

A principled approach to the development of drum improvisation skills through interaction with a conversational agent: A design study with professional drummers

Noam Lederman
Music Computing Lab
The Open University
noam.lederman@open.ac.uk

Simon Holland
Music Computing Lab
The Open University
s.holland@open.ac.uk

Paul Mulholland
Knowledge Media Institute
The Open University
p.mulholland@open.ac.uk

Abstract

This research aims to design a conversational agent that can assist drummers to develop their original voice on the drum kit. Trading rhythmic phrases with another drummer is one way to explore creativity in drum vocabulary. However, in practice drummers have limited opportunities to play with other drummers, and in live work vernacular music drummers largely focus on providing a solid groove for their band members, rather than practicing drum conversational skills. In this paper we initially provide a brief outline of the developmental steps that led to our principled approach, the principles behind them and related work. We then describe a design study in which seven professional drummers participated in three types of conversational task. The conversational form of interaction was found to be engaging and beneficial by the participants. The findings will inform the design of a software agent for conversational drumming.

1. Introduction

Under our initial conversational model, the agent embodied an inference system allowing it to navigate through the possible transformations of a *core phrase*. This is a rhythmic phrase which forms the starting point for the drumming interaction, with a design aim of conversing with the human drummer in a way that is perceived as meaningful, musical and inspiring. The transformations involve the agent taking the *core phrase* and adapting it in various ways, for example, by making changes to elements such as *orchestration*, *metric modulation* and *phase shift*. These elements offer dimensions of development in drumming, where a range of transformations of each element can be explored by the agent and human drummer. More information about the preliminary stages of this research can be found in our paper *A principled approach to the development of drum improvisation skills through interaction with a conversational agent* (Lederman et al, 2020).

Following several prototyping studies using Wizard of Oz, we were able to refine the initial transformation model with three elements: *linear drumming*, *grouping* and *external inspiration for core phrases*. The focus on *linear drumming* (i.e. a monophonic drumming style) aims to amplify the clarity of the system responses, making the transformations of the core phrase stand out for the human drummer. Analysing the note *grouping*, and more specifically the accent patterns within the groups, enabled us to add another layer of musicality resulting in more meaningful system responses. Combining these two refinements, *linear drumming* and *grouping*, proved highly effective when used in our design study with professional drummers. The third refinement involves borrowing rhythmic phrases from another art form, in our case a freestyle rap by the artist Mos Def, and using it as a possible inspiration for the drumming interaction. Following these three refinements, we progressed to plan a study with professional drummers in order to debug the future system and test its engagement and effectiveness before continuing to develop it as code.

2. Related work

Research into reflective music systems such as *Flow machine* (Pachet, 2004) has significantly developed over the last two decades, leading musicians to experiment with composing, playing and creating music with some level of system interaction. More recently, *Controlling Interactive Music*

(Brown, 2018) and *Monterey Mirror* (Manaris et al, 2011) presented conversational systems which focus on improvised mixed-initiative interaction. Although musicians have used different mirroring tools to assist them in the process of self-reflection (Caruso et al, 2016) our work aims to present a preliminary system design that aims to elicit creativity by conversing with the human drummer in a variety of ways.

This led us to form the following research questions:

RQ1: Which drumming skills can be developed by using this conversational tool?

RQ2: How can the system be improved and provide more engaging and inspiring interactions for drummers?

RQ3: How important is stylistic diversity and authenticity for drummers in our proposed agent?

3. A design study with professional drummers

The design study included seven professional drummers with over twenty years experience each in performing, teaching and learning drums. We chose to use a mixed methodology known as *performer-based analysis method* (Caruso et al, 2016) which integrates quantitative and qualitative perspectives. The study participants were asked to complete three tasks: i) a practical drumming interaction ii) a survey iii) a semi-structured interview. The practical drum interaction was provided in the form of a twenty minute audio track based on a conversational model which consists of three different scenarios. All system interactions were pre-recorded into Logic Pro X and laid out in a way that allows participants' responses for each system interaction (Fig. 1). The participants were asked to record their first attempt at the drumming interaction, and to forward the audio data to us for analysis. The decision to focus on the first attempt was made in order to capture the participant's initial and intuitive responses.

As previously mentioned, the drumming interaction track consisted of a sequence of three different musical scenarios. In the first scenario we used recordings of famous drummers and edited them to fit our conversation model. In the second scenario we explored our proposed conversational agent, using core phrases and some of the transformations mentioned above, for example, orchestration and phase shift. However, in the third scenario we employed a vocal rhythmic source, in this case a rapper, so the system can converse either as a drummer or as a rapper. For the second task in this study we designed a survey to be taken straight after the practical drum interaction was completed. The aim was to collect immediate feedback from the participants about how engaging and challenging the interaction was, but more specifically, how the interaction was perceived by them in each one of the three scenarios. The third task was to attend a semi-structured interview to discuss in further detail the participant's individual insights and suggestions on how to improve our system. A thematic analysis (Braun and Clarke, 2006) of the interview data is being undertaken to ascertain participant experiences of the interactions with our conversational agent.

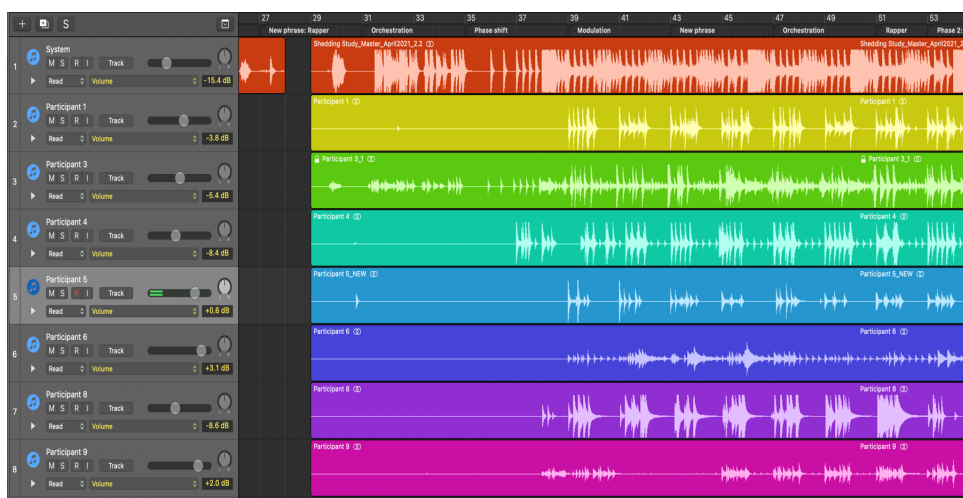


Figure 1 – Drumming interaction project in Logic Pro X

4. Preliminary results and discussion

'A very helpful tool for increasing drum vocabulary' (participant 5)

'I can definitely see this benefiting my playing' (participant 9)

'A very useful tool to improve response time' (participant 4)

Six out of seven participants found our conversational design engaging or very engaging and all the participants said they would like to repeat this type of conversational drum interaction in the future as well as incorporate it into their practice routine. Four out of seven participants found scenario 1, drumming along to famous drummers, difficult or very difficult while interestingly none of the participants found scenarios 2 or 3 difficult, suggesting that the refinements discussed above were effective. All the participants found scenario 3, interacting with a drummer and a rapper, engaging or very engaging. Six out of seven participants chose this as their favourite scenario.

All the participants found the study as a whole engaging. The *unknown* elements of this type of improvised real-time interaction were mentioned during the interviews as inspiring. Most participants said they enjoyed the practical drumming task as our tool enabled them to investigate their drumming language in a safe and non-judgemental environment. Preliminary results from the interviews suggested that the participants resonated with the stylistic diversity and authenticity of our agent. However, many commented that having additional stylistic options in the future would be useful. Preliminary results from the interviews also suggested that the rap interactions in scenario 3 were found inspiring, largely because of the laid-back swung rhythm used by the rapper.

5. Future work

1. Implement our conversational agent design in future studies in code using Supercollider.
2. Conduct a large-scale study with professional drummers to test the next stage of the proposed agent.
3. Explore further the relationships between spoken art forms and drumming with the aim to include more of these types of interaction in our agent.

6. References

- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101.
- Brown, A. R. (2018). Creative improvisation with a reflexive musical bot. *Digital Creativity*, 29(1), 5-18.
- Caruso, G., Coorevits, E., Nijs, L., & Leman, M. (2016). Gestures in contemporary music performance: a method to assist the performer's artistic process. *Contemporary Music Review*, 35(4-5), 402-422.
- Lederman, N., Holland, S., & Mulholland, P. A principled approach to the development of drum improvisation skills through interaction with a conversational agent. In: *PPIG 2020 - 31st Annual Workshop*, 30 Nov - 4 Dec 2020, Online. <http://oro.open.ac.uk/74638/>
- Manaris, B., Hughes, D., & Vassilandonakis, Y. (2011, June). Monterey mirror: combining Markov models, genetic algorithms, and power laws. In *Proceedings of the IEEE Conference on Evolutionary Computation*.
- Pachet, F. (2004). On the design of a musical flow machine. *A Learning Zone of One's Own*, 111-134.