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Interacting with Robots as Performers and Producers of Music

Alan Chamberlain[1*] Kevin R Page[2] David De Roure[2] Graham Klyne[2]

[1*]Department of Computer Science, MRL, University of Nottingham, UK, azc@cs.nott.ac.uk
[2]Oxford e-Research Centre, University of Oxford, UK

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.

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