.45-16.15</td>
<td>Posters</td>
</tr>
<tr>
<td>16.15-17.00</td>
<td>Keynote Luke Windsor (Leeds University)</td>
</tr>
<tr>
<td>17.00-17.30</td>
<td>Drinks &amp; Nibbles</td>
</tr>
</tbody>
</table>

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Music Mind Machine Launch Event
27 Nov 2012
The collaborative work of Desain and Honing signalled a sophisticated interrogation of the methods we use to study music cognition and behaviour. In this paper I will attempt to place their efforts and those of their students and colleagues within a broader context of bodily and ecological contexts, showing how their pioneering work points both backwards into traditional cognitive science, but also forwards into a more embodied, social and situated view of musical behaviour.
D1. The presence, experience and influence of background music in gambling situations

Stephanie Bramley
University of Sheffield

Many individuals gamble, finding gambling activities or environments fun, engaging, exciting and, potentially, addictive (Orford 2011). Background music is a factor, which can influence risk-taking behaviours including driving (Dibben & Williamson, 2007), drug-taking (Van Havere et al., 2011) and gambling (Griffiths & Parke, 2005). The aim of the present research is to examine the presence, experience and influence of background music in gambling situations. This will further understanding of responsible gambling and contribute to limiting any harm experienced from gambling (Cornish, 1978; Griffiths, 1993; Parke & Griffiths, 2007; Gainsbury & Blaszczynski, 2012).

Music is considered as a feature of gambling, which can initiate, reinforce and maintain gambling behaviour (Griffiths & Parke, 2003; 2005). However, little is known about why certain background music is played by gambling operators in gambling environments or how gamblers' perceive the music heard when gambling. Researchers have argued that to understand the responses that music evokes, the relationships between the music, listener and situation ought to be investigated (Juslin et al., 2008; Lamont & Greasley, 2009). This approach may benefit the understanding of music within gambling situations as the experience of music can be considered from a number of perspectives involving gamblers, non-gamblers, gambling operators, gambling environments and the music itself. This enables music's utilisation in different gambling environments, within different gambling activities and by gamblers to be compared.

Technological advances have improved the accessibility and portability of music; enabling gamblers’ to self-select music to listen to whilst gambling. Research is therefore required to understand the rationale for self-selecting music to listen to as opposed to listening to music selected by gambling operators. There is a body of research that has identified many reasons for why individuals listen to self-selected music and which functions music can fulfil (North, Hargreaves & Hargreaves, 2004; Greasley & Lamont, 2011). From this, knowledge of gamblers’ music listening habits is necessary as potentially individuals' gambling behaviour could be influenced differently when listening to self-selected music compared to gambling operator chosen music.

The manipulation of music tempo can influence behaviours including the speed of eating (Roballey et al., 1985) drinking (McElrea & Standing, 1992), moving through a supermarket (Millman, 1982) and reading (Kallinen, 2002). Music tempo’s effect on speed of behaviour has been found to transfer to a gambling situation as laboratory studies have consistently found that fast tempo music leads to faster betting in virtual roulette (Spenwyn, Barrett & Griffiths, 2010; Bramley, 2009; Dixon, Trigg & Griffiths, 2007). Arousal has been proposed as the mechanism responsible for tempo’s effects on betting speed, however, more research is needed to confirm this hypothesis as to date, gamblers’ physiological arousal has not been recorded when listening to background music whilst gambling.

The present PhD research investigates the presence, experience and influence of background music in gambling situations. The research consists of three studies, which aim to explore, from a number of perspectives, the utilisation, experience and influence of background music in gambling situations.
D2. The mood organ

Tom Cochrane
University of Sheffield

I propose to demonstrate a new system that I have developed called ‘the mood organ’. The system takes peripheral signals of emotion, and uses these signals to automatically generate music that is expressive of the emotional state of the user. Several sensors are attached to the body: a GSR sensor worn on the fingertips, a heart rate sensor strapped around the chest, and an EMG sensor affixed to the trapezius muscle on the upper back by means of a trouser brace. In addition to this, the user is seated in front of a webcam which tracks facial expression.

These signals are fed into the music programme MAX/MSP and translated into 3 overarching emotion dimensions: Valence, Power and Expectation. The translations between the physiological measures and the emotion dimensions have been inferred from the scientific literature. For example, raised heart rate variability has been correlated with positive emotions and so this measure contributes to the dimension of valence. Raised GSR levels have been correlated with the emotions of anger, fear and sexual arousal (but not pain or sadness) which I have inferred as correlated to the sense of expectation.

The 3 emotion dimensions are then the locus of control over the musical variables of the system (except for the tempo of the music which is more directly proportional to the heart rate of the subject). For example, the dimension of valence is responsible for controlling the harmonic consonance of the music, as well as the distortion on some instruments. The dimension of power is responsible for controlling the loudness, instrumental attack, reverb and rhythmic intensity. The dimension of expectation controls some instrumental envelopes (e.g. whether the bass tone rises or falls in volume and pitch) and the use of tremolo.

To demonstrate this system I will show myself using the device, but also give people a chance to try the device for themselves (since some of the sensors will need to placed next to the skin, participants may need somewhere private to attach them). I will guide the participant through a 5 minute calibration process that adapts the system to physiological and expressive ranges of the individual. I will then encourage the participant to recall emotional situations from their lives to test the effectiveness of the system.

There are several aims to this device: First it provides an intuitive way to combine the various patterns of activity that characterize our emotional states, allowing us to verify how these patterns are correlated with emotional states. Second it provides further confirmation of how musical variables combine in the expression of certain emotions (the connection between the dimensional measures and the musical results are tested separately here). Third it provides a novel means of expressive communication and musical performance. Finally, I ultimately hope to have several people use the device simultaneously to test whether musical feedback on each other's emotional states can result in emotional synchronization, or experiences of intense interpersonal rapport of the kind occasionally reported by ensemble musicians.
D3. Together in time: measuring group movement synchrony using wireless inertial measurement units

Mark Elliott, Juliane J. Honisch, Dagmar S. Fraser, Alan M. Wing
University of Birmingham

Synchrony of movements within groups can occur under various circumstances. For instance, synchrony can emerge spontaneously such as falling into step when walking with a partner or can be explicit such as in an ensemble of musicians. However, achieving synchrony within a group is not necessarily a trivial task: the brain must combine sensory information from each individual in the group, through a combination of vision, sound and touch to determine what tempo and phase one should move at to remain in time with the group as a whole. In addition, there are potential social influences to group synchrony: we may synchronise better with a group of friends than strangers, for example. Research at the University of Birmingham is investigating how and when group synchrony occurs either spontaneously (e.g. football crowds bouncing together in a stadium) or explicitly (e.g. in a musical quartet) as well as under different social contexts (in-group versus out-group feelings).

One challenge arising from this research is how to measure the timing of movements within a group. Traditional 3D video motion capture methods are possible, but even with a group of just 3 or more individuals marker occlusions become problematic, while identification and labelling of markers becomes laborious. In our demonstration, we will use synchronised wireless inertial measurement units (IMU; APDM Opal) which simply clip on a belt around the waist as a method of capturing temporal events in movements. Participants will be asked to bounce up and down as a group under different conditions: i). manipulated sensory cues, vision/no vision, touch/no-touch conditions; ii). manipulated social cues, participants fill in a short personality inventory questionnaire that aims to manipulate their in-group and out-group feelings at the beginning of the demonstration. Subsequently, we will demonstrate methods of analysing the synchrony performance of each individual relative to the other members of the group.
D4. Musical composition and recognition with hierarchical structures

Charles Fox  
University of Sheffield

Music has structure at many levels, from grand arrangements of verses and choruses down to patterns in small riffs and themes. I will present a practical tool, MusicGenie, that uses grammatical representation of these structures both as a human composition aid and for semi-automated composition via generic algorithm operations. ThomCat is open source and free to use in your own composing. Similar structural representations can be used to perceive structures in semi-improvised performances (such as jazz and pub rock, where the number of choruses is not determined in advance, and where chord and rhythm substitutions are common) and I will present a second, proof of concept, system, ThomCat, which uses Bayesian blackboard inference to do "inverse composition" to perceive the structures in limited domains. Papers and mp3 demos are available at www.5m.org.uk.
D5. Fluid dynamics: demonstration

Peter Lennox

University of Derby

Fluid Dynamics is an example of the exploration of musical temporal and spatial structure drawn from narrative elements from within an abstract animation. Motion within the animation is interpreted and used to determine synchronised sonic events spatialised using ambisonic plugins created by Dr Bruce Wiggins and deployed within the software Reaper.

The piece is envisioned in the horizontal plane with the listener centrally positioned from which the sound emanates and tracks the path of the tendrils temporally and spatially.

The presented animation was developed from constrained source material: collected sounds and images from a series of locations which were subject to processes and filters resulting in new syntheses.
D6. A practice space demo: learning to fluently play piano trills

Makiko Sadakata (1), Alex Brandmeyer (1), Renee Timmers (2) & Peter Desain (1)

(1) Radboud University Nijmegen, (2) University of Sheffield

“Playing the right notes at the right timing” is the first step when learning to perform music. However, there are more to learn and practice when one wish to perform music expressively. In the Practice Space project (2006-2010), we developed and evaluated five real-time visual feedback systems, each of them aims at highlighting different aspects of learning involved in musical performance: loudness and timing imitation of simple rhythmic patterns, longitudinal study on learning timing patterns, learning expressive drum patterns, learning to fluently play the piano trills, and exploration practice of the grace note timing. Here, among these systems, we present the piano finger exercise system.

The primary aim of this system is to provide a support for improving the fluency in finger exercises. A feedback system that visualizes timing, loudness and articulation information in detail is expected to be useful for pianists to fine-tune their motor control. The second aim is to make the rather monotonous finger exercises more interactive and motivating by implementing interactive contrast training method.

We found that conservatory piano students improved their fluency in trills over multiple tests and trainings. Furthermore, the use of the VFB system and the contrast training seemed to help this improvement. Qualitative data showed that most participants considered the system – especially the interactive contrast training – very useful.

We found that rather simple real time visual feedback on timing, loudness and articulation is effective in improving fluency in finger exercises. Furthermore, it makes exercise more attractive and interesting. We consider this system as one of the promising prototypes for music education.
D7. The effects of long exposure photography on musical improvisation

Mark Summers & Guy Brown
University of Sheffield

This project investigates the effect of an extra-musical constraint on improvisation, namely using an improvised performance to create a long-exposure photographic image using a pinhole camera. A pinhole camera is placed near an improvisor and a photograph is made of them performing. The length of the improvisation is roughly determined by an exposure time that is appropriate for the film/camera/lighting combination, generally between 2 and 6 minutes.

A pinhole image has a much longer exposure time than a lensed camera, and in lower light situations an image must be built up over minutes. During these extended times, a relatively brief movement will not appear if performed on its own, but may become visible if many similar movements are made. For example, a single note bowed slowly on a stringed instrument will not appear, but a suggestion of that movement may be seen if one hundred similar notes are played.

If images and music are to be satisfying, an improvisor has to think about their physical movements in space and time, i.e. in four dimensions, as much as about their musical material. There is no need to play the same thing monotonously to build an image, instead groups of diverse movements/musical gestures that occupy similar spaces repeatedly could be employed. Conversely, an improvisor could decide to be seen as little as possible, in which case they might make movements that rarely share the same space.

Using a simulated pinhole camera cuts time and mess from the learning process as results are instant instead of being dependent on chemical processing, making results more predictable and placing smaller demands on musicians' time. The resulting images will be similar to, but not exactly the same as film, but have the added benefit of being viewed as they are created. The current demonstration shows the concept of using improvisation to create an image and, in addition, the computer-aided learning process for a musician, designed to be an aid to developing a 4D sense of musical gestures in preparation for taking a film-based photograph.

Two distinct methods are employed for the simulator, one showing a properly exposed but changing image, the other showing an image that gradually emerges from nothing. Specifically, in the first method an image is built up of a series of conventionally exposed webcam photographs - here, single gestures will show up to start with but will decrease rapidly in effect, such that more and more movements have to be made to appear. In the second, an image is built up using a fraction of a series of webcam photographs, e.g. for a 5 minute exposure comprising 600 photographs, each photograph would make up 1/600th of the final image and thus make a negligible difference on its own.

As well as being used as an aid for creating photographs, the simulator will be used to help investigate how improvisors react to having an unusual extra-musical constraint imposed on them during performance.
P1. Perception of augmented and diminished triads in different harmonic functions

Yuko Arthurs
University of Sheffield

The purpose of this study is to investigate how the function of augmented and diminished triads influences a listener’s perception of them in terms of consonance/dissonance (C/D) and pleasantness/unpleasantness (P/U). Both augmented and diminished triads are usually categorised as dissonant chords due to the absence of a perfect fifth and the ambiguous sense of root. However, they are not uncommon chords in musical pieces, and perception of C/D varies depending on cultural conditioning and familiarity. Experiments were conducted to test the assumption that the function of an augmented or diminished chord will change its C/D and P/U levels.

The results from these experiments revealed that both the C/D and P/U levels of augmented and diminished chords vary depending on their function within a sequence. Future studies will focus on the effects of such elements as timbre, the means of resolving chord sequences, and the duration of chords and sequences, on perceptions of the C/D and P/U of augmented and diminished chords.
P2. Cognition during musical improvisation: using reaction times on a secondary task to assess the effects of improvisational experience and different improvisational tasks on levels of controlled processing during musical improvisation

Hannah Beezer
University of Sheffield

The cognitive processes underlying musical improvisation have previously been studied using analysis of improvisations, the accounts of improvisers or neuroimaging techniques. However, whilst other areas of expertise performance have been found to be characterised by proceduralisation, and models of musical improvisation have speculated as to the interplay between controlled and automatic processing in musical improvisation (Johnson-Laird, 2002), quantitative investigation of this has been overlooked.

This study addresses this gap through quantitative investigation of cognitive processing levels using a dual-task methodology. Reaction time responses to a match/mismatch paradigm of the Stroop task were used to indicate levels of controlled processing across 5 tasks; A baseline measure of cognitive processing, scale playing, melodic generation, rhythmic generation and blues improvisation. In order to assess the effects of improvisational expertise on cognition, a sample of 20 pianists was used consisting of non-improvisers ($N = 9$, with an average years of improvisation experience of .6 years) and improvisers ($N = 11$, with an average years of improvisation experience of 7 years).

The results suggest that musical improvisation requires higher levels of conscious cognitive processing than scale playing but that these levels are also likely to fluctuate over the time course of an improvisation. In addition a method for measuring levels of cognitive processing in a time-dependent manner is established and tested using a case study. Results indicate that this method provides a potential means of measuring the relationship between levels of cognitive processing and what improvisers are playing on a time-dependent basis.
P3. The presence, experience and influence of background music in gambling situations

Stephanie Bramley
University of Sheffield

Many individuals gamble, finding gambling activities or environments fun, engaging, exciting and, potentially, addictive (Orford 2011). Background music is a factor, which can influence risk-taking behaviours including driving (Dibben & Williamson, 2007), drug-taking (Van Havere et al., 2011) and gambling (Griffiths & Parke, 2005). The aim of the present research is to examine the presence, experience and influence of background music in gambling situations. This will further understanding of responsible gambling and contribute to limiting any harm experienced from gambling (Cornish, 1978; Griffiths, 1993; Parke & Griffiths, 2007; Gainsbury & Blaszczynski, 2012).

Music is considered as a feature of gambling, which can initiate, reinforce and maintain gambling behaviour (Griffiths & Parke, 2003; 2005). However, little is known about why certain background music is played by gambling operators in gambling environments or how gamblers’ perceive the music heard when gambling. Researchers have argued that to understand the responses that music evokes, the relationships between the music, listener and situation ought to be investigated (Juslin et al., 2008; Lamont & Greasley, 2009). This approach may benefit the understanding of music within gambling situations as the experience of music can be considered from a number of perspectives involving gamblers, non-gamblers, gambling operators, gambling environments and the music itself. This enables music’s utilisation in different gambling environments, within different gambling activities and by gamblers to be compared.

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The manipulation of music tempo can influence behaviours including the speed of eating (Roballey et al., 1985) drinking (McElrea & Standing, 1992), moving through a supermarket (Milliman, 1982) and reading (Kallinen, 2002). Music tempo’s effect on speed of behaviour has been found to transfer to a gambling situation as laboratory studies have consistently found that fast tempo music leads to faster betting in virtual roulette (Spenwyn, Barrett & Griffiths, 2010; Bramley, 2009; Dixon, Trigg & Griffiths, 2007). Arousal has been proposed as the mechanism responsible for tempo’s effects on betting speed, however, more research is needed to confirm this hypothesis as to date, gamblers’ physiological arousal has not been recorded when listening to background music whilst gambling.

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P4. Ambisonic 3-D sound composition tools for artificial auditory-and-visual environments

Michael Brown & Bruce Wiggins
University of Derby

Ambisonics is a systemic approach to 3 dimensional sound fields, utilising spherical harmonics, that is intrinsically “speaker layout agnostic”. A spatial sound piece can be composed and engineered without regard to the target auditory display configuration and can be subsequently played to varying degrees of spatial verisimilitude from (in order from least-to-most spatially detailed) stereo, 5.1, 6.1, 7.1, through to full with-height representations using not less than 8 speakers with no theoretical upper limit (depending on the size of the display space).

As Ambisonics is free and open, this allows development of purpose-specific software compositional tools, which have been used here in composing three-dimensional auralisations of high definition rendered abstract imagery.

This poster describes that availability and usage of free tools such as the WigWare Ambisonic VST plugin suite that can run in hosts such as Reaper and Audiomulch. There is also demonstration of a piece composed in this way.
P5. Coughing and clapping: investigating audience experience

Karen Burland (1) & Stephanie Pitts (2)
(1) University of Leeds, (2) University of Sheffield

For the past few years we have been working on a number of projects investigating the nature of audience experience in a variety of contexts including jazz clubs and festivals, chamber music festivals and orchestral concerts. The contexts encompass a range of factors: venues, from small and intimate, to large and quirky; degrees of formality, from the informality of the small jazz club to the more formal Symphony Hall; and styles of music, from Dixieland Jazz to Beethoven string quartets.

We have found across genres that live performance events can often (though not always!) enhance the listening experience as audience members:

- feel as if they are among like-minded listeners;
- can make a connection with the musicians;
- can escape from external distractions and become immersed in the music;
- balance the social and musical aspects of musical preferences and identity
- might form friendships or a sense of belonging with regular audience members
- become loyal to particular events, venues or performers – so affecting their music listening beyond the event

However, audience members hold certain expectations about venues (particularly appropriate layout and comfort), other audience members (talking too much, not respecting the performers on stage), the performers (particularly that they should communicate with the audience directly), and the management of venues (particularly regarding programming). Unfulfilled audience expectations can lead to dissatisfaction and ultimately reduced motivation to return to that particular venue.

Our next project is an edited book, Coughing and Clapping, which aims:

- To understand the process and experience of attending live music events from the decision to attend through to audience responses and memories of a performance after it has happened.
- To adopt a multidisciplinary approach to reflect the complex interplay between marketing, architecture, sociology, psychology, technology and performance art that is present during live performances.

Our poster will present an outline of the book, showing its range of interdisciplinary perspectives and so providing an overview of current and future directions in audience research.
P6. Psychoacoustic cues to emotion in speech prosody and music

Eduardo Coutinho (1) & Nicola Dibben (2)
(1) University of Geneva, University of Liverpool, (2) University of Sheffield

There is strong evidence of shared acoustic profiles common to the expression of emotions in music and speech, yet relatively limited understanding of the specific psychoacoustic features involved. We will present a study that combines a controlled experiment and computational modelling to investigate the perceptual codes associated with the expression of emotion in the acoustic domain. The empirical stage of the study provided continuous human ratings of emotions perceived in excerpts of film music and natural speech samples. The computational stage created a computer model that retrieves the relevant information from the acoustic stimuli and makes predictions about the emotional expressiveness of speech and music close to the responses of human subjects. We will show that a significant part of the listeners' second-by-second reported emotions to music and speech prosody can be predicted from a set of seven psychoacoustic features: loudness, tempo/speech rate, melody/prosody contour, spectral centroid, spectral flux, sharpness, and roughness. The implications of these results are discussed in the context of cross-modal similarities in the communication of emotion in the acoustic domain.
P7. Models of music cognition & implications for cochlear implants

Harriet Crook
Sheffield Teaching Hospitals

Many cochlear implant users experience difficulties listening to music, both in terms of perception and discrimination skills, and in terms of emotional appreciation. Many models of music cognition can be applied to cochlear implant users. In particular neuropsychological studies focus on study of the damaged brain and how processing is impaired. The patterns of impairment and sparing of musical functions provide us with working models regarding the autonomy and organisation of music cognition. Case MR is described, showing remarkable sparing of musical processes in the presence of global aphasia, demonstrating separation of language and musical skills, and autonomous music processing. As implant users also have an impaired model of auditory processing they cannot access some levels of discrimination and consequently not only have poor discrimination skills but may lose out on emotional aspects of musical listening. Neuropsychological models can show how a system functions with reduced input or a degraded auditory analysis, providing an analogous model to the musical input received by cochlear implant users.
P8. Mix tapes and turntablism: DJs' perspectives on musical shape

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The notion of musical shape is widely used by performing musicians, but current studies have focussed on classical performing contexts. This poster is intended to begin the process of widening the scope of this research to include a specific ‘popular’ performing context, namely DJs performing on turntables. Is there evidence that DJs also use the notion of shape in relation to music? How might this notion of shape manifest itself in the musical materials they produce?

Three professional DJs with varying backgrounds were interviewed to explore the use and understanding of musical shaping. Participant 1 specialized in mixing; Participant 2 in mixing and turntablism; and Participant 3 in turntablism. Interpretative Phenomenological Analysis, a technique designed to work particularly well with small sample sizes, was used to analyse the data.

Results suggest that DJs do use the notion of shape when planning and executing their sets, and that playing sets without any shaping involves playing the music badly. DJs reported using the idea of shaping to help them to modify a track while it was playing and control the transition between tracks (using a variety of features on the decks and mixer including pitch faders, cross faders, EQs, filters, and by incorporating scratching techniques). DJs also reported using the idea of shape when considering the overall trajectory of a set, which included a consideration of style of tracks, the order in which they are played, and levels of energy and sound intensity over time.

There was evidence to suggest a multi-modal understanding of musical shaping: participants indicated shape-related ideas using gestures and also referred to the visual display of their mix as an indicator of shaping, as well as controlling the shape of the music through listening and responding to sound. The findings are considered in relation to existing work on performers’ use of musical shape as well as work on the practice of DJs. The poster is a prompt for the necessary extension of the current work on shaping music in performance to incorporate turntable performers.
P9. The effect of appearance style on perceptions of female solo violinists’ professional characteristics

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Empirical evidence suggests that visual aspects of performance, including musicians’ concert dress, can affect audience perceptions of musical aspects of performance (Wapnick, Mazza and Darrow, 2000). Furthermore, Griffiths (2008; 2010) found that a body-focussed style of dress was judged to be less appropriate than traditional concert dress and was associated with lower ratings of aspects of performance quality in female solo violinists. In sociological research, Barnard (2002) described how dress can also indicate an individual’s social role and states that such roles are associated with a set of expected behaviours or qualities. Therefore, it is possible that the degree to which a performer’s concert dress reinforces expectations of a classical soloist may affect observers’ perceptions of their personal as well as musical qualities. Through dress, a musician may be able to define their role as a soloist and aim to manage observers’ perceptions of their musical standing. Artistry and authority are characteristics associated with the role of classical soloist (Cook, 1998) and perceptions of professionalism have been shown in psychological research to be related to judgements of quality (Baker et al. 2004). The research reported here aimed to investigate the effect of style of concert dress on audience perceptions of authority, artistry and professionalism in female classical soloists, as well as perceptions of their musical performance quality. Women musicians were selected due to their more flexible dress code and the specific challenges they face in terms of gender stereotypes related to their dress and body image (see Bartky, 1990).
What could be musically interesting, valid or informative in spatial music, and what perceptual impressions could be catered to?

Contemporary commercially available spatial sound tools are not designed to efficiently manage such salient aspects of auditory spatial environments, as distance, motion, physical interactions, object and place size or physical construction. Although these are readily comprehensible to human perception, they do not form part of the mainstream musical lexicon.

This poster describes a simple soundscape compositional theme based on the precept that perception efficiently uncovers, in any environment, the set of causal relationships here termed ‘the local ecology’.

In an artificial ecology, where physical and perceptual rules can be creatively subverted, the challenge is to retain perceptual plausibility – in the same way that cartoons can be perceptually plausible yet physically improbable.

The scheme described here is based on a ‘modular through-and-through’ conception of perception, where specialised subsystems rapidly identify, within a received sound field, those components that denote place, physical features, entities (position and behaviour), trajectories and events.

It is hypothesised that by composing in terms of the artificial causal ecology (including the physics), these perceptual modules can be appealed to directly in isolation or in concert to produce novel perceptual impressions.

This work is part of on-going research to develop intuitive compositional spatial sound tools that can incorporate elements of naturally available spatiality into musical syntax.
P11. Perception and learning of relative pitch in the vibrotactile mode

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This research concerns the use and understanding of vibrotactile information to facilitate group performance for musicians with and without a hearing impairment. Little or no attempt seems to have been made to address the issue of learning relative pitch (RP) for musical notes in the vibrotactile mode. The aim of this study was to investigate the perception and learning of basic RP in the vibrotactile mode via the fingertip. For the purpose of this work, basic RP is defined as the ability to distinguish one note as being higher or lower than another.

The results show a high success rate for basic RP with and without training. For intervals ranging from one semitone to one octave below to one octave above Middle C, there was a significant difference for individual intervals between 9 and 12 semitones when comparing pre-training and post-training test results. An appreciable and significant improvement was found for the whole group of 12 intervals comparing both pre- and post-training tests. In addition, reaction times to identify relative pitch tended to reduce over the training period.

The findings of this study contribute to the on-going development of vibrotactile music technology. Further tests in the vibrotactile mode will explore (a) the effect of a hearing impairment on RP perception and detection thresholds, and (b) the perception and learning of absolute pitch.
P12. Can teaching about music & emotion improve children’s expressive performance?

Henrique Meissner
University of Sheffield

Since children can express happiness and sadness in their singing and music making from a young age (Adachi & Trehub, 1998; Davies, 1986, 1992), it seems likely that they are also capable of expressing such emotions in their instrumental playing, provided that appropriate methods to develop expressive performance are adopted.

To investigate methods for improving children’s expressive performance, an Action-Research (AR) project was initiated. Ten music teachers and sixteen pupils took part in this project which consisted of ten weeks teaching on music & emotion. At the beginning and end of this period, informal concerts were held and students’ performances were audio-recorded.

Participating teachers used a variety of strategies to develop students’ expressivity: teacher’s inquiry, discussion, explanation of expressive devices, gestures & movements, singing, imagery, modelling, ‘projected performance’ and listening to own recordings. According to teachers, these strategies had been useful in lessons. However, analysis of assessments of students’ performances did not show a significant improvement.

Interestingly, four out of five students who did improve their expressivity were taught by teachers who used discussion of musical character and instruction about modifying expressive devices.

The AR-project influenced the practice of most participating tutors, as they focussed more on teaching expressive performance.

Additionally, in a Small Exploratory Study, children’s progress in expressive performance during one lesson was investigated. Eight children were given two pieces portraying contrasting emotions and received a lesson on music and emotion. Their performances at the beginning and end of the lessons were audio-recorded. In most performances expressivity had improved. Discussion of musical character, instruction about modifying expressive devices and modelling were used to improve students’ musical communication.

The findings of these exploratory projects form the foundation for further research investigating teaching and learning expressive music performance.
P13. Interdisciplinary scientific research in music

Kia Ng & Alex McLean
University of Leeds

The University of Leeds Interdisciplinary Centre for Scientific Research in Music (ICSRiM) specialises in multi- and inter-disciplinary research and involves members of staff from a number of Schools, including Computing, Music, Electronic and Electrical Engineering, Civil Engineering, Mathematics, Psychology, Earth Sciences, with external members from other academic institutions, freelance and industrial collaborators. ICSRiM is involved in a wide range of interdisciplinary research areas, including: human-computer interaction, gestural interfaces, virtual and augmented instruments and interfaces, modelling and simulation of expressive performances; hybrid live coding environments; computational creativity; tangible interaction; trans-domain mapping, multimodal interfaces and feedback including visualisation and sonification; music psychology and its technological applications; analysis, encoding and transcription of musical information and symbolic music representation.

In celebration of the launch of "Music Mind Machine", we present a poster on a number of selected collaborative research projects from ICSRiM focusing on “Music via Motion” (MvM). The poster briefly introduces the key concepts of the MvM framework and presents several related research including:

- i-Maestro 3D Augmented Mirror (supported by the EC IST) on technology-enhanced learning for music (see http://www.i-maestro.org);
- Interactive Dance exploring trans-domain mapping of movement and colour for music (see http://news.bbc.co.uk/1/hi/technology/3873481.stm). The system enables an intuitive and non-intrusive interactive audio-visual performance interface that offers the users or performers real-time control of multimedia events using their physical movement;
- Interactive Rock instruments created using stones from Lake District region with multimedia augmentation. This is resulted from an interdisciplinary collaboration supported by Natural England (see http://www.guardian.co.uk/music/2010/aug/18/stone-xylophone-evelyn-glennie). The new instruments utilised digital signal processing techniques to enhance tuning of the keys. The new interface explored new considerations on ergonomics, playability and expressivities, employing sensors and multimedia interface technologies to create an augmented instrument with additional control and interactivity.

We are participants in the University of Leeds Cultural and Creative Industries (CCI) Exchange. Kia Ng leads the Human/Technology Interface area of CCI to further works on interactive multimedia systems through collaboration between science, arts and technology. This includes sensory rooms and spaces, live interfaces for performance, and rich environments for creating, collaborating and learning. We intend to further understanding of interaction and intelligent interfaces in the performing arts, and collaborate with other fields to develop shared aims and far-reaching impacts.
P14. Motor knowledge and the development of musical expertise

Andrea Schiavio
University of Sheffield

The audio-motor integration underlying musical experience has increasingly received attentions over the last few decades. Since the cognitive neuroscience of music led to the possibility of empirically testing the neural basis of cognition and learning, a large amount of studies has been published with the aim to understand the mechanisms involved in this process. The field of musical learning, among the others, represents an excellent domain (Palmer, Meyer 2000) to shed light on the motor basis of musical understanding (Schiavio 2012) in league with the recent focus of phenomenological and neurocognitive studies on embodiment (e.g. Froese 2009; Gallese 2011). In particular, learning tasks can be appropriate for investigating the strategies used by the participants to familiarize, considering their musical expertise, with a given melodic fragment. The present study aims therefore to investigate the role of motor learning in the memorization of four different musical excerpts for piano. Musicians (non-pianists) and non-musicians have been asked to familiarize with 4 different short piano melodies under different conditions: “playing condition” (performing the melodies on a keyboard), “silent tapping condition” (performing the melodies on a piano without any auditory feedback) and “seeing condition” (watching a video with a performer playing the melodies).

The results I collected up to now (made of 50 out of 70 participants) show that - generally - musicians have greater accuracy in responses than non-musicians. However, it’s worthy to note that, in silent tapping condition, this difference is not significant. Moreover, the trend for musicians is to score lowest with audio only, and to score better with seeing, silent tapping and playing. This suggests that they take advantage of the additional modalities provided in these conditions. The non-musicians also show a difference between silent tapping and playing on the one hand, and seeing and the control group on the other hand. Accuracy is lowest when training with seeing the pieces performed, showing that non-musicians cannot make use of this type of training, in
P15. How a melodic theme should continue: a new rule for the Melody Generator II

Marieke Sweers, Louis Vuurpijl, & Makiko Sadakata
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Melody Generator II (Povel, 2010; MG II) is a knowledge-based melody composing system. The system has rules for music features (contour, rhythm and harmony) which together form a good basis of a musical piece, a theme. The MG II helps composing a continuation after the theme by offering full possibility to repeat or manually vary each feature. This, however, means that it knows little about how the theme should continue.

The current study investigated whether there are rules that can describe a good continuation of a melody. In order to derive the continuation rules, we carried out a web-based experiment examining effects of repetition and variation of musical features on naturalness (human-made – artificially made) and preference (like – dislike) rating of a melody.

The naturalness rating was higher when melodies included rhythmic repetitions and harmonic variations, but only when the contour were kept constant. The preference rating was higher for melodies containing rhythmic repetitions. The similarity rating correlated with the number of varied features (the more varied features, the more dissimilar), indicating that the results of naturalness and preference ratings were not due to participants’ insensitivity to feature variations.

Participants perceived a melody as more natural when it included rhythmic repetitions, contour repetitions and harmonic variation. Interestingly, this variation / repetition pattern is very similar to a so-called “sequence” technique, which is often used in music composition. We consider this rule as a good candidate to implement in MG II as a support for composition of longer musical melodies.
Modern digital hearing aids are equipped with numerous adjustable parameters and features, most of which are designed with the aim of maximising speech intelligibility for the wearer. However, speech may not be the only sound source of significance; music is an important source of enjoyment for many people, and often plays a key role in life events and has been demonstrated to have impact on quality of life. As hearing instruments are designed with speech in mind, the electroacoustic settings applied may not be optimal for processing musical input signals and anecdotally many patients complain of poor music listening experiences. This review summarised current findings within the literature regarding the limitations of hearing aids for processing music and recommendations to optimise music listening. These are summarised as a set of clinical recommendations which can be applied to current digital aids within NHS settings. Future directions for research will aim to evaluate outcomes with these recommendations.
P17. The issues raised in an analysis of the views of professional and semi-professional musicians on the value of aural skills

Colin Wright
University of Hull

Aural ability has featured strongly as a fundamental skill of the professional musician and has been traditionally regarded as an essential element of musicianship, underpinning composition, performance and the critical appraisal of music, including listening and analysis. Essentially a neurological phenomenon, the inner ear is the vital link between hearing music and its physical application using the voice or instrument. As part of my research into the role of aural skills in a music degree programme, the views of a number of mostly local professional musicians have been sought about their importance in their own work and career and this poster outlines an analysis of their responses following interviews undertaken earlier this year. Reference is made to the problems and sufficiency of the methods currently adopted in the general development of aural skills prior to university entrance, and the extent to which specific and systematic training should be provided at degree programme level.
Among various sounds in the environment, natural sounds, such as water sounds and birdsongs, have proven to be highly preferred by humans, but the reasons for these preferences have not been thoroughly researched. This research study explores differences between various natural and urban environmental sounds from the viewpoint of objective measures, which include psychoacoustical parameters that have been recommended in previous soundscape research and additional psychoacoustically related parameters that have mainly been applied in music perception. 100 recordings, of about 700 minutes in total divided into 1140 30-second segments have been collected from recordings and from multiple databases. The natural sound recordings were made in English countryside and natural parks, and the human activity/facility sound recordings were made in the urban areas of London, Manchester and Sheffield in England. Psychoacoustic Analysis have been performed in terms of Loudness (N), Sharpness (S), Roughness (R), Fluctuation Strength (Fls) and Tonality (Ton) as well as average (AVE), standard deviation (STD), maximum (MAX) and minimum (MIN) of the parameters. The music features analysis has been based on Pitch and Rhythm. Discriminate function analysis, Hierarchical cluster analysis, Principal component analysis and Artificial neural networks have been utilized for the parameters prediction.

Based on psychoacoustical evaluation it has been found that Water sounds have low Fls AVE values and a wide range of N; Wind sounds: low Fls AVE values, a wide range of N and low S AVE values; Birdsongs: high Fls AVE values, high S AVE values and low N AVE values; Urban sounds: high N AVE values. In terms of music features bird songs have been proven to have much more Pitch and Rhythm related structure compared to the other sounds. The planned future work will be carried out to perform subjective listening test for the parameters identifications also aiming at linking the objective parameters and perception of soundscapes and studies on soundscapes with combined sound sources.