Interacting with Robots as Performers and Producers of Music

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Abstract— **This paper discusses some of the issues relating to Human Robot Interaction and the use of robotics in performance and music creation**

I. INTRODUCTION

Is it really so strange to think about a robot as something, or perhaps someone that can produce music, as a performer or even as a composer? What happens when robots perform on stage to live audiences, and when they are perceived as intelligent? In this abstract we start to unpack and explicate some of the issues that emerge when the fields of music technology and robotics come together. The aim of this piece of writing is to prompt the *Digital Music Research* community to engage in debate, in order develop this emerging field of research.

II. WHERE IS THE HUMAN, THE ROBOT, THE "INSTRUMENT"?

Understanding *Human Robot Interaction* (HRI) is complex, and by its very nature research in this area is multifaceted. Additional levels of complexity become part of this project, when systems are looked at that are in some way intelligent, creative and in particular when the physical form of the robot is humanoid, or the actions/tasks that the robotics are physically able to accomplish, somehow mirror human activity, or give the appearance of intelligence/sentience. Understanding where agency lies, who has ownership of the occurring actions and how control is mediated across a given system are all key to the understanding of robotic systems as musical. It is not the case that all robotic musical systems are the same. Godfried-Willem Raes takes an approach that places the human at the centre of the system, the performance and the composition. Instruments are augmented robotically and are controlled by the movements of a performer. The instruments are played (mechanically) in a way that that a human could never emulate. The robots are not necessarily mimicking human capacity or physicality. It is through the performers' 'accountable' actions that the augmented-instruments are played, and in this respect the system becomes an instrument. Understanding this relationship between human and machine as one of symbiosis, and one that affords mechanisms for music creation and performance is one that should be highlighted

and needs further development in respect to developing understandings of the ways that tools are used for creative purposes in this continuum. In our next section we start to unpack the role of robots in music performance.

II. PERFORMING ROBOTS?

Can robots perform, or is it the case that humans program computers to give the impression that the robotic system is the performer? Research laboratories such as the Center for Music Technology (Georgia Tech) [2] have offered a range of robotic systems, from systems that are able to 'jam' and improvise to robotic prosthetic limbs (for drumming), but are these really able to do the things that performers do on stage, or are they akin to audio automaton? Perhaps an initial understanding of robotic musical performances could be brought about by examining the interaction between the 'performer' and audience, and by looking at different settings, dynamics and situations. It might be that audience expectations are different for someone who plays with a robotic prosthetic limb, as compared to other systems where the agency of the system is less obvious, and the audience is unsure of where this lies. Of course this is to presume that the technology used is not autonomous and has no creative agency in its own right.

III. CONCLUSION

The role that robots can play in music creation and performance, and our interaction with them, is something that is arguably still not fully understood. Robots and the application of robotics in the field of digital music performance and creation is constantly evolving, and as the technologies evolve it becomes apparent that we too need to reassess our relationship with such technologies, both in terms of application and theory.

REFERENCES

[1] Godfried-Willem Raes (November 2016) For examples of the work of this work *see*:
http://www.logosfoundation.org/index-god.html

[2] Center for Music Technology (Georgia Tech) (November 2016) For examples of the work of this lab *see*:
http://www.gtcmt.gatech.edu

Other related Mixed Reality Lab References

Alan Chamberlain & Andy Crabtree (2016) "Searching for Music: Understanding the discovery, acquisition and organisation of music in a domestic set- ting for design" in Personal and Ubiquitous Computing Journal, Springer

Steve Benford, Adrian Hazzard, Alan Chamberlain, Kev- in Glover, Chris Greenhalgh, Liming Xu, Michaela Hoare, Dimitrios Darzentas (2016) "Accountable Artefacts: the Case of the Carolan Guitar", Pro- ceedings of the Conference on Computer Human Interaction, CHI'16, May 07 - 12, 2016, San Jose, CA, USA, 2016, ACM

Andrew McPherson, Alan Chamberlain, Adrian Hazard, Sean McGrath and Steve Benford (2016) "Design- ing for Exploratory Play with a Hackable Digital Musical Instrument", Proceedings of Designing In- teractive Systems, DIS'16, June 4 - 8, 2016, Bris- bane, Australia. ACM Press.

Alan Chamberlain, Mads Bødker, Adrian Hazzard, Steve Benford (2016) "Audio in Place: Media, Mobility and HCI - Creating Meaning in Space", Proceed- ings of the 18th International Conference on Hu- man-Computer Interaction with Mobile Devices and Services. September 6th - 9th, 2016 - Congress Palace, Florence (Tuscany), Italy, Mobile HCI 2016. ACM Press.

Steve Benford, Adrian Hazzard, Alan Chamberlain, Kev- in Glover, Chris Greenhalgh, Liming Xu, Michaela Hoare, Dimitrios Darzentas (2016) "Experiencing the Carolan Guitar", Proceedings of the Confer- ence on Computer Human Interaction, CHI'16, May 07 - 12, 2016, San Jose, CA, USA, 2016

Benford S., Hazzard A., Chamberlain A., Xu L. (2015) "Carolan: Augmenting a Guitar with its Digital Footprint." International Conference on New Interfaces for Musical Expression (NIME 2015), Louisiana, USA.

Alan Chamberlain and Adrian Hazard (2015) Sonifying the Scene: re-framing and manipulating meaning through audio augmentation. In: DMRN+10: Digital Music Research Network, December 2015, London.

Hazzard, Adrian., Benford, Steve., Chamberlain, Alan.,Greenhalgh, Chris and Kwon, Hyosun (2014) Musical Intersections across the Digital and Physical. In: DMRN+9: Digital Music Research Network (EPSRC), December 2014, London.

Hoare, Michaela and Benford, Steve and Greenhalgh, Chris and Chamberlain, Alan (2014) Doing it for themselves: the practices of amateur musicians and DIY music networks in a digital age. In: DMRN+9: Digital Music Research Network (EPSRC), December 2014, London.

Alan Chamberlain, David De Roure, Pip Willcox, Chris Greenhalgh, Steve Benford (2016) Understanding Creativity and Autonomy in Music Performance and Composition: A proposed 'toolkit' for research and design. In: DMRN+11: Digital Music Research Network, December 2016, London

David De Roare, Pip Willcox, Alan Chamberlain (2016) Experimental Digital Humanities: Creative interventions in algorithmic composition on a hypothetical mechanical computer. In: DMRN+11: Digital Music Research Network, December 2016, London

Glenn McGarry, Peter Tolmie, Steve Benford, Chris Greenhalgh and Alan Chamberlain (2017) "They're all going out to something weird: Workflow, Legacy and Metadata in the Music Production Process". ACM CSCW 2017 - Full Paper

Fabio Morreale, Guilio Moro, Alan Chamberlain, Steve Benford and Andrew McPherson (2017) "Building a Maker Community Around an Open Hardware Platform". Proc. CHI'17, Denver, USA, 2017. - Full Paper

Chris Greenhalgh, Steve Benford, Adrian Hazard and Alan Chamberlain (2017) "Playing Fast and Loose with Music Recognition". Proc. CHI'17, Denver, USA, 2017