HOW INTERACTIVE ARE INTERACTIVE INSTALLATIONS? HOW MUSICAL ARE MUSICAL INTERFACES? TESTING INTERACTIVITY AND PLAYABILITY IN STUDENTS’ PROJECTS.

Kjetil Falkenberg Hansen
Dept. Speech, Music and Hearing
KTH (Royal Institute of Technology)
Stockholm, Sweden
kjetil@kth.se

Hilmar Þórðarson, Haraldur Karlsson
Tone and Video Lab
Listaháskóli Íslands
Reykjavík, Iceland
{hilthor, halli}@lhi.is

ABSTRACT

This paper describes the results and experiences from an experiment at The Tone and Video Lab at Listaháskóli Íslands sponsored by ConGAS, European cost action 287. Emphasis was to look at interactive interfaces, and the research aimed at finding a correspondence between how the interaction with an art piece looked, its potential for allowing interaction and expressive communication, and its appeal. Questionnaires were used to study aspects such as expressivity and playability. Most artists have a quite good appreciation on how their piece will be experienced. The results show some tendencies with regards to how easy it is to interact compared to the potential for practising skilled performances. How attractive the interaction looks seems to be of less importance.

1. BACKGROUND

This paper describes the results and experiences from a Short Term Scientific Mission (STSM) to The Tone and Video Lab at Listaháskóli Íslands (Iceland Academy of the Arts), sponsored by ConGAS, European cost action 287. The visit took place during three weeks in March and April 2006.

Tone and Video Lab is a part of the Iceland Academy of the Arts that attracts students from all disciplines, but mostly from visual arts, music and sculpture. The lab provides an excellent environment for working with interactivity. The STSM was planned to coincide with the course “Sound and interactivity”.

1.1. Purpose

My purpose of the visit was to study interaction and new musical interfaces with experts and students in a realistic, artistic setting. The emphasis was to look at control of computer models of (new) instruments and interactive, expressive interfaces in general. Also, an evaluation of the interaction and expressibility was planned.

The working title of the project was “Finding ways to play new musical instruments”. Some of the original objectives in the research project had to be refined and changed, however. Emphasis was moved to looking at novel models and interactive interfaces in general, not only musical instruments. Still, the initial question could be approached with a study on expressive interaction.

Another purpose that had to be refined was the focus on sound models developed at KTH. There were several reasons for this change, but most important was the privilege of having a larger student group than prepared for, which demanded a different strategy.

1.2. Final aim

As moving too far from the initial time schedule and aim was undesirable, the research questions and work plan were changed to better suit the new circumstances. First of all, there were more students (16 students) enrolled in the course than anticipated, and their scholarly and artistic backgrounds were more diverse. Students had, in general, more experience with building sensors than expected, but less with using computers and programming in e.g. Max/MSP.

Also, the students had many interesting proposals for projects that would allow them to work with their creativity on their conditions. While the whole project became less devoted to interfaces for musical instruments, it opened up for unexpected and fascinating interactive installations. Most students came from visual arts, and there was a clear connection to that discipline in the projects.

From looking at strategies for playing new instruments, the research aimed at finding a correspondence between how the interaction with an art piece looked, its potential for allowing interaction and expressive communication, and its appeal. Interactive installations or pieces have arguably much in common with new musical instruments, so the changes were considered to be well motivated.

1.3. The projects

While the course title “Sound and interactivity” can allow many interpretations, students were encouraged to have expressive interaction and communication of emotions in mind when designing their projects. During the first building phase, these concepts were discussed with the students individually. After that, the projects were allowed to develop as the student wished.

In all, 11 different projects were presented by the end of the experiment. For different reasons, the remaining projects could not be presented at that occasion, but were shown by the end of the course. Two projects were cooperations between two students, the rest were individual efforts.

The following shows the 11 projects with a short description and a fictional title. Also, projects are clustered in four groups by their main features.

Group A Musical instrument-like projects

Keyboard A modified electronic toy keyboard. Wires were soldered from the circuit board to the chassis and to
large metal buttons and connectors. Some of the original sliders and knobs were rewired. The keyboard’s mapping was thus radically altered and it behaved unpredictably, but not randomly.

Radioguitar A guitar-like instrument for playing short loops of sampled sounds using the Radio Baton as interface. The player interacts by moving both hands above the antennae and can control parameters such as amplitude, vibrato, filters, and sample length and position.

Stringpaint A wooden frame equipped with crisscrossed guitar strings and microphones. The amplified sounds are analyzed and manipulated in software. Intentionally to be played with a painting brush.

Touchsampler A sample player made of many touch sensors attached to a human body. Each key of a detached computer keyboard was mapped to a sound sample, and the interacting person triggers sounds or changes their sound level by touching any of the sensors. Intended to be a performance piece operated by the artist.

Marimba Contact sensors were placed on three persons standing next to each other. The sensors, placed on the shoulders, represent a set of marimba bars. The player performs by touching the ‘bars’. Sounds are either generated with Max/MSF or they are samples. The final version was very different from the prototype.

Tray An installation with a tray of cookies that provokes the visitors to taste, then starts to insult them when a cookie is removed. Approach sensors were mapped to sound sample playback. While the sounds (spoken sentences) were ready at the presentation, the prototype was unfinished.
Group C  Less interactive installations and compositions

**Footsteps**  Pressure sensors on the steps of a stair controlling playback of samples. The sensor is invisible to the person climbing the stair. An unfinished prototype was presented.

**Bassvideo**  A multimedia composition with bass guitar and a loop-station controlling video playback using MIDI. Video sequences are made from still images that are superimposed and processed, for example in color and transparency. While the composition requires an expert musician and is rather inflexible, the visuals are dynamically affected by the expressive performance.

**Feedback**  An interactive video installation using an analog camera and a modified TV. Visitors interact with contact microphones on the floor. The signal is picked up, amplified and fed directly into the modified TV. The camera is filming and playing the output simultaneously, creating a feedback loop.

Group D  Non-interactive installations

**Resonator**  An installation where a huge oil tank is the resonating body for one single sound source (a loudspeaker) playing sine wave sweeps to demonstrate different room acoustical phenomena. Visitors climb into the tank and are surrounded by seemingly moving sounds with extreme reverberation. It was planned to be controlled or affected by visitors’ gestures, but this was not realized.

2. Method

Using questionnaires was considered to be a suitable method for looking at aspects concerning expressivity and playability. Both students and the attending audience answered questions about each project. The audience consisted of fellow students and teachers. The two questionnaires, for self assessment and audience evaluation, had corresponding statements that were answered by indicating a point on a continuous scale from ‘disagree’ to ‘agree’. Self assessment and the corresponding audience evaluation were later compared.

At the presentation, most projects were in a nearly finished state, and a couple were in an early prototype state. Each artist got the opportunity to shortly explain the project after the demonstration. The audience was invited to interact with the pieces where that was appropriate.

2.1. Time schedule

Following the course schedule, students could participate in the experiment for 13 working days. While the STSM ended as the Easter holidays started, the students still had two more weeks of work after the break. Thus, the results from this study can only reflect an intermediate stage of the projects. Final versions were presented at the end of the course, but were not evaluated.

The course was a full-time employment for the students. Many days had scheduled workshops and lectures in the morning. Those sessions could be introductions, work reports, tutorials and presentations, but not all were mandatory.

On the first day, the experiment was explained accompanied by a lecture on expressivity and gestures. On the day before the
presentations, each student filled out the self assessment questionnaire for evaluating how they believed their project would be appreciated by the audience. They were not made aware that a similar questionnaire would be given to the audience. On the last day, all projects were presented, and the audience evaluated each project immediately after presentation.

3. RESULTS

The 11 statements in the questionnaire can be grouped according to the research questions they address. Most statements will however be interesting for more than one issue. A few of the results are set against the first-hand knowledge acquired from having followed both the artist’s ideas and construction closely. Also, the results from the audience questionnaire are compared to the self assessment of the artist.

3.1. Self assessment

Most artists have a quite good appreciation on how their piece will be experienced. Students in Group A performed almost three times better than the other groups, which in average only will estimate the response correctly for one statement. Often, it seems that the student expects the audience to react unfavorably, e.g. interaction will look uncool, or the communication will not be improved by training. Even this happens more frequently for Group B and Group C, and not for Group A.

It is unsure whether the relationship between the self assessment and audience evaluation is coherent for the projects that were presented in their early prototype state. While the intended purpose of Collection and Tray were sufficiently clear to the audience, it was perhaps harder to realize the potential of Touchsampler, Marimba and Footsteps.

Not all statements were relevant for all projects, and in the next section the most interesting results will be presented.

3.2. Audience experiences

3.2.1. How interactive is the project?

For all projects, the audience regarded expressive interaction to be an important factor. As expected, the whole Group B considered this to be the case also. Neither of Keyboard and Stringpaint among the instruments, or Footsteps, Resonator and Feedback among the more experimental ones, regarded expressive interaction to be an important factor. Since the whole purpose of the course was interactivity, this came as a surprise.

A typical and “traditional” interactive installation can be said to have a predictable feedback, and that interaction is expected. All the projects that most resembled such installations, Collection, Footsteps, Tray and Feedback, had very high ratings for possibilities for audience or performer interaction. These were, notably, even higher than the ones resembling musical instruments.

Ratings for possibility of audience interaction were quite low for Keyboard, Bassvideo and Resonator, which was also expected since the audience interaction is limited or even non-existent for these.

From the previous, one should expect to see that Collection, Footsteps, Tray and Feedback both anticipate and show high ratings for being inviting for interaction, and that interaction is obvious and self-explanatory, and this is also the case. Instruments normally invite to interact since the purpose of the object is so commonly accepted. Both Radioguitar and Stringpaint confirmed this, but not Keyboard, which seems strange since it is just an ordinary toy keyboard that is modified.

The projects with least interaction from the audience, Touchsampler, Bassvideo and Resonator, were also considered to be least inviting. Even the low rating for Keyboard can be explained because of this, as it was obvious all the time for the audience that it was hard to operate and that only the artist performed with it.

3.2.2. How efficient and clear is the communication?

One way to look at efficiency is to find out if the audience feels that the person interacting can easily be expressive and (successfully) communicate emotions or ideas with the piece. This is most interesting to observe for Group A and Group B. In the instrument group we should, instinctively, expect a high rating, but both the self assessment and the audience showed only moderately high agreement to the statement. For the installations, the artist regarded them to be rated higher in agreement than what was actually reflected in the audience’s answers. Looking at it from the interacting person’s perspective, even here it is most interesting for Group A and Group B. All the projects in Group A were considered to not easily allow expressive interaction and communication by a visitor, and this was in correspondence to the audience’s response. On the other hand, Group B expected that such interaction was easy, while the audience regarded it as hard.

3.2.3. How good is the playability?

The original intention with the whole experiment was to test playability of new musical interfaces and correlate it to various factors. It was therefore also interesting to see if both the creator and the audience could compare the project to existing musical instruments. As expected, the projects in Group A are believed to have similarities with instruments, and this is also the reaction from the audience. Even Bassvideo, played on a standard bass guitar, gets a high score. Although, this was not expected by the artist since the intention was to keep focus on the visual output.

All the other projects were found to show little resemblance to instruments. It can be argued that some of these indeed were inspired by existing instruments, such as melodic percussion in Marimba, MIDI pedals in Footsteps, and a keyboard in Touchsampler.

A common way to describe the potential of a musical instrument or interface is to examine the threshold for beginners, the learning curve, and the potential for virtuosity. While these indeed are common principles, they are debatable even for traditional, well-studied instruments (violin, for instance, has a much higher threshold for beginner interaction than piano, but both have a similar potential for virtuosity).

For the instruments, Group A, the general mapping between sound generation and gesture seems very clear and obvious. While the actual mapping of the knobs and keys in Keyboard was very strange, and the sound generation in Radioguitar is made in software, it still seems straightforward to start interacting. Nonetheless, the beginner’s threshold-statement was the only where all projects in Group A had estimated incorrectly. One explanation is that the presentations were done by performers that had practiced. Also there might have been higher expectations of a musically meaningful output from the system.
All the installation projects from Group B and Group C, except for Touchsampler and Bassvideo that both allowed interaction only from the artist, were considered to have a low threshold for successful interaction.

The learning curve was not considered, but one statement concerned if practising on the interaction would enhance the outcome. For Group A, this was not believed to be more than relatively important. That was not at all expected. The audience, on the contrary, compared it to the normal situation for musicians that requires a high degree of practising to achieve virtuosity.

3.2.4. How is the interaction perceived?

One of the initial theories was that a clear communication requires a high correspondence between the effort of the interaction and the output. None of the projects expected the correspondence to be high either.

For the effort of the interaction, Group A and Group B were expected or intended to have a high correspondence, while Group C and Group D were expected to have low. However, none of the projects remarks itself by having either high or low correspondence. A possible exception is Feedback where the audience is moving in front of a camera – even though the real interaction is with the pressure sensitive floor.

Since many of the projects used sensors that responded best to rather fine handling, the amount of effort or energy would not be easily transferrable to the output.

The gestures of the performer are important in expressing and conveying emotions. Still, results from the audience showed an even lower correspondence between the gesture and the output than for the interaction effort and the response. A possible exception here is Collection which had a direct mapping between object and output. None of the projects expected the correspondence to be high either.

If the performers and audience had more time for each presentation, the results may have looked different. Especially, Radioguitar, Stringpaint, Marimba and Tray have an obvious connection between gesture and output.

The statement on how comfortable, cool and appealing the interaction looked did not yield any useful information. Results from the audience evaluation are uniformly positive for all projects. Probably this can be explained simply by the fact that all projects indeed looked “cool and appealing” to the audience consisting mostly of classmates. Self assessment, on the other hand, is less in agreement with the statement. This can be explained by the fact that self assessment was done on a prototype that lacked the finishing touch. It can even have an explanation not directly related to the project; that the artist might have been modest for this aspect.

Two projects, Touchsampler and Resonator were rated slightly higher by the audience. Those were arguably also the most spectacular ones.

4. CONCLUSION

An uncertainty was the students’ understanding of ‘interaction’ and ‘expressivity’, especially given the diverse backgrounds of music, painting, multimedia and sculpture. This could have been avoided with clearer guidelines for the students, but possibly to the expense of creative and unexpected outcome such as Bassvideo, Resonator and Feedback.

By judging comments from the students both during the work and after the presentations, this way of evaluating their projects was a rewarding experience. While the results still give insufficient answers to the questions we had, the method seems valuable. Also, by considering the issues from the statements while designing and making the art piece, a more successful result can be achieved, at least with respect to how interactive the piece will be. It is more complicated to understand the musical impact or function, and especially whether the interface is efficient. Both the threshold for first interaction and headroom for developing skills should be kept in mind and investigated, even for projects that have only a little degree of music or sound.

Although we had the highest expectations from the evaluation of how attractive the interaction looked, it was not possible to see any clear outcome. One explanation is that how the interaction looks affects so many aspects of the art piece besides the communication of emotions through music, which was the starting point here. So even for a project that fails in having a clear communication, like Resonator, the interaction might still look good. What looks cool or not is a subjective opinion, but for projects that allowed for expressive interaction, the interaction was considered cool. Of less importance is the relationship between input and output of the system.

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