Are the Robots Coming? Designing with Autonomy & Control for Musical Creativity & Performance

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ABSTRACT

This paper[1] expands upon our previous work, and starts to unpack notions of autonomy and control in musical composition and performance-based systems. The term autonomous has become synonymous with technologies such as "autonomous vehicles" and "drones", while notions of control have mainly been raised in respect to the "control" of industrial systems and in respect to protocols. This position piece disrupts these notions and provides a platform, introducing a more radical proposition in respect to the representation of autonomy and control of features that can be used to design systems that support musical composition and performance. This paper supports a growing interest within the Design, HCI and Artificial Intelligence communities, leading us to think about Human Like Computing systems and the development of a Computational Creativity Continuum.

CCS CONCEPTS

• **Human Centred Computing → Interaction Techniques** → Design

KEYWORDS

Performance, Design, Creativity, Control, Artificial Intelligence, Machine Learning, Music, Autonomy, CHI, CSCW, Musical Instrument, Ethnography, Human-Like Computing

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1 INTRODUCTION

Our earlier work discussed notions of artificial intelligence, control, autonomy and agency in regard to robotic music performance [1]. The novel understandings provided by the paper offered insights into the interaction occurring in such performances, presenting notions of the robot as both performer and instrument. However, we need to further understand and develop approaches by which one might study such systems in ways that give insights applicable to further design and research.

Trying to study autonomy and control in any creative process is a difficult and challenging task, one of the difficulties that impacts upon this kind of work is that of understanding context. That is to say that what is perceived as autonomous, may be viewed as control in another setting, in the same way that one might see order and patterns in chaos, while another person may interpret the same phenomena as truly random and devoid of meaning. The situation, and understanding the context particularly in a musical context is key to unraveling the nature of the activity in which people are engaged [2]. Performing, improvising and music compositions are often seen as creative, and something that a machine cannot do. So we might ask, "Are the robots really coming?" will autonomous systems take over as the creators and performers of music? Before we can answer this question it has been suggested [2] that we must first understand the roles that control and autonomy play in respect to human behaviour. Starting to answer this question this has been a focus of our research.

In this paper we present an ongoing strand of work that bases itself within a series of experimental ethnographic approaches in order to further understand the implications of designing for autonomy and control. The approaches outlined, and style of reporting, are akin to the ones used by Sudnow in his seminal ethnographic work on playing jazz piano, Ways of the Hand [3].

2 APPROACHES

Our approach is based on our other ethnographic studies [4][5] and is about both having a system/strategy by which to understand the use of systems and taking part in the activities related to that system in order that one can fully understand, develop a competence and through that competence and engage. This is done to document the observable features of the interaction in order to discuss how such activities are accomplished. In the confines of this paper we briefly outline a series of ongoing studies that are enabling us to look at the different ways in which technologies for music production, performance and composition relate to autonomy, control and creativity.

3 DESIGNING AND DEFINING METHODOLOGY

Our research methodology was to engage in a series of compositional and performance-based practices that would enable us to understand the reasoning, methods and characteristics of 'doing' such activities. A core part of doing this was for the researcher to develop 'competences' that would then enable them to describe the practices they engaged in, and fully understand the practices and reasoning behind the practices that other 'members' engaged in.

A range of scenarios was developed in order to understand the issues relating to autonomy and control; here we provide an overview of some of these. Our initial investigation pulled together notions of field recording and generative music composition. This enabled us to understand the nature of recording and the use of sounds that might be controlled and used in certain ways that were independently occurring, but could equally be controlled and used in a composition and performance. Combined and mixed with generative/evolving music we were able to unpick the features of engaging in a compositional process that informed our design implications and understanding of the scenario. We used non-input mixing techniques and combined these with algorithmic tone generation software. This brought an understanding of the control of feedback (non-input) and enabled us to understand controlled algorithmic tone generation in an improvisational setting.

We were able to further develop our understandings of autonomy through developing other parameter-based algorithmic compositions that allowed us to consider the use of algorithms as a controlled or autonomous artifact that could then be used within compositional practice on which one could base a musical piece, or that one could further develop once imported into a digital audio workstation. It was evident that we were seen as competent as we presented at sound art events [6][7], performed and our compositions have been used as a soundtrack. These can be found here [8]. Our work is ongoing.

4 FINDING FOCUS

So what do such studies really tell us about the world of autonomy, control and creativity? What these studies tell us is that control and autonomy are situated; this means that they are features of the setting bounded by context [9] and as such are not necessarily uniformly applicable in terms of having an innate ability to be used in a descriptive manner. This in itself is important for the designers of systems, as it means that there are more indicative and personal ways to reference the role and application of autonomy and control as part of a system. This means that more work is needed in order to tease out and to unpack further related issues. Finding out about the practices relating to composition and performance have shown that that not all compositional and performance-based practices are the same. However, being able to understand the workflows, the tools, channels and services that are implicated in this process, whether people use Ableton Live or 'no-input' mixing is key to helping us understand more. There are salient features that relate to these, and the skillful practices that people engage in are evident in the music performance/creation process, these can be documented and exist as carefully thought out strategies that are not random, but can take account of randomness as a compositional tool as we have found when carrying out our investigations.

Often many design papers ask, "Does it really matter?" or "Who cares?" In response to this it is evident that understanding the metadata and meaning relating to composition, production and performance how to make this useable and useful is a real challenge. Being able to inform consumers, scholars and musicians about music practice is important, but challenging, and even though our studies have only 'scratched the surface' of this issue, it has started to open up an area in which much research still needs to be carried out. For a multi-partner project response to this see [10] [11].

5 IMPLICATIONS FOR DESIGN

This section briefly introduces some of the implications for design [12] that have arisen from our ongoing studies. The implication for design starts to open up a range of possibilities for designers and technologists to think about the development of possible systems and tools that can relate to back to the initial research setting/domain and to future solutions. Our understandings have raised a whole range of possibilities that could impact upon the design of autonomous systems for music creation and composition. In this section we focus in on those scenarios (at a general level) in order to further explicate the findings and their application.

Are the robots coming? Well it's difficult to answer the question in a definitive way. However, our research suggests that there it is possible for the use of intelligent agents (that 'learn') to be a key part of a performance, or a composition system. Being able to work with an Agent live is something that we would like to further study; there are possibilities in regard to live improvisation, where an autonomous system plays with or against the

performer and as a mechanism for support in the creative process, where such a system might offer support as part of the music creation workflow. Some systems are already starting to emerge for composed works [13].

This is not to say that a physical embodiment of an agent could not be developed. When thinking about issues relating to performance (in particular) it is important to think about the way that the audience interacts with the performer and the performance, enabling the audience to fully understand the systems that are being used, could offer performers, designers and technologists a whole range of new and exciting performative possibilities that go beyond the tradition performer – consumer paradigm and offer new ways in which the audience can effect and interpret the system used. In a compositional setting this could also be used as a way to physically manifest something that may challenge compositional practice and at the same support the creative process. However, in this paper we can only present an overview of the possibilities that are emerging, our next research steps will focus on engaging with autonomous technologies designed for music performance and creation.

5 CONCLUSION

Although we live with situations and systems that offer varying degrees of control and autonomy it is not until we start to unpack, analyse and reflect upon the ways in which we use such systems that it becomes clear that we are able to use such learnings and draw out features that may then be related to the design of tools that support the composition of music and its performance.

As systems evolve and become more 'intelligent' and are able to 'learn' it becomes increasingly important to understand how we can interact and engage with such systems, particularly if we as a community are to design better systems that can be used in a creative manner for the composition and performance of music. Research methods such as ethnography can clearly give us insights into creative practices and in so doing raise implications for the design of Human-Like Computing systems. Such studies can provide data that can help to develop and model a useable Computational Creativity Continuum. Currently we are at an early stage in this process, but we hope that this paper goes someway to helping researchers and designers appreciate some of emerging issues in this rapidly evolving field.

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REFERENCES

[1] Alan Chamberlain, Kevin R Page, David De Roure, Graham Klyne (2016) Interacting with Robots as Performers and Producers of Music. In: DMRN+11: Digital Music Research Network, December 2016, London.

[2] Harold Garfinkel (1967) Studies in Ethnomethodology. Englewood Cliffs, NJ: Prentice- Hall.

[3] David Sudnow (2001) Ways of the Hand, MIT Press.

[4] 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.

[5] Alan Chamberlain and Andy Crabtree (2016) "Searching for music: understanding the discovery, acquisition, processing and organization of music in a domestic setting for design". in Personal and Ubiquitous Computing. pp. 1-13. Springer, ISSN 1617-4917, DOI: 10.1007/s00779-016-0911-2

[6] David De Roure, Pip Willcox and Alan Chamberlain (2017) Interconnected alchemy: an apparatus for alchemical algorithms. In: Listen to the Voice of Fire: Alchemy in Sound Art, 3rd March 2017, Aberystwyth University.

[7] Alan Chamberlain & Dafydd Roberts (2017) Between chaos and control: compositional & computational approaches to alchemy inspired sonification, Music of Sound Symposium, University of Oxford.

[8] Alan Chamberlain, Soundcloud (May 2017) https://soundcloud.com/alain_du_norde

[9] *Dirk vom Lehn (2014) Harold Garfinkel: The Creation and Development of Ethnomethodology. The Leftcoast Press.*

[10] The FAST Project (May 2017) http://www.semanticaudio.ac.uk.

[11] Alan Chamberlain, Mads Bødker, Adrian Hazzard, David McGookin, David De Roure, Pip Willcox and Konstantinos Papangelis (2017) "Audio Technology and Mobile Human Computer Interaction: From Space and Place, to Social Media, Music, Composition and Creation", In the International Journal of Mobile Human Computer Interaction (IJMHCI) Volume 9, Issue 4, October - December 2017 pp. 25 - 40. DOI https://doi.org/10.4018/ijmhci.2017100103

[12] Paul Dourish (2006) Implications for Design. Proc. ACM Conf. Human Factors in Computing Systems CHI 2006, Montreal, Canada, ACM Press.

[13] Chris Greenhalgh, Steve Benford, Adrian Hazard and Alan Chamberlain (2017) "Playing Fast and Loose with Music Recognition". Proc. CHI'17, Denver, USA, 2017. DOI 10.1145/3025453.3025900