Free-Improvised Rehearsal-as-Research for Musical HCI

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Abstract

The difficulties of evaluating DMIs (digital musical instruments), particularly those used by ensembles of musicians, are well-documented. We propose a methodology of rehearsal-as-research to study free-improvisation by ensembles of DMI performers. Sessions are structured to mirror established practices for training in free-improvisation and to allow controlled, order-balanced studies with extensive data collection in the style of factorial HCI experiments. Experiment structures, designs for questionnaires, and objective measures such as session duration will be discussed. We ask whether improvised rehearsal processes from music could apply more broadly to studying collaborative interaction.

Author Keywords

methodology; HCI; free-improvisation; NIME; rehearsal

ACM Classification Keywords

H.5.5 [Sound and Music Computing]: Methodologies and techniques

Introduction

It has been well-documented that systematic evaluation of collaborative creativity support tools is difficult, particularly in performing arts practices [9]. Free improvisation, however, has a history of practice and pedagogy that is ide-

Figure 1: Research participants improvising on touch-screen instruments in a rehearsal-as-research study. Each improvisation was performed using different interface conditions and performers filled in short written surveys after each one. Video and touch-screen interaction data was also collected.

ally suited to examining new tools for collaborative musical interaction. A potential methodology for investigating the use of these tools is a process of *rehearsal-as-research*. This re-frames the typical improvised rehearsal process as a controlled HCI study. Such a process would provide opportunities to capture subjective data, such as surveys, discussions, and interviews, as well as objective, such as data logs from instruments, and performance recordings.

Motivating Rehearsal-As-Research

Free- or non-idiomatic improvisation has no restrictions on style and no pre-determination of the music that will be played. Free-improvised performances often take the form of explorations, both of a musical world, and of the affordances of an instrument. For this reason, free-improvisation is often seen in performances of NIMEs, where the parameters of musical interaction may be unmapped. In ensemble form, this style of music making involves negotiations of musical decisions and game-like interactions that are compelling to both performers and audiences.

The emphasis on exploratory performance and collaborative creativity in free-improvisation has led to its adoption in pedagogies such as Cahn's Creative Music Making (CMM) [1]. Cahn defines a particular style of improvisation characterised by complete freedom for all performers: "performers may play (or not play) anything they wish". Although Cahn suggests that performers should listen carefully to themselves and others it is emphasised that "there is no penalty for breaking this rule". Although sessions may have a determined starting point, as performers are free to not play whenever they wish, the end of performances is defined to be "when all of the players have individually decided to stop playing".

CMM sessions typically consist of multiple improvisations,

as well as discussions and listening-back sessions similar to the structure of video-cued-recall [2]. We have previously conducted HCI research using this kind of process to investigate an ensemble of iPad performers [5].

In computer music a range of methodologies have been explored for evaluating DMIs in the lab and on stage, many borrowing concepts from HCI [11]. O'Modhrain [8] argues that there are multiple stakeholder perspectives that could be considered in evaluating a DMI, including audiences, performers, designers, and manufacturers. The most important of these stakeholders, however, are performers as they are "the only people who can provide feedback on an instrument's functioning in the context for which it was ultimately intended". For improvised music, this is particularly important, as the performer is responsible not only for translating musical intentions into sound with the DMI, but for creating these intentions as well.

Computer music evaluations frequently use qualitative approaches applied to interviews conducted after a period of initial experimentation. Longitudinal research has also been advocated to go beyond the first impressions of an interface [4]. Studies such as Xambó et al.'s [12], have used ethnographic techniques to investigate natural ensemble rehearsal processes. We suggest that, by borrowing from the process of CMM, these techniques could be complemented by written surveys and other quantitative data collected during sessions.

Session Structure

Over a number of HCI studies of musical interaction (e.g., [5, 6, 7]), we have developed a structure for rehearsal-as-research sessions. These mirror typical rehearsals where performances are repeated under different conditions. Sessions begin with an orientation of each condition of the mu-

sical interface. During this part of the session, the rules (or lack of rules) of CMM style improvisation can be explained. Each experimental condition is then used in CMM improvisation with the researcher outside of the rehearsal studio. After each improvisation, the performers fill in written questionnaires, and at the end of the whole session, an open-ended interview is conducted.

We have explored two different rehearsal structures. In the first, an experienced group was asked to perform three replicates of six different interface conditions for a total of 18 improvisations [6]. For less experienced groups, single improvisations using four interface conditions have been conducted in 90 minute sessions [7]. These sessions began with an introduction to the four interface conditions and CMM performance. Each condition was used in one improvisation, directly followed by a written survey. An open ended interview was held at the end of each session to compare experiences with the interface conditions. Factors such as performance experience, session length, fatigue, and learning effects could be further investigated to design appropriate session structures.

Questionnaires

In our rehearsal-as-research studies, we have asked performers to fill in written surveys after each improvisation to gain their immediate perspectives. We design our surveys to assess the quality of improvisations and of the musical interfaces under examination. Although free-improvised performance is often thought to defy objective examination, rating systems have been developed for assessing improvised performances in musical education [10], and in solo improvisations [3].

We have followed such examples by using multiple ordinal rating scale questions that follow basic aspects of impro-

vised musical interaction: technical proficiency, ensemble interaction, musical structure, creativity, performance quality, and enjoyment. A short written survey can be administered quickly after each improvisation session without disruption. Participants appear to have little trouble self-assessing an improvisation and are frequently in consensus regarding various aspects of the performances. Although our questionnaire designs have improved over several experiments, further investigations could discover better ways to assess improvisations, perhaps using continuous, rather than ordinal, rating scales.

Session Duration

The duration of an improvisation can have several factors, especially in live performances. If one performer starts to "wind up", should the others follow? Should the performers finish more quickly if the audience looks bored? In CMM rehearsals, each performer plays as long as they want and there is no pressure to keep an audience interested. This suggests that the length of improvisation sessions could be more related to the performers' level of creative engagement with an interface.

We collect *individual*, rather than group, session durations. The start of a performance is given by the time of the first sound, and the end is given for each player by their final sound. As an individual time can be recorded for each performer, more precise statistics can be calculated regarding the effects of different interfaces on improvisation.

To ensure that participants have performed long enough to fairly evaluate an interface, we set a lower-bound on improvisation sessions using a stage lighting system. Lights are set to green to indicate that performers must continue. After seven minutes of improvisation, these lights are remotely faded to blue, indicating that performers can stop when they

wish. In practice, we have found that performers usually continue for some time after the change.

Session duration is particularly useful as it is a more objective measure than survey responses. In a recent two-factor rehearsal-as-research study, we found that survey responses supported one main effect, while session duration supported the other [7]. Performers were generally unaware of the relative length of improvisations. Future studies could investigate the relationship between session length, engagement, creative flow, and performers' subjective understanding of improvisations.

Conclusion

Rehearsals of multiple free-improvised performances present a natural, yet controlled, environment for studying collaborative musical interaction. These sessions permit the application of typical HCI research methods, such as factorial studies with multiple experimental conditions spread over the improvisations. Data collection through questionnaires or instrumentation of musical interfaces can be accomplished without disrupting the participants' musical process. In our studies, these tools have been used to understand new ensemble-focussed DMIs but have also been highly enjoyable and rewarding artistic experiences. Future work could investigate better survey and experiment designs or consider measurement of session duration. Improvised rehearsal processes could also be applied in other areas of HCI and of musical interaction.

References

[1] William L. Cahn. 2005. *Creative Music Making*. Routledge, New York, NY, USA.

[2] Brigid Costello, Lizzie Muller, Shigeki Amitani, and Ernest Edmonds. 2005. Understanding the experience of interactive art: Iamascope in Beta_space. In *Proceedings of the Second Australasian Conference on Interactive Entertainment (IE '05)*. Creativity & Cognition Studios Press, Sydney, Australia, 49–56. http://dl.acm.org/citation.cfm?id=1109180.1109188

[3] Jacob Eisenberg and William Forde Thompson. 2003. A Matter of Taste: Evaluating Improvised Music. *Creativity Research Journal* 15, 2–3 (2003), 287–296. DOI:http://dx.doi.org/10.1080/10400419.2003.9651421

[4] Steven Gelineck and Stefania Serafin. 2012. Longitudinal Evaluation of the Integration of Digital Musical Instruments into Existing Compositional Work Processes. *Journal of New Music Research* 41, 3 (2012), 259–276. DOI:http://dx.doi.org/10.1080/09298215.2012.697174

[5] Charles Martin, Henry Gardner, and Ben Swift. 2014. Exploring Percussive Gesture on iPads with Ensemble Metatone. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '14)*. ACM, New York, NY, USA, 1025–1028. DOI:http://dx.doi.org/10.1145/2556288.2557226

[6] Charles Martin, Henry Gardner, Ben Swift, and Michael Martin. 2015. Music of 18 Performances: Evaluating Apps and Agents with Free Improvisation. In *Proceedings of the Australasian Computer Music Conference (ACMC2015 - MAKE!)*. Australasian Computer Music Association, Fitzroy, Australia, 85–94. http://hdl.handle.net/1885/95205

[7] Charles Martin, Henry Gardner, Ben Swift, and Michael Martin. 2016. Intelligent Agents and Networked Buttons Improve Free-Improvised Ensemble Music-Making on Touch-Screens. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '16)*. ACM, New York, NY, USA. DOI:http://dx.doi.org/10.1145/2858036.2858269

[8] Sile O'Modhrain. 2011. A Framework for the Evaluation of Digital Musical Instruments. *Computer Music Journal* 35, 1 (2011), 28–42. DOI:http://dx.doi.org/10.1162/COMJ_a_00038

[9] Ben Shneiderman. 2007. Creativity Support Tools: Accelerating Discovery and Innovation. *Commun. ACM* 50, 12 (2007), 20–32. DOI:http://dx.doi.org/10.1145/1323688.1323689

[10] Derek T. Smith. 2009. Development and Validation of a Rating Scale for Wind Jazz Improvisation Performance. *Journal of Research in Music Education* 57, 3 (2009), 217–235. DOI:http://dx.doi.org/10.1177/0022429409343549

[11] Marcelo M. Wanderley and Nicola Orio. 2002. Evaluation of Input Devices for Musical Expression: Borrowing Tools from HCI. *Computer Music Journal* 26, 3 (2002), 62–76. DOI:http://dx.doi.org/10.1162/014892602320582981

[12] Anna Xambó, Eva Hornecker, Paul Marshall, Sergi Jordà, Chris Dobbyn, and Robin Laney. 2013. Let's Jam the Reactable: Peer Learning During Musical Improvisation with a Tabletop Tangible Interface. *ACM Transactions on Computer-Human Interaction* 20, 6 (2013), 36:1–36:34. DOI:http://dx.doi.org/10.1145/2530541