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A principled approach to the development of drum improvisation skills through interaction with a conversational agent

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Abstract

Shedding is a term used to describe a musical conversation between drummers with the aim to improve their drumming vocabulary, gain confidence in real-time trading of musical ideas, develop an understanding for their original voice on the drum kit and enjoy the process of exploring creativity with a fellow drummer. However, in practice drummers have limited opportunities to play in real time with other drummers. This research explores shedding activity in the form of mixed-initiative interaction between a human drummer and a conversational agent. This paper focuses on a series of design studies and experiments to explore three novel refinements to the proposed shedding model.

1. Introduction

The proposed agent embodies an inference system allowing it to navigate through transformations of a *core phrase* chosen by the user (the starting point of every shedding interaction in our model) 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 a 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 linear drumming, where a range of transformations of each element can be explored by the agent and human drummer. This research focuses on creating a reflective drumming agent that inspires the user by having a conversation rather than by teaching specific grooves (Senn, 2018) or drumming concepts. This paper focuses in particular on how this central shedding model can be enhanced and deepened based on a novel characterisation of rhythmic grouping and accent patterns.

2. Previous work

Previous research has investigated creativity from a number of perspectives including computer modelling (Boden 1994, Cope 2005), communication (Davidson 2005) and perfection (Berger 1999). However, creativity in performance has received relatively little attention (Pinheiro 2010). More specifically, research into musical interaction activities with intelligent systems such as the *Continuator* (Pachet, 2003), *Controlling Interactive Music* (Brown, 2018) and *Monterey Mirror* (Manaris et al. 2018) present tools for contemporary music creation and co-creativity. However, our present work suggests a musical framework with a reflective agent that aims to elicit creativity by encouraging the human drummer to observe and refine their creative process.

3. Adding depth to the shedding model

The inference system employed by the agent uses the core phrase and rules of transformations in order to converse with the human drummer in ways that are perceived as meaningful. Following several design 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*.

3.1. Linear drumming

Linear drumming is a monophonic drumming playing style, where drum instruments are hit exclusively one at a time. Combining the conversational shedding model with the linear concept amplifies the clarity of the system responses, making the transformations of the core phrase stand out for the human drummer. Moverover, linear drumming is very common in live shedding interactions and therefore adds a layer of stylistic authenticity to our model. The relative ease of monophonic drumming, as opposed to polyphonic, allows us to refine our design further by exploring one-bar drumming phrases that alternate unambiguously between *accented* and *unaccented* notes. The relationships between these two *types* of notes create clear grouping relationships that reflect the shape and conversational tone of the drummer.

3.2. Grouping

Although the idea of grouping as a recursive segmentation of musical phrases occurs in Jackendoff (2009), in this paper we propose an alternative characterisation of groupings based on accent patterns in the context of linear drumming. We explore two-bar system transformations that take advantage of this characterisation with the aim to promote thematic unity in the shedding process. Under this characterisation we analysed the accent patterns to identity groupings using the following procedure: i) the first accented note marks the beginning of a phrase and is therefore internally annotated with the number '1'. ii) each subsequent unaccented, or crucially, consecutive accented note is then numbered serially '2', '3', '4' etc. iii) new sections (marked with the number '1') start with each new accented note that follows an unaccented one. We posit that the shedding interaction will be perceived as more meaningful and inspiring to the human drummer if the system's transformations are sensitive to the accent patterns that emerge from the grouping characterisation.

3.3. External inspiration for core phrases

With the aim to make the shedding interaction more inspiring and promote learner's autonomy (Green, 2002), we have explored a model where the agent and human drummer can utilise the similarities in the hierarchical metrical grid (Jackendoff, 2009) between drumming and 30 second extracts from spoken art forms such as rap, speech and poetry. For example, rhythmic content can be borrowed from a rhythmic speech art form, transformed into one or more core phrases and used for shedding with the conversational agent. Our experiments drew on a wide variety of creative sources: i) a speech by Nelson Mandela ii) a song by Grime artist Stormzy iii) a freestyle rap by the artist Mos Def. We conclude that further research into the hierarchical metrical grid used in spoken art forms such as rap and poetry may offer creative new ways for learning stylistic improvised interaction through a musical instrument, such as the drum kit.

4. Conclusions

- Shedding is a promising basis for mixed-initiative interactions between a human drummer and a conversational agent.
- Early explorations have presented the potential of such interactions to improve drumming vocabulary, promote confidence in real-time trading of musical ideas, foster originality and promote exploration of creativity.
- Relationships between the accented and unaccented notes in linear drumming create clear grouping relationships that reflect the shape and conversational tone of the drummer.
- Shedding interactions will be perceived as more meaningful and inspiring to drummers if the system's transformations are sensitive to the grouping of accent patterns.
- Further research into the hierarchical metrical grid used in spoken art forms such as rap and poetry may offer transformative ways for learning stylistic improvised interaction through a musical instrument, such as the drum kit.

5. References

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