

Virtual Music Instrument

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Abstract – New technologies have changed the way music can be composed and performed. With computer software and electronic equipment, a virtual music instrument system has been developed and used for a music performance. The aim of this research project is to create a virtual music instrument and a performance that integrates sound and visuals.

Keywords - Virtual music instrument, interactive performance, Max/MSP.

1 INTRODUCTION

Virtual is a word that describes computer simulations of things that behave like real-world objects, situations and phenomena. Virtual music instruments behave somewhat like real instruments, and can be played from the computer keyboard, a MIDI controller, or as an extension of a traditional instrument.^[19] A virtual music instrument is not a singular entity, but a system, consisting of several components.

A *performance* generally comprises an event in which a performer or group of performers behave in a particular way for another group of people, the audience.^[13] A performance has a clear beginning and an end, in contrast to installation art, which leaves “space and time as [its only] dimensional constants”.^[9] What this implies is that whilst installation art can be more experimental and can perhaps evolve due to environmental changes, a performance is generally controlled and planned, and the performer executes the performance according to what was planned.

2 CONCEPT

The objective of my project is to create a virtual music instrument and to compose a performance for the instrument. As in the definition of performance, the audience is an important element. Therefore it is essential that I take into account the audience’s reaction in my performance. I am creating a performance that is didactic in nature, allowing the audience to learn to appreciate the elements in the music. As I am interested not just in sound, but in imagery as well, my performance includes a video projected at the same time as I am playing the instrument.

Some of the limitations of my project includes having pre-recorded sounds in the performance as I am the sole performer for a four-part melody.

3 BACKGROUND AND AESTHETICS

Viewing a live performance by the Singapore-based group *Ang Moh Faux*^[2] served as an introduction to virtual music instruments for me. I was particularly captivated by how the performers used unconventional items such as a rock or a game controller to create a sonic experience for the audience. I was also introduced to different components in a virtual music instrument system, such as mixers, soundcards, microphones, speakers and computers. Interviews with the performers allowed me to understand some ideas behind composing for a virtual music instrument.

Alexander Schubert’s “Weapon of Choice”^[15] for violin, live-acoustics and live-video inspired me to incorporate visual images to my performance to enhance the dramatic effects and it also showed me how it is possible to use a Wii sensor to achieve these effects. Other music involving virtual music instruments such as Pierre Boulez’s *Anthèmes 2*^[4] for violin and electro-acoustic realization and Karlheinz Stockhausen’s *Tierkreis*^[16] provided the artistic foundation for my music composition. The music by these composers is not the usual melodic music to be found in what is normally referred to as a ‘classical’ CD. Even though the electronic elements are more controlled than Alexander Schubert’s *Weapon of Choice*, there are still many passages that have a lot of dissonance and even sound unpleasant. However the pieces convey a strong presence of a particular mood and are coherent throughout. The runs and quick notes in *Anthèmes 2* have been an inspiration for one passage in my composition.

4 PROCESS

4.1 MUSIC COMPOSITION

I have used three different compositional approaches for the music material of my piece: variations on a theme; generating melodies from text; and generating melodies from a computer application. I will describe these techniques one by one.

Firstly, variations on a theme. In composing the music, I have decided to use the well-known folk song *Twinkle, Twinkle Little Star*^[17] as an inspiration. The rationale is that this is one of the most famous tunes. Since my composition is about introducing the audience to virtual music performance, using and manipulating this tune will give the audience a familiar, yet new music

experience. I have manipulated the tune of the song with different methods, such as,

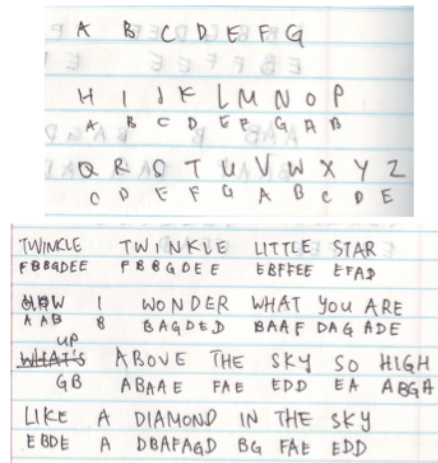
1. Transposing it to different keys
2. Elongating the notes
3. Adding ornamentation

I created several versions of the tune and the different versions will interweave in the composition.



Figures 1 and 2 show the manuscripts of the evolution of the different variations of Twinkle, Twinkle Little Star.

Secondly, generating melodies from text. Another section of the composition is an entirely new melody, separated from the *Twinkle, Twinkle, Little Star* tune, but instead inspired by its lyrics. I have assigned a musical note to each letter in the lyrics and composed a melody from there.



Figures 3 and 4 show my system of assigning a musical note to each letter in the lyrics of *Twinkle, Twinkle Little Star*.

Thirdly, generating melodies with a computer application. I have used an *iPhone* [10] Application, in my composition. *Bloom* [3] is a generative music application. By tapping different parts of the screen on the *iPhone*, I am able to create different sounds and I have composed several original tunes using the application as well.

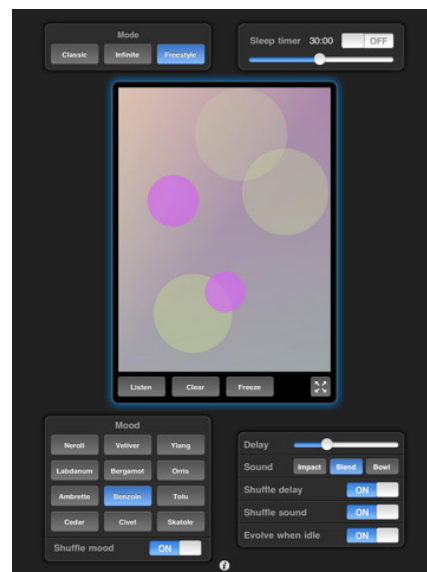


Figure 5 shows the *Bloom* interface, where users can tap on the screen (middle) to compose music. The controls at the bottom allow users to choose an ambient sound to complement the music.

So far I have explained the process of creating the melodic music material. Now I will move on to describe how I combined them in a composition.

With the different musical elements, I created a pictorial diagram, charting how I wanted the different elements to flow together and become a musical piece. With the pictorial diagram as a guide, I transcribed the notes in the tunes and created a detailed music score.

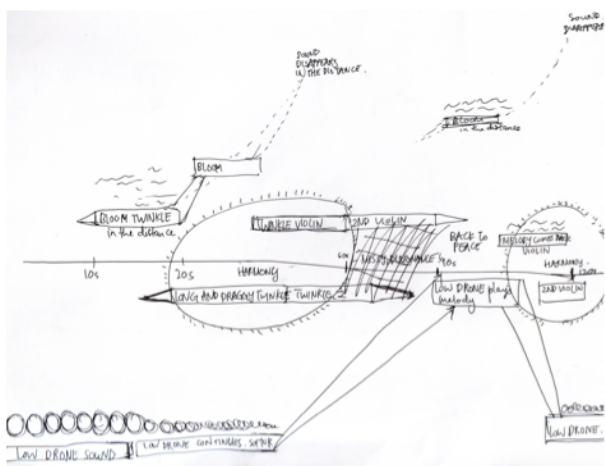


Figure 6 shows the pictorial diagram that I have created to aid me in putting the music elements together as a smooth flowing piece.

My composition is made up of a four-part melody, consisting of

1. A violin part (live performance)
2. A second violin part (pre-recorded)
3. A drone-like, low-key instrument part (pre-recorded)
4. Melodies from *Bloom* (both live and pre-recorded)

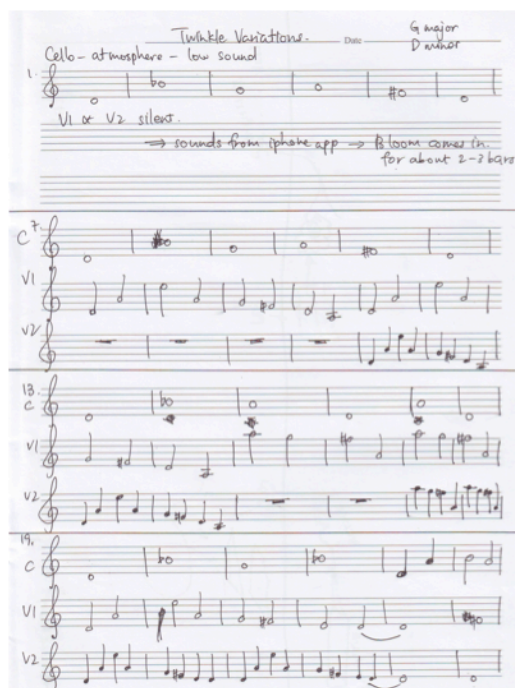


Figure 7 shows a page from the master score of my composition.

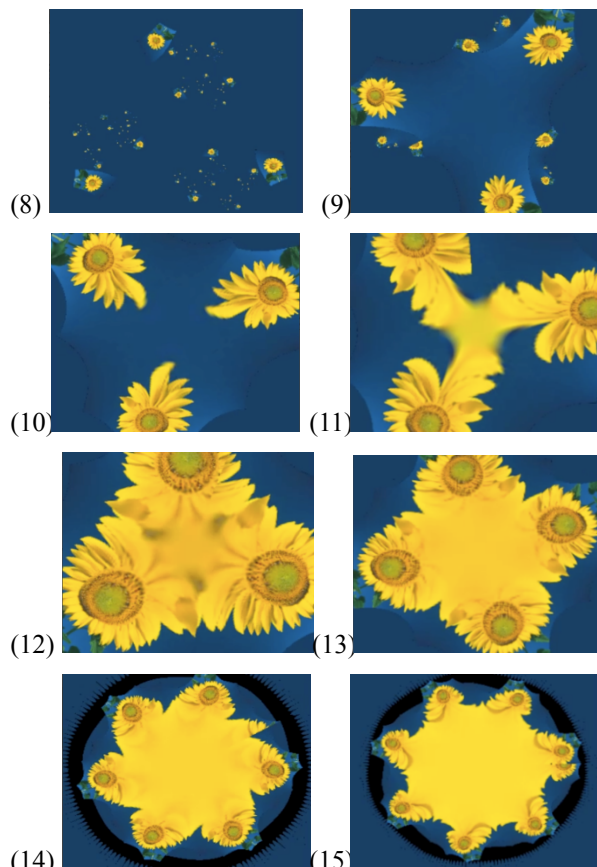
When the transcribing was complete, I played the different parts of my composition on the violin and recorded the playing. I used *Pro Tools* [13] to mix the sounds recorded.

I repeated the process of composing, trying out different versions on the violin, re-recording and mixing again on

Pro Tools several times such that the different music elements flow from one to another.

4.2 DEVELOPMENT OF THE VISUALS

Initially, I took photographs of nature and intend to manipulate them in real time during the performance. With the *Fractal Explorer plugin* [7] in *Adobe After Effects* [1], I am able to animate all the parameters of the image, such that the changes in the image run in real time as I manipulate the values of the parameters.



Figures 8-15 are screenshots from the video made by manipulating the power, rotation, spinning speed and scale of the image in *Adobe After Effects*.

However, the limitation is that it is very difficult to programme the *Wiimote* [18] to manipulate the controls within the *Adobe After Effects* software for live performance. Therefore this method is seen to be impractical and I had to source for an alternative.

Jitter [11] is a more favourable option, as I can use the programme within *Max/MSP* and I can programme the signals from the *Wiimote* to manipulate the images during live performance.

I filmed some footage of nature and edited them in *Final Cut Pro* [6].

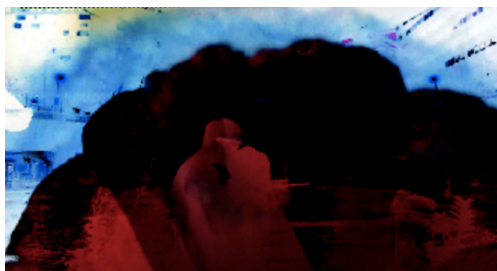


Figure 16 shows a screenshot of footage that I have recorded and edited in Final Cut Pro.

After which, I imported the videos to *Max/MSP/Jitter* [11] and programmed the *Wimote* to manipulate the video's parameters during live performance.



Figures 17 and 18 show screenshots of how signals from the *Wimote* manipulates one of the parameters of the video (the resolution).

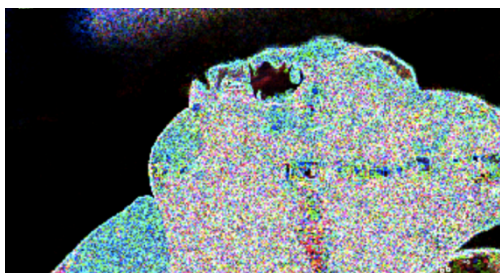


Figure 19 shows a screenshot of how signals from the *Wimote* manipulates one of the parameters of the video (noise).

4.3 PROGRAMMING IN MAX/MSP

The computer software *Max/MSP* [11] allows me to have control of all the components of the performance within a single *Max/MSP* patch, including the recorded sounds, the recorded footage, input from the microphone, the mixers, the *Wimote* and the output for the speakers and the video.

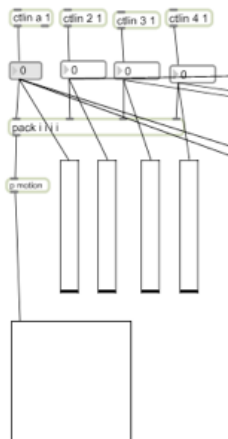


Figure 20 shows a *Max* patch that shows the reception of control data, coming via the *Osculator* application, and into *Max/MSP/Jitter* via the *ctlin* objects. It allows me to monitor the signals coming from the *Wimote*.

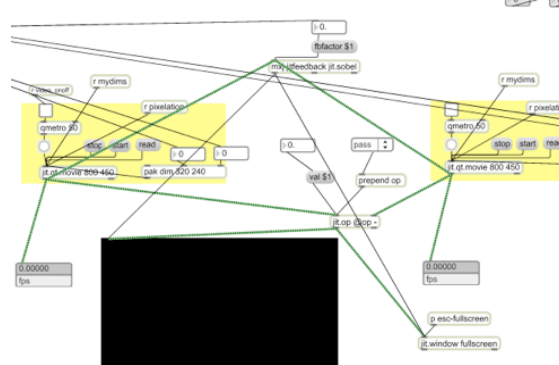


Figure 21 shows part of a video patch that allows signals from the *Wimote* to change parameters of the pre-recorded footage

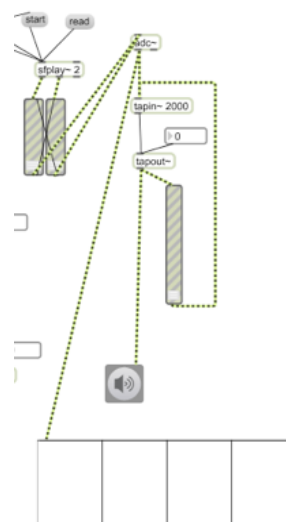
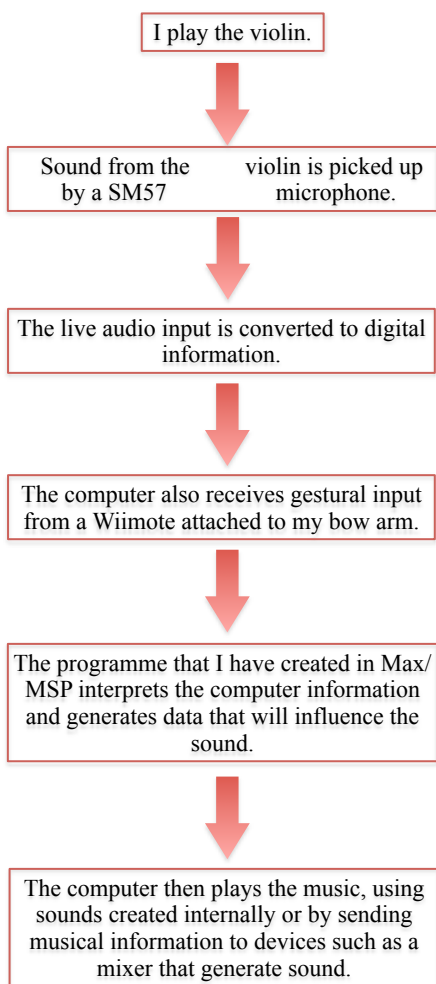


Figure 22 shows part of a sound patch that allows controlling delay-feedback of live sound from the microphone.

5 OVERVIEW OF THE PERFORMANCE SYSTEM

My virtual music instrument system includes a violin, a computer software (*Max/MSP*), a mixer, speakers and a microphone.



Figure

Flowchart of how the system works.

Through the microphone and the mixer, sounds created from the violin would be translated into digital information and sent to the computer. The computer receives the human input. Programmes that I have created in *Max/MSP* interpret the computer information and generate data that will influence the sound. The

computer then plays the sound, using sounds created internally or by sending musical information to devices such as a mixer that generate sound (Winkler, p. 6).

There will be two *Wiimotes* attached to my body. One *Wiimote* will be on my right arm, while the other *Wiimote* will be on my left arm. The *Wiimotes* attached picks up signals of my movement as I am playing the violin. The signals are sent to a computer programme, *OSCulator* [12]. *OSCulator* sends signals from the *Wiimote* to *Max/MSP* and the programme generates data that will influence the pre-recorded footage projected on the screen.

6 OVERVIEW OF THE PERFORMANCE

The performance involves interplay between music, video and movement.

6.1 SOUND

Throughout the performance, the music elements interact with each other, creating harmony at times and conflicting with one another at times. The piece also challenges the conventional way of creating music through violin playing, as the sound output from the speakers is a mix of violin sounds and electronic material that may sound unpleasant for the audience. However, the music composition is didactic in nature. The beginning of the piece is slow and the four different parts of the melody are introduced one by one, such that the audience will gradually discover the elements in the music.

6.2 VISUALS

The video projected on the screen is an abstract display of colours and forms to complement the music. I have filmed and edited a series of abstract footage. This footage will be played together with the pre-recorded sound. The *WiiMotes* attached on my arms capture my arm gestures and the signals sent to the computer changes the various parameters of the footage, such as the pixilation, colours, noise level etc. The orientation and acceleration of my arm movement will affect the amount of changes to the parameters. Therefore, in some parts of the piece, I have stronger and more exaggerated hand movements to increase the drama.

7 DISCUSSION

The initial objective of the project was to create a virtual music instrument and composing a performance. However, the use of new technologies, including a *Wiimote* and an *iPhone* application, has not only extended the possibilities of performing with a violin, but the methods in which I can compose music as well.

In my research, I have come to realise that composition does not have to be the traditional process, where we think of a musical melody and transcribe them onto music scores. In the new technological age, composing for music involves an integration of other media, such as using *Bloom* to compose music on the *iPhone* or using *Pro Tools* for mixing of sounds. With such

softwares, it is much more convenient to compose music and have better control over the different music elements in the composition. One does not even need to be an expert in music to compose music.

Technology is influencing the ways in which composition and performance is possible, and even driving the aesthetics of composition and performance.

Using the Wiimotes in my performance allowed my movement to influence the video projection, such that the gesture of playing the violin is an integral part of the performance. Thus I have not only created a virtual music instrument, but also a new way of musical performance that involves the body movement of the violin player, making the player a part of the musical instrument.

8 CONCLUSION AND FUTURE WORK

I have achieved my objectives in creating a virtual music instrument and composing a performance. I have also used technology to create new ways to perform with a violin.

However, is it possible for a performance to go beyond a planned execution? Can the audience be part of the performance? The performance in my research demonstrates an interaction between the performer and electronics. In future research, I would like increase interactivity between the audience and the performer. One way of achieving this would be to extend the use of the virtual music instrument. For example, I can catch the audience by surprise by inviting one of them to perform a “duet” with me. I can attach one of the *Wiimotes* to their arm and request them to speak or sing into the microphone. The signals from the *Wiimote* will change the video on the screen and my programme in Max/MSP will also process their voice and the signals will be used to create new sounds. The audience will have an opportunity to perform on a virtual music instrument through simple participation. In that case, every performance will be unique as the sound and visuals evolves with the audience’s reaction.

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