



Exploring Musical Systems That Create A Collaborative And Intuitive Experience For Non-Musicians

Broken Chords
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11th June 2017

This report will be exploring musical systems that create a collaborative and intuitive experience for non-musicians. These new musical systems are used to demonstrate how and why ARTEMIS, designed and built by Broken chords was developed in a way that created a collaborative and intuitive experience. Playing an instrument as well as composing music requires technical skill, practice and musical knowledge to do and learning these skills take time which can be quite discouraging for people. ARTEMIS was designed and built in a way such that it allowed people to collaborate and explore musical compositions through the tip of a coloured marker which represented instruments, without any prior knowledge of music. ARTEMIS allows people to skip the technical hurdle of learning how to play an instrument and removes the tradition individual learning and allows people to learn together using an interactive table which provides audio feedback when people draw on it.

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Physical Computing & Interaction Design Studio Reflective Report
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Introduction

Through the past semester of DECO3850 Physical Computing and Interaction Design. The course provided us the opportunity to delve in to the space of new interactions in everyday life. We, Broken Chords looked into the space of new interfaces for musical expression accompanied by the problem of early learning. Through researching into this problem space we designed and built ARTEMIS which stands for Augmented Reality Teaching Everyone Music In Society, allows people to come together in the same space to learn and collaborate and compose music together through drawings with the use of coloured pens which represent different instruments.

This report will explore new musical systems which create a collaborative and intuitive experience which help accommodate non-musicians in playing an instrument and composing music. The report will discuss pre-existing musical system and provide observations on how these systems provide collaboration with a user-friendly interface which in hand gives an intuitive experience. Some of these pre existing works were also used as inspiration during the design phase of ARTEMIS to further take our musical system in path that focussed on collaboration while having an intuitive design. Furthermore there will be a closer look on how ARTEMIS was designed and deployed which will cover my individual contributions to the project. Lastly a reflection on my experiences working on this project and the my final thoughts on the final outcome of ARTEMIS.

Background Research

Collaborative Experience

What makes a collaborative experience? A collaborative experience can connote many things but in the context of music, a collaborative experience can be seen as a group of people coming together and producing one large piece of music. Whether it is coherent music is not of any concern because the larger goal is that people had come together and collaborated with each other in an attempt to compose music. Through the introduction of new musical systems that invite collaboration, these systems create a pathway for groups of people to reach new potentials (Okerlund J. & Shaer O, 2015). In terms of the topic music these new systems remove the traditionalism of individual learning and even though there is history of people coming together and making music (Okerlund J. & Shaer O, 2015). These new musical systems create a collaborative experience for people allowing them to express themselves whether it may be individually or as a group their expressions come from the collaborative experience which allow people to shape their individual expressions. A collaborative experience is created through the interactive musical systems and in turn through invited collaboration we see that there is a gap close in musical skill levels coming together (Blaine T, Perkis T, 2000). We see people of all skill levels whether they maybe non-musicians to novices right through experts in the knowledge of music come together and learn off each other to try and create a musical composition through novel interactions.



Figure 1: DECO3850 Exhibition, ARTEMIS Interactions.

Intuitive Design/ Experience

Intuitive design in hand creates the intuitive experience. There are of course many techniques and methods of creating an intuitive experience in a musical system and its all unique according to how the musical system is designed. Intuitive designs comes in many forms, for example the use of a pre existing gestural controllers such as the Nintendo Wii Controller, has been used for musical performance utilizing the gestural controls and motion sensing capabilities it has allowed a group of three individuals Elaine L. Wong, Wilson Y.F.Yuen and Clifford S.T.Choy over at Hong Kong Polytechnic University to develop an interactive musical instrument in 2008. This controller not only provided motion sensing capabilities but it is highly accessible to the public which means several aspects of the intuitive design for their musical instrument have already been done for them. The fact that they utilise a pre-existing controllers from a popular console means that a majority of people who use this system will be already familiar with how the controller should work which allows users to freely explore this new system with the confidence in using the controller as it is a familiar interface (Elaine L. Wong, Wilson Y.F.Yuen and Clifford S.T.Choy, 2008).

Visual feedback and sound cues are also considered intuitive designs. The use of audio and visual feedback are very good aids for people to use to further understand (Sergi Jordà, 2002) their respective musical systems. Audio and visual feedback are the common methods of providing a intuitive experience when it comes to interactive musical systems. We can see these techniques used in musical systems such as the Reactable, the visual along with the audio cues allow users who are playing with the table to intuitively manipulate the sounds using the feedback provided to them.

Force-feedback is also another avenue of intuitive design it allows people to feel what they are interacting with on another level and therefore with such intuitive feedback the experience of using such musical systems that provide this Haptic feedback enhances the users understanding of the interactions and allows easier understand of the particular musical concepts. This concept is further explained by Berdahl E, Verplank B, O Smith III J and Niemeyer Gunter from Stanford University in 2007 as they discuss "musical instruments that aim to promote skill transfer through physical intuitiveness" (Berdahl E, Verplank B, O Smith III J and Niemeyer Gunter, 2007).

Musical System that Inspired ARTEMIS

There were several inspirations when the designing of ARTEMIS was in progress. These inspirations help mould ARTEMIS to become a intuitive and collaborative musical system. We took inspiration on how these previous systems utilised themes and common ideas and technologies to provide the collaborative experience.

Sequence is a web application which takes on musical composition from a different perspective. Sequence adopts a biological theme in how it exhibits musical compositions (Alexander R, Dunne G, Massey D, 2010). The process that sequence wants users to utilise is that they have option to choose wave forms in which they would like to work with and then further alter the waveforms scales and octaves to produce different sounds. Once users had completed altering their waveforms they would place it in the visual part of sequence otherwise known as the dish and watch their waveform interact with other wave form. This part of sequence was the part that took our attention the most it was quite a interesting collaboration technique it was quite passive and so we had taken this concept and flipped it so the collaboration was faster real time. This application influenced the design of ARTEMIS quite heavily in the fact that we originally headed towards a biological theme as well as adopting a similar visual aid for users to see their musical compositions. Sequence also helped us with forming the round table design originally as well.

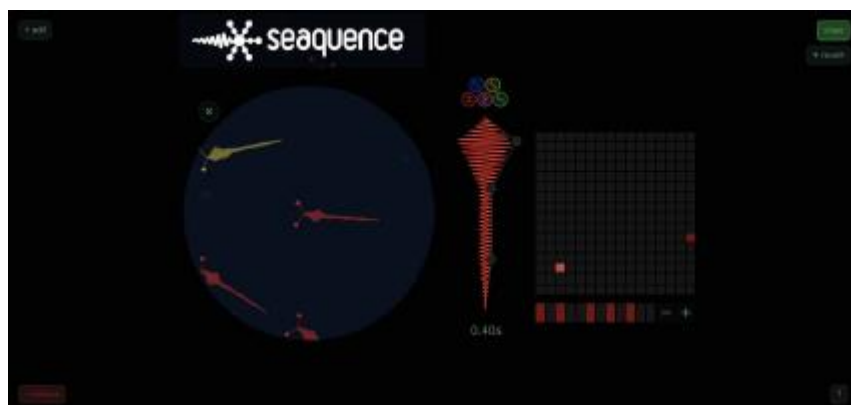


Figure 2: Sequence, Web Application

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Reactable influenced our design of ARTEMIS in a very physical manner. ARTEMIS took inspiration of the round face and the visual feedback the Reactable provided for users. The intuitive design of the Reactable was quite compelling and we wanted ARTEMIS to follow a similar path and so we had considered how to design ARTEMIS with a face that was intriguing and would spark interest in newcomers. ARTEMIS is arguably quite similar to the design of Reactable, although ARTEMIS pushed for a collaborative experience compared to Reactable where offered the opportunity to collaborate. That was what we thought separated ARTEMIS from Reactable.

Design Process

When we formed Broken Chords, we were formed due to the fact we wanted to work with the space of new interfaces for musical expression along with the problem space of early learning. During our first meeting we had ideated several ideas which revolved around the idea of allowing people to collaborate together creating music and we also had a very strong focus that what we wanted to build was for non-musicians as we had long discussions of how difficult it can be for people at any age to learn an instrument. While having these ideas and concepts in mind we had iterated our concept to a table in which allowed people to draw whatever they wanted and it played sound according to what coloured marker they were using.

We had several iterations with this core concept of drawing then having audio feedback and through much research we have seen that this sort of concept has been done before and so we had confidence in moving forward with the concept. Our concept changed constantly due to trying to balance how we wanted to build it internally which was the coding side along and making that internal design complement the physical design of our concept. While we were in our early stages of designing our physical build we had several ideas on what sort of table we wanted for example we first started with a curved semi-circle like table and then we moved to a full round table and from a design perspective having a round table seemed more inviting than having a standard rectangular table and of course our main goal was to push collaboration.

Another part of designing our concept is that we had different variations on how the table worked. It began with little webcams sitting on the table capturing users drawings and having a projector below the table to project visuals of users compositions. We thought about how people would draw on the table would they use a physical coloured marker or would they be using a digital marker for example using a Wii remote to represent a pen or brush for users to use. We came to the conclusion that we would allow users to use

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physical markers to use and draw on the our table and also have a webcam above that would take snapshots of the table and convert user drawings into music with the help of a pre existing music making software called Ableton.

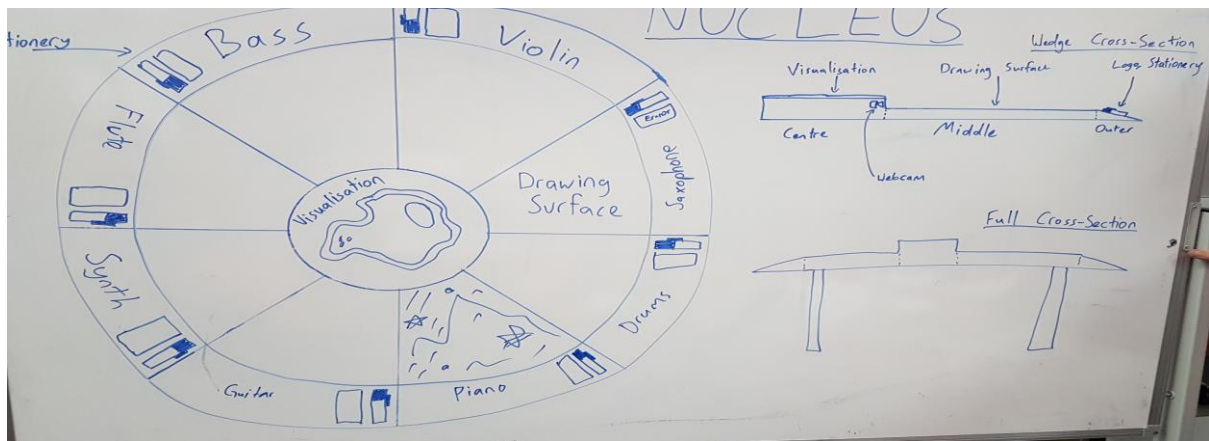


Figure 3: First Iteration of ARTEMIS originally named Nucleus.

Development and Deployment

There were several different areas of development for ARTEMIS, there was the coding development which Domenico was primarily working on and then there was the physical development of ARTEMIS which I took part of the most in terms of the sides of development. The physical development involved making the prototype and also making the measurements and designs for the final table to be cut out and built as well.

The development of our prototype consisted of the core ideas of ARTEMIS. This was the drawing surface and the webcam that would be sitting above the drawing surface as well. In concerns with the backend we had quickly setup a unity program which took a picture of the drawings on the draw able surface every 10 seconds and then we bridged the image to a pre-existing software called i2sm which converted images to music. This was our rough prototype for several weeks until we had a proper backend working.

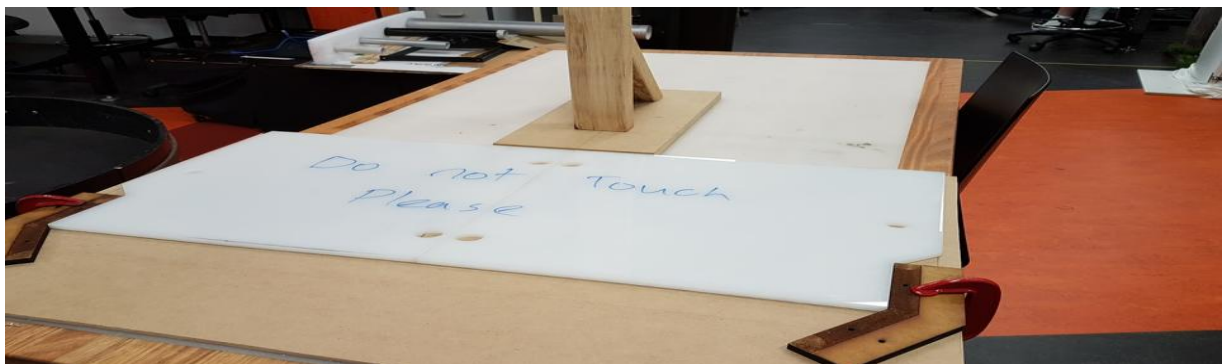


Figure 4: ARTEMIS Prototype.

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The prototype served tremendously well considering how easy it was to do. We used the prototype right up until we had our table assembled. When we had our core concept of ARTEMIS coded we had small tests and although it was collaborative many asked the question of what our prototype was and so we had realised that there nothing there to spark peoples interest unless people were already using it. Therefore the lack of intuitiveness to our prototype made us go back to our design of ARTEMIS and review what we could do to allow ARTEMIS to become more intuitive and intriguing for users to come and interact with. We had the idea of having LED lights as a visual aspect originally but we decided it should have been an afterthought feature. After much consideration we had an idea that the LED should allow the users to understand that there is a loop happening constantly and so we implemented the LEDs late into the development of ARTEMIS to allow users to understand where the loop is in real time. Not only do the LEDs let people understand where the loop is currently it also produces the colour at the exact angle the users drawings are to create more intuitive understand of what ARTEMIS is doing.

As it came closer to the exhibition we had finally completed the physical build of ARTEMIS and were required to have pin-up materials to support ARTEMIS and allow users to understand what ARTEMIS is conceptually and what it was problems it was trying to address and solve. Posters were developed along with brochures that I had produced and printed out. The brochures explained what ARTEMIS was about , how it worked and how it solved the problems space of learning music and instruments at an early stage for non-musicians. The brochure also gave details of each team member of broken chords.

Figure 5: ARTEMIS Brochure Front Face.

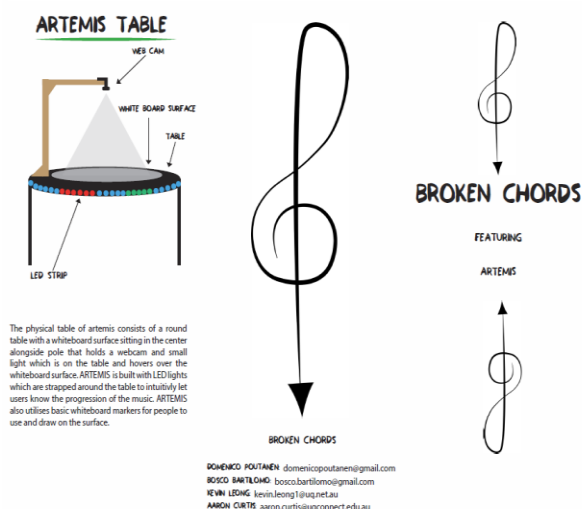
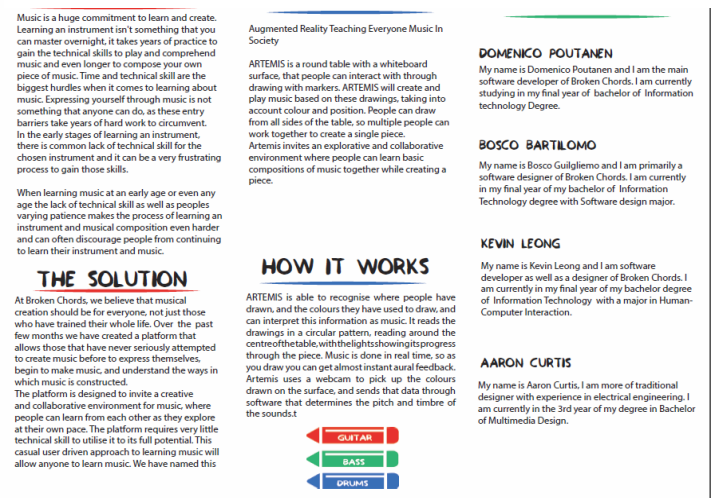


Figure 6: ARTEMIS Brochure Back Face.



Reflection

During my time in participating DECO3850 Physical Computing & Interactive Design Studio there were many different situations that I encountered. Some situations felt quite familiar and some I had never been in before. The processes and the phases that we partook in although at the time felt quite useless in the end were quite useful. We had regular presentations where we had discussed our current progress of our project and to be quite fair they were great although sometimes we knew the feedback we would have it was still a very good activity we participated in as it help us stay on the right track for developing ARTEMIS. The hardest part of getting ARTEMIS ready was during the early ideating phase, as a group we had so many ideas of what we wanted to do with ARTEMIS but as the weeks went on we had to defiantly start stripping down features for the project to become feasible. These features included more instrument which meant more colour detection optimisation was required for each colour to function properly and another problem that came along with that was lighting. ARTEMIS needed to be often recalibrated according to its locations lighting for colours to be detected correctly.

Although this wasn't a real problem near the end as Dom had created a recalibrating GUI for ARTEMIS. Even though we had to strip down features throughout the semester we slowly started to understand that this was quite a common process in order to get our core features done we needed to start prioritising features that needed to be done and features that could be done if we had the time. In summary I think we did tremendously as we ended up finishing and producing a functioning musical system for the exhibition. If we had more time on this project we would have defiantly had more instruments available for people to use and also made the sound a bit more coherent.

As a final reflection on my experiences, the exhibition was the most fulfilling part of the journey. Seeing people of all ages marvel over our concept and use it and find joy in using it was a great thing to see. The experience of explaining to people who weren't sure what it was but was intrigued by the sound it made and then having see their faces light up after understand what it is was invaluable. Also seeing what people drew on ARTEMIS was quite the spectacle as well.

Conclusion

As a group we all agreed that the core concept of ARTEMIS was to allow collaboration of all skill levels to come together and collaborate, with a high focus towards non-musicians to come and express themselves in a novel way. We wanted to take away the traditional individual learning of music and encourage group learning so that people would be inspired off each other to create their own type of musical expression. In terms of if we successfully accomplished this concept was quite evident at the exhibition with the large positive response to our project by the audience that came throughout the day. Especially during the evening we had great suggestions on how to further develop ARTEMIS in the future.

In considerations of collaborative and intuitive experiences as a whole, ARTEMIS provides these experiences in a visual and audio technique along with a carefully designed table which invites collaboration more than a standard table would. The background research that was previously discussed earlier in the report reiterates the idea of the importance that collaboration and intuitive experience has on learning music at an early stage. Along with a couple of important inspirations that help guide ARTEMIS to where it is today.

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