Towards electronic digital music practice for neurodiverse people

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Abstract
This paper gives an overview on the DEIND project which aims to connect neurodiverse people with the field of contemporary electronic and digital music practice.
In pursuit of this, people with autistic spectrum disorders are invited to take part in the design process of electronic instruments.
The close integration of target group members into the research process encourages a bilateral learning process: on the one hand, there is an intense and fruitful experience for the participants developing, on the other hand, involved researchers will identify design challenges specific to the target group yet very likely reveal new perspectives on the broader view of their respective area of research.

Keywords
Keywords go here.

ACM Classification Keywords
H.5.2 Information Interfaces and Presentation: User interfaces – Evaluation/ methodology

Introduction

Caused by recent technological as well as cultural developments – cheap electronics, rapid prototyping technologies, respectively the DIY, maker and demo scenes – the majority of people in the western world are able to creatively express themselves in a multitude of ways. Apart from mainstream hypes such as the hipstamatic phenomenon[1] the tools for digital content creation as well established social and cultural niches featuring unique expression vocabularies, e.g., embodied by experimental electronic music practice.

People with disabilities, however, mostly lack the possibility to take part in such cutting-edge movements: assistive technologies and careful design considerations are often of secondary interest to the designers and developers of the required technology, especially when it comes to the facilitation of cultural niches[2].

However, questions remain on how, for example, electronic music practice (*EMP*) can be scaffolded to support people facing challenges in society due to differences in their neurologic development: How can *EMP* support them in expressing themselves in an experimental way beyond mainstream? How can it make the engaging nature of *EMP* accessible for them without pressing it into too much guidance? Can *EMP* empower them to even shape their own social niche(s) in the above-mentioned sense?

This paper gives insights on how the DEIND project, which aims to connect neurodiverse people with the field of contemporary electronic and digital music practice, approaches these questions. In pursuit of this, people with autistic spectrum disorders are invited to take part in the design process of electronic musical instruments. To facilitate music practice, we aim for a holistic instrument experience rather than a modular approach in which the underlying modules of electronic instruments, interface & mapping & sound synthesis, would become too evident, possibly interfere with the flow experience. The close integration of target group members into the design cycle encourages a bilateral learning process: On the one hand, there is an intense and fruitful experience for the participants, on the other hand, it opens the opportunity for the involved researchers to identify challenges that are specific to this group yet reveal new perspectives on the broader view of their respective research area.

Research objectives

some words about the research objective

Implementation and research methods

We investigate the above-mentioned research objectives through three work packages. A structural overview of their interrelation is shown in Figure 4; their general intention and content is explained below.

WP1 investigative field work This WP covers the actual work with the target groups and the collection of data on which the other WP's rely on. Interactive participatory design sessions are conducted in which the participants are introduced to contemporary electronic music and (later on) to the instrument prototypes to be built in WP3. A particular focus lies on playing the instruments and giving the people an opportunity to explore their possibilities. During these sessions, the musical play is recorded and various other research material such as drawings, written comments and interviews is collected. The deliverables of this WP are musical recordings, workshop documentations, and, possibly with the help of the recorded material, attendances to public

[1] See e.g. http://www.kunsthal.nl/en-22-681-Hipstamatic.html

[2] This is by far not caused by bad faith, furthermore grounded in the very constraints inherent to such cutting edge movements

events and international festivals. All this will happen in accordance with the performers.

WP2 evaluation & coding, theory building In this WP, the material gathered in WP1 is analysed and put into a broader context by incorporating knowledge gained from background research eventually leading towards a theory of electronic music practice for neurodiverse people. The deliverables of this WP are scientific papers for IxD, NIME and Autism related conferences.

WP3 conceptual synthesis & instrument development This WP aims to turn the observations and derived theory of WP1 & WP2 into practice by (a) turning the theoretical considerations into practical guidelines and (b) creating and altering instrument prototypes that in turn are used in WP1. The deliverables of this WP are instrument prototypes and guidelines for the design of electronic instruments to be published at international conferences.

This project is mainly based on practice-oriented qualitative research methods. Therefore, the project will extensively draw from participatory design and ethnomethodological research methods, which will be adapted to the target groups' intrinsic character. To fulfil the above-listed objectives, we intend to apply a combination of experimental and theoretical methods that are based on both artistic and scientific research practices. The subsequent list gives an overview on the methods as intended to be used for the work packages. By their combination, new knowledge for specific electronic instruments will be gained, generalised and finally fed back into the respective research areas.

WP1 Adaptation of participatory design workshop methods, focus group sessions, concerts and phenomenological observations of target group members exploring musical possibilities of instruments resulting in interviews, field notes, questionnaires and quantitative measurements.

WP2 Grounded theory and phenomenological analysis based on recorded research material combined with background research in related fields.

WP3 Rapid software and hardware prototyping, incorporating the Aalto facilities (Aalto MediaFactory, Aalto FabLab, textile-workshop, wood-workshop).

First iteration

In which we give an overview about the first design iteration.

initial workshop

Tells that we had a kick-off meeting with all contributing members followed by a one-day trip to our project partner Nuorten Ystävät in Imatra. This was followed by an initial workshop day at which we discussed arising challenges (tell which!).
We came up with possible ideas for the system design (give examples for the prototype ideas and why they were considered).

instrument prototyping

We decided to develop two of the many ideas further, namely he rhythmical interaction part and the idea on room modes.

audio prototyping

Reports on the two to seventeen audio prototypes we did: the ambient system (complexRes), the FM matrix, the autoLoopPointer, the diodeRing, the noiseRing

sensor prototyping

reports on the different sensors we looked at, e.g. switchDesigns (floor plan, imatra map)

interface prototyping

Mentions (again) that we're focusing mainly on textile-based interfaces. Why is that so? We have some knowledge and want to extent it. Because textiles are nice to touch, give a lot of haptic feedback and are easily accepted (when showing the prototypes to people, they immediately grasp for them and hug them. Happened for real!) We did an initial interface design with *conductive fur*. We describe conductive fur, how we anticipated its usage, how it feels and how it works. We as well give sound examples on how it sounds with and without added effects.

sonic environments

Contact microphone attached to the ventilation outlet to capture its vibrations. FM synthesis

field trip

We tell about the first field trip to Imatra and what happened there, namely five days of intense listening sessions. We further explain the general day layout and that we tried to fit our interventions into it. Also quite important is that we actually wanted to keep the fun factor in the equation: it should not be difficult, no heavy learning process should be involved. Why? Because the goal of the project is music practice not music therapy or learning.
The people there are different. Different in the sense that they value other things than I expect from someone on the street.

general impressions made on the field trip

look at notes made in Imatra and report those as general observations.

data analysis

describe what can be observed in the video session with participant 1 (rhythmical patterns).

lessons learned

oh my. so many. e.g. slowness, security,

Conclusion and outlook

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References

[1] M. Baalman, S. Kersten, and T. Bovermann. *The SuperCollider Book*, chapter Ins and Outs — SuperCollider and external devices. In Wilson et al. [26], 2011.

[2] A. M. Baggs. In my language, 2007. http://www.youtube.com/watch?v=JnylM1hI2jc.

[3] O. Bown, A. Eldridge, and J. Mccormack. Understanding interaction in contemporary digital music: from instruments to behavioural objects. *Organised Sound*, 14(02):188–196, 2009.

[4] J. Burrows. *A choreographer's handbook*. Taylor & Francis, 2010.

[5] B. Cappelen and A. A.-P. Musicking tangibles for empowerment. *SMC Sweden 2012 Sound and Music Computing, Understanding and Practicing in Sweden*, page 1, 2012.

[6] A. de Campo. *The SuperCollider Book*, chapter Microsound. In Wilson et al. [26], 2011.

[7] A. de Campo, J. Rohrhuber, and T. Bovermann. *The SuperCollider Book*, chapter Object Modeling. In Wilson et al. [26], 2011.

[8] A. de Campo, J. Rohrhuber, T. Bovermann, and C. Frauenberger. *The SuperCollider Book*, chapter Sonification and Auditory Display in SuperCollider. In Wilson et al. [26], 2011.

[9] H. K. Fard, S. Oliver, P. Gardner, and S. Stein. WITH YOU: Interactive Vibro-tactile & Visual Stools for Children with Autism Spectrum Disorder. In *DIS 2012: Proceedings of the international conference on Designing interactive systems*, Newcastle, June 2012.

[10] O. Green. Agility and playfulness: Technology and skill in the performance ecosystem. *Organised Sound*, 16(02):134–144, 2011.

[11] M. Gurevich and J. Treviño. Expression and its discontents: toward an ecology of musical creation. In *Proceedings of the 7th international conference on New interfaces for musical expression*, pages 106–111. ACM, 2007.

[12] A. Hammel and R. Hourigan. *Teaching Music to Students with Special Needs: A Label-Free Approach*. OUP USA, 2011.

[13] D. Headlam. *Sounding Off: Theorizing Disability in Music*, chapter Learning to Hear Autistically, pages 109–120. In Lerner and Straus [20], 2006.

[14] P. Hegarty. *Noise/music*. Continuum, 2006.

[15] J. Herstad and H. Holone. Making sense of co-creative tangibles through the concept of familiarity. In *Proceedings of the 7th Nordic Conference on Human-Computer Interaction: Making Sense Through Design*, NordiCHI '12, pages 89–98, New York, NY, USA, 2012. ACM.

[16] J. Herstad and H. Holone. What we talk about when we talk about co-creative tangibles. In *Proceedings of the 12th Participatory Design Conference: Exploratory Papers, Workshop Descriptions, Industry Cases - Volume 2*, PDC '12, pages 109–112, New York, NY, USA, 2012. ACM.

[17] P. Jaarsma and S. Welin. Autism as a natural human variation: Reflections on the claims of the neurodiversity movement. *Health Care Analysis*, pages 1–11, 2012.

[18] J. Kleimola, V. Lazzarini, J. Timoney, and V. Välimäki. Vector phaseshaping synthesis. In *Proc. 14th Int. Conf. Digital Audio Effects*, pages 233–240, Paris, France, 2011.

[19] J. Kleimola, V. Lazzarini, V. Välimäki, and J. Timoney. Feedback amplitude modulation synthesis. *EURASIP Journal on Advances in Signal Processing*, 2011(434378), 2010.

[20] N. Lerner and J. N. Straus, editors. *Sounding Off: Theorizing Disability in Music*. Routledge, 2006.

[21] J. Parker. A simple digital model of the diode-based ring-modulator. In *Proc. 14th Int. Conf. Digital Audio Effects*, pages 163–166, Paris, France, 2011.

[22] J. Parker, H. Penttinen, S. Bilbao, and J. Abel. Modeling methods for the highly dispersive slinky spring: a novel musical toy. In *Proc. of the 13th International Conference on Digital Audio Effects (DAFx10)*, Paris, France, Sept. 2010.

[23] J. Sinclair. Don't mourn for us. In *Our Voice*, volume 1 of *Autism Network International newsletter*. 1993.

[24] J. Straus. *Extraordinary measures: disability in music*. OUP USA, 2011.

[25] V. Välimäki, J. Parker, and J. Abel. Parametric spring reverberation effect. *Journal of the Audio Engineering Society*, 58(7-8):547–562, 2010.

[26] S. Wilson, D. Cottle, and N. Collins, editors. *The SuperCollider Book*. MIT Press, Cambridge, 2011.

[27] T. Wishart. *Audible Design: A plain and easy introduction to practical sound composition*. Orpheus the Pantomime Ltd, 1994.