Sonic Arts Creative Projects

Assignment 2: Independent Creative Project

Brief: Devise a creative project that places the relationship between sound and electronic technology (or other technology) at the fore.

Nicholas Smith - 2083492S

Dropbox: https://www.dropbox.com/s/neuldpvluqkdbmq/2083492S.zip?dl=0

The submission for this assignment is titled “For Two Computers”. It is a piece that seeks to examine and reflect on the role that computers have played in the field of sonic arts over the course of the 20th and 21st centuries. It will pay tribute to the technological milestones that have led to the computer’s ubiquity in our lives, and attempt to highlight some of the inherent, yet abstracted processes that have irrevocably changed the way composers and musicians approach their craft. This commentary seeks to document the research and creative processes that have led to the development of this piece. It will cover the composer’s methodology and influences, the artistic and aesthetic context in which the work was created, and its implementation as a fixed installation. The work, which was implemented on a MacBook Pro and a Raspberry Pi in the ChucK programming language, will be referred to in the commentary as a piece, composition or system.

Computers are so embedded into our lives that we often do not realise when we are interacting with one. We use computers whose form and function vary greatly between applications, from servers in huge data centres that power search engines, to the microcontroller in our toaster. Faced with the overwhelming amount of computers that now run our daily lives, creating a piece that would pay tribute to the computer and highlight its processes requires a more precise definition of its scope. From this one could determine which type processes and sounds should be used in the piece.

When considering computers in a musical context, one immediately thinks of digital audio workstations (DAWs) run on personal computers. Using only personal computers seems rather limiting however, as they are the most concrete manifestation of computing in most people’s lives, and their inclusion would not give the listener much additional insight into the world of computers. Broadening the scope of the project is therefore necessary. The impact of computers on music can be extended to their use in academia and contemporary classical music, where composers such as Iannis Xenakis developed dynamic stochastic synthesis years before it could actually be implemented (Serra, 1993), and also to the role the internet has had in breaking down the geographical separation that existed between local musical scenes (Ableton, 2017). Therefore, in addition to considering the computer as a physical object, looking at the role of the internet and algorithmic/computer-based composition is key to making the project engaging and relevant to its conceptual subject matter.

The main inspiration for this piece came from the work of Matt Parker, particularly his ongoing project “The People’s Cloud”, a web based series of short films and compositions seeking to get to “the bottom of the internet” (Parker, 2017). His films and recordings presented an incredible insight into a world that millions interact with every day, yet know very little about. In his essay accompanying the first episode of the series, Parker explains that through sound recordings of data centres and their environment, one begins to “sense, feel and hear the material presence of the otherwise abstracted existence of the internet” (Parker, What is the Cloud vs What Existed Before?, 2017). Highlighting the processes of computers should therefore start with the inclusion of sounds reflecting their physical computers should therefore start with the inclusion of sounds reflecting their physical, electro-mechanical nature. This led to the recording of around a dozen sounds in the School of Engineering's server rooms located in the Rankine Building, three of which were included in the final piece ("STE-005", "STE-006", "STE-009").

Considering the above, the samples used in the piece were chosen on the premise that sound can reveal processes that are otherwise unnoticed. The essay "The Aesthetics of Failure: Post-Digital Tendencies in Contemporary Computer Music" by the composer Kim Cascone discusses the use failure as a compositional tool, by which composers can highlight the limits of our control over technology and its inherent flaws that are suppressed "beneath the threshold of perception" (Cascone, 2004). This technique is useful in the context of this project as it can be used to bring the physical systems of computers that during normal operation would be silent to the foreground. Samples were sourced from the online sample library www.freesound.org due to the lack of faulty hardware available for recording ("Short_Circuit", "Skype_Feedback"). Ryoji Ikeda's "datamatics 2.0" also informed the sample choices for this piece. By manipulating, displaying and sonifying data (Ikeda, datamatics, 2008), one can highlight the importance of the flow of information in the music making process, from sharing music across the internet to creating pieces with software MIDI instruments. Thus, a recording of a 56k modem (effectively digital data converted to audio to be sent down a telephone line) was included in the piece ("data", www.freesound.org). Concerning the historical aspect of the piece, paying tribute to work of those that came before, Matt Parker's "Imitation Archive" served as the main source of samples, from which the sounds "colossus_calc", "creed_7b_teleprinter" and "mechanical_calculator" were sourced. Juxtaposing these historical elements with the modern whirring of data centres serves as a reminder of the progress that has been made in the past 50 years (Parker, The Imitation Archive, 2015).

An important concern during the work's development was how to relate it as closely as possible to the theme which it was trying to address – highlighting the processes of the computer. This led to the creative decision to limit human interaction with the work to a minimum – the computer would make all relevant musical decisions and inform the structure and sonic characteristics of the piece. To implement this idea, the project would have to take the form of a generative composition, running indefinitely in "a never ending cycle of computing" (Parker, The Imitation Archive, 2015), reflecting the very nature of modern technology: always on and always accessible. Following this logic, the piece should also be "performed" by two computers in order to give listeners a sense of the hyper-connected communication networks of our world, in the spirit of compositions for distributed electronics such as "Dialtones (A Telesymphony)" (Levin, et al., 2001).

To practically implement these two creative concepts, some important musical notions had to be considered: how should the computer generate its own musical content? When should it start or stop playing, and when should it continue to develop a certain motif? How should one computer respond to the other's output – should it respond or accompany or follow its lead? Due to a computer's lack of instinct and, crucially, experience when compared to a human performer, these issues had to be addressed by creating a precise framework in which the system could evolve. Crafting this framework led to significant research in the fields of algorithmic/generative composition and improvisation.

There are several algorithmic/generative methods that can be used to create musical events. Each method relies on a strict set of rules in order to produce a particular output. These methods include stochastic processes, L-systems ("Cells" (Kyburz, 1993)), neural networks ("Hybrid II (Networks)" (Winkler, 2003)) and cellular automata ("Horos" (Xenakis, 1986)), which have each been explored at different stages of the 20th century's musical history. Unfortunately, due to their complexity and high processing power requirements, implementing L-systems, neural networks or cellular automata in a real time computing environment was considered to be unfeasible within the time frame of the assignment. It was therefore decided that the most appropriate generative method for the project was stochastic, simply due to technical and time constraints. In addition to this, real time sample processing proved to be extremely difficult, once again due to the limited processing power available on the Raspberry Pi; extracting interesting sonic components processing power available on the Raspberry Pi. extracting interesting sonic components from the samples had to be done ahead of time. One of the first uses of stochastic processes as a compositional method was in "Illiac Suite" (Hiller & Isaacson, 1957), where "individual musical events were determined by chance procedures" (Supper, 2001). The composition was set however within a "rule based structure" including "16 different rules in three categories: what is allowable, what is forbidden, and what is required" (Supper, 2001), allowing the computer to tweak only certain, very specific, parameters of the composition. Limiting the computer's decision making abilities does go somewhat against the ethos of "minimal human intervention" discussed previously, as the programmer's decisions will heavily influence the system, but it is a necessary choice, as leaving too many parameters to chance effectively would render the piece formless and dilute any interesting sonic material that might come from it – as Charles Baudelaire said in a letter to Armand Fraisse "Because the form is restrictive, the idea flows with more intensity!" (Baudelaire, 1890). Therefore, the parameters controlled in the piece itself by a stochastic process are the sample playback speed, which sample from the library should be played, the sample's start and end points, and where the sample should be panned in the stereo plane (see the genParam() function on lines 46-69 in the main_implementation_MAC.ck file).

Since the computer's output will be stochastic, and therefore unpredictable, improvisation is the only way one machine can respond to the output of the other. George Lewis' "Voyager" (1988) proved to be an extremely influential piece when developing a "series of conventions or rules" on which "every improvisation rests on" (Netti, et al., 2014). Indeed, his conception of a "performance of *Voyager* as multiple parallel streams of music generation […] – a nonhierarchical, improvisational, subject-subject model of discourse, rather than a stimulus/response setup" (Lewis, 2000) would fit in perfectly with the idea of constantly running parallel computer systems that can respond to one another without being dependant on each other. Derek Bailey also touches on this notion in his essay about free improvisation, discussing the "circular quality to the improvisation" in a "closed system", in which the "release is built into the tension, […] the answer is contained in the question" (Bailey, 2004). Emulating this free improvisation aesthetic started by creating an OSC link between the two machines through which they could pass information back and forth to each other (see lines 123-184 in main_implementation_MAC.ck). The computers would then trigger each other's samples using OSC messages, sometimes playing identical samples at different rates, creating a sense of intentionality, and at other times accompanying each other (with one machine playing more textural, ambient material while the other played discrete percussive material). The samples were triggered according to parameters specific to each computer (their IP and MAC addresses, as seen on lines 28-40 in main_implementation_MAC.ck), giving each computer a certain "style" (Tarabella, 2004) upon which and improvisation can be based.

This commentary has touched upon some of the driving forces and inspirations behind this project, from the choice of samples used to reify some of the aspects of computers that escape the attention of a wider audience, to the medium in which it was implemented as a fixed, generational and improvisational piece. However, the development of this piece raised many questions that were not addressed in this document. How did the choice of hardware and programming language influence the creation and form of the piece? At which point will a computer truly be able to make musical decisions, and how would that be expressed in code? It did not address how the piece could be further developed using more advanced processing techniques such as machine learning, alternative generative algorithms and multiple machines. These are some of the issues and concepts that I hope to address in the future, as an extension of the work I have done this semester. I have very much enjoyed this final assignment of my sonic arts course, and hope that I will be able to pursue similar projects in the future. I'd like to extend my thanks to Dr Nick Bailey for helping me understand the inner workings of the Raspberry Pi, without whom my installation would probably not be working, and to Dr David Muir, who kindly let me visit the School of Engineering's server rooms.

Bibliography

Ableton. (2017, March 14). *What is local? Perspectives on music-making in a hyper-connected world*. Retrieved March 14, 2017, from Ableton: https://www.ableton.com/en/blog/music-making-in-hyper-connected-world/

Bailey, D. (2004). Free Improvisation. In C. Cox, & D. Warner (Eds.), *Audio Culture: Readings in Modern Music*. New York: Continuum International Publishing Group Inc.

Baudelaire, C. (1890). Lettre à Armand Fraisse. In C. Baudelaire, *Lettres*. Paris.

Cascone, K. (2004). The Aesthetics of Failure: "Post-Digital" Tendencies in Comptemporary Computer Music. In C. Cox, & D. Warner (Eds.), *Audio Culture: Readings in Modern Music*. New York: Continuum International Publishing Group Inc.

Hiller, L., & Isaacson, L. (Composers). (1957). Illiac Suite.

Ikeda, R. (Composer). (2008). datamatics 2.0. [R. Ikeda, Performer]

Ikeda, R. (2008). *datamatics*. Retrieved March 20, 2017, from Ryoji Ikeda: http://www.ryojiikeda.com/project/datamatics/

Kyburz, H. (Composer). (1993). Cells.

Levin, G., Shakar, G., Gibbons, S., Sohrawardy, Y., Gruber, J., Semlak, E., et al. (Composers). (2001). Dialtones (A Telesymphony).

Levin, G., Shakar, G., Gibbons, S., Sohrawardy, Y., Gruber, J., Semlak, E., et al. (2001). *Dialtones (A Telesymphony)*. Retrieved March 20, 2017, from Flong: http://www.flong.com/storage/experience/telesymphony/index.html

Lewis, G. (2000). Too Many Notes: Computers, Complexity and Culture in Voyage. *Leonardo Music Journal , 10*.

Netti, B., Wegman, R. C., Horsley, I., Collins, M., Carter, S. A., Garden, G., et al. (2014, September 3). *Improvisation*. Retrieved March 23, 2017, from Grove Music Online: http://www.oxfordmusiconline.com/subscriber/article/grove/music/13738

Parker, M. (2017). Retrieved March 20, 2017, from The People's Cloud: http://www.thepeoplescloud.org/

Parker, M. (Composer). (2015). The Imitation Archive. [M. Parker, Performer]

Parker, M. (2017). *What is the Cloud vs What Existed Before?* Retrieved March 20, 2017, from The People's Cloud: http://www.thepeoplescloud.org/documentary/episode-1/

Serra, M.-H. (1993). Stochastic Composition and Stochastic Timbre: GENDY3 by Iannis Xenakis. *Perspectives of New Music , 31* (1), 236-257.

Supper, M. (2001). A Few Remarks on Algorithmic Composition. *Computer Music Journal , 25* (1), 48-53.

Tarabella, L. (2004). Improvising Computer Music: An Approach.

Winkler, G. E. (Composer). (2003). Hybrid II (Networks).

Xenakis, I. (Composer). (1986). Horos. Paris.