



Faculty of Applied and Creative Arts

**ETUDE ON MIXED PIECE COMPOSITION
WITH VIOLIN AND CSOUND**

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Bachelor of Applied Arts with Honours
(Music)
2017

ETUDE ON MIXED PIECE COMPOSITION WITH VIOLIN AND CSOUND

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This project is submitted in partial fulfillment of
the requirements for the degree of Bachelor of Applied Arts with Honors
(Music)

Faculty of Applied and Creative Arts
UNIVERSITI MALAYSIA SARAWAK
2017

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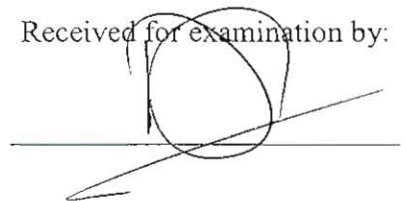
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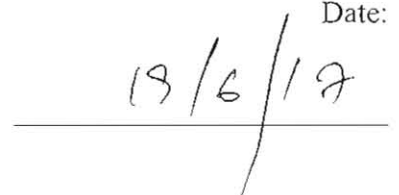
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ACKNOWLEDGEMENT

First and foremost, I have to thank my research supervisor, Prof. Madya Dr. Hasnizam Abdul Wahid. Without his assistance and dedicated involvement in every step throughout the process, this paper would have never been accomplished. I would like to thank you very much for your support and understanding over these process of accomplish this research.

Besides my supervisor, I would like to thank the rest of my thesis committee: Drs. Yoesbar Djaelani, Dr. Thia Sock Siang, Ms. Laura Pranti Tutom, Ms. Ng Sie Ai, Mr. Jurgen Frenz, Mr. Iran Amri Musoddiq, Madam Connie Lim Keh Nie, for their encouragement, insightful comments, and hard questions to help me improve my research.

Most importantly, none of this could have happened without my family. To my parents and my brothers, every time I was ready to quit, you did not let me and I am forever grateful. This thesis stands as a testament to your unconditional love and encouragement.

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ABSTRACT

This research was inspired on curiosity toward Csound and attempt to explore it by specifically on how to synchronise a real-time processing with a musical instrument. This is a case study research. The researcher also wanted to evaluate audiences' interest toward the composed piece. The composition explore the use of Csound software, specifically exploring the “grain opcode” examples. In this work, the researcher explores the notion of sound resulted from Csound language programming and the sense artistic curiosity between aesthetic and technical implications. The methodology used was qualitative and quantitative using questionnaires and reviewed by a group of selected expert panels. The composition are presented in stereo format. The Csound score file and orchestra file are synchronised in a real-time performance with the violinist.

ABSTRACT

Melalui penyelidikan ini, pengkaji menghasilkan sebuah karya muzik yang berbentuk sintesis dengan menggunakan perisian *Csound*, dengan menumpukan khusus kepada penggunaan “*grain opcode*” yang terdapat di dalam perisian *Csound*. Di dalam karya ini juga pengkaji turut meneroka penggunaan fail .arc dan .sc iaitu orkestra dan skor yang terdapat di dalam perisian *Csound*.

TERMINOLOGY

a) Etude:

- A study piece designed to help a performer master specific technical difficulty.

b) Mixed piece:

- A Live instruments or human voice composed with digital sound like synthetic or processed sound, processed sound, or both of it.

c) Csound:

- A sound and music computing system which was originally developed by Barry Vercoe.

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Csound is a very powerful and versatile software synthesis program (Boulanger, 2000). It is widely known as a software and compiled that take the textual instruction in the form of coding instructions and later compiled and converts them into sounds. Mixed piece means live instruments or human voice combines with the digital sounds like a synthetic sound, processed sound, or both of it (Risset, 2003).

Csound considered one of the software tools that can be extensively use to compose computer music. Most of the people are still experimenting on using Csound to compose music. The application of Csound in computer music are quite common in the western country as compare to Malaysia. In the West, we have known lots of the experiment in performing a mixed piece on music instruments with Csound.

At present, according to Boulanger (2000), composers are experimenting on how Csound can emulates modern orchestra instrument so that the sound it produces will be more nature, not flat, dull, and inexpressive when they combine the real music instrument and perform in real-time (Boulanger, 2000). In this research, the researcher will be focusing on producing a mixed piece composition by using Csound and a violin to explore the notion of the sound domain approach in the composition as well as the scoring technique.

1.2 Research Scope

This research will be conducted by adapting a Csound module, study the coding language in the “grain opcode” in Csound and composed a piece with violin as the principle instrument, with present live synthesized sound.

1.3 Statement of the Problem

Combination of synthesized sound and scoring in sound domain are technically and aesthetically subjective.

1.4 Research Objectives

The aim of this research is to explore the Csound score file and orchestra file and synchronize it during real-time performance. As well as to enhance intended composer’s aim to the audience receptions of sound domain composition. The researcher will also investigate awareness and understanding of the composed piece, particularly in a form of a mixed piece composition.

1.5 Importance of Research

The importance of this research is to give an idea to the audience about what is mixed piece. This research can help in test the audiences’ acceptance toward the sound domain composition. It also help in trigger the sensitivity of listening and imagination when the audience listens to the piece and guessing the sources of the sounds.

1.7 Literature Review

Csound

Thompson (2001) stated that for creative computer musicians, Csound is an important tool for them to compose their music. Csound is a sound renderer where it converts a text-based instruction into object code (Boulanger, 2000). According to Hearon (2014), it is also a modular software synthesiser which contains specialised modules, opcodes, and different variable types to operate as input and output variable for opcodes to control instruments (Hearon, 2014). Nowadays, there are people who use Csound to create different kinds of music. According to Vercoe and Ellis (1990), Csound can also be used to perform music in real-time where spectral analysis of live audio and the evolutions of synthesised voices can be controlled by the pitch or spectral content (Vercoe & Ellis, 1990). The outcome of sounds will be based on the score and orchestra files inside the Csound. Covert (2005) stated that Csound has the flexibility and efficiency in audio processing, but it is not completely suited for the higher level of general programming tasks.

In order to work with Csound, the researcher needs to understand the Csound language. Gogins (2006) stated that Csound is extremely capable of high-definition audio because by using floating-point samples, it can transmit to any number of channels, at any sampling rate. Csound not only could work by itself, it also can work with other software like Python, C++, Graphical user interface (GUI), Max/MSP to help the computer music composer more easy to compose music (Gogins, 2006).

According to Boulanger (1991), orchestra file used to create Csound instrument, and a separate score file is written with the list of notes to play. Csound instrument and the notes are created using a standard word processor (Boulanger, 1991). He also stated that, when a

specific orchestra and score run by Csound, the score will drive the orchestra by telling the specific instruments when to start to play and its duration, and during the course of each note event, what parameters are needed.

Boulangier (1991) stated that, in Csound, there are two main parts in the orchestra file which are the header section and instrument section. The header section is where the user can define the sample rate, control rate, and number of output channels. Whereby the instruments are designed in the instrument section.

Federico (2016) demonstrated his work on convolution as can be seen on YouTube¹, using Csound in real-time by playing different instruments. The first example was playing the “Bağlama”, which is a string folk instrument from Turkey. The signal was received by hardware then sends to the Csound and combines with the sound of the Tampura, a string instrument from India. The piece gives the illusion to the audience that there are two instruments playing at the same time. Another video title “Csound from Dr. Boulangier Labs”, on YouTube² by Jang (2013) demonstrated, how the sounds of string instrument are being altered by using Csound. In the video, the sounds of the string instrument are being altered by using iPad with the Csound controller. When the audio signal of the string instruments was being received by the Csound controller of the iPad, the composer manipulate the sound in real-time.

¹ <https://www.youtube.com/watch?v=B8vCLtGxgEk>

² <https://www.youtube.com/watch?v=uQCTIodkb-s>



Figure 1: Bağlama, photo from online magazine - The Bağlama: More Than Just An Instrument by Güneş (2016)



Figure 2: Tamera, photo adapted from eBook – Teaching Music to Children: A Curriculum Guide for Teachers Without Music Training by Bielawski (2010)

Ervik and Brandsegg (2011) stated that granular synthesis are available as a sound manipulating and sound generating technique. Both of them mentioned that it generates sound based on the additive combination of many very short sonic grains into the larger acoustical event. According to Opie (1999), sonic grain has a very short duration and as a single entity would seem very insignificant, but once the grain becomes part of a granular population, the sound wave and envelope makes a big difference to the sound. Ervik and Brandsegg (2011) also stated that this synthesis has vast expressive possibilities outcome by controlling the time and frequency domain.

Grain rate, grain envelope, grain duration, grain pitch and the waveform inside each grain are some basic examples of granular synthesis parameter (Ervik and Brandsegg, 2011). According to Kholomiov (2016), grain rate is the speed of grain production in Hz. If it is in the audio range, we can no longer perceive the original pitch of the file (Kholomiov, 2016). Then the pitch is determined by grain rate value (Kholomiov, 2016). Grain envelope, which is an envelope which determine the duration, and the amplitude of the grain. "The envelope can be any shape" (Lee, 1995). Grain duration is the time taken for one grain (Smaragdis, 1997). Grain pitch is the frequency of the grain (Smaragdis, 1997).

Ervik and Bradsegg (2011) stated that in a live performance or as a plug-in in a DAW (digital audio workstation), granular synthesis can act as an audio effect in real-time. According to Ervik and Bradsegg (2011), the most common technique of this synthesis is the grain delay effect, which is according to them, it is similar to the classic delay effect in delaying the incoming signal, with the parameters its delay time, feedback amount and dry/wet amount. "Dry", according to Hass (2013) are the original signals and "wet" are the "effected" signals. However, Ervik and Bradsegg (2011) also mentioned that, there still have some difference between the grain delay and the classic delay effect, this is where it is the

possible to “chop” the delay signal into grains and use granular synthesis parameter such as grain pitch, grain rate and grain duration. Grain delay as described by Sasso (2012), performs simple process, where it took samples from incoming audio in small chunks, called grains, and emits each grain after a delay whose time can be set in milliseconds or sync to tempo (Sasso, 2012). According to Ervik and Bradsegg (2011), it can sound like a reverb effect if the parameters of this kind of delay effects are adjusted correctly.

Ervik and Bradsegg (2011) stated that there are some conceptual problems with the idea of time stretching in real-time, according to them after the instrument is starts, it cannot produce a sound like a reverb effect if the time between the playback position of the original signal and the playback position of the stretched signal is large. According to Ervik and Bradsegg (2011), the solution is to use several buffers for storage and several instances of the time stretch the instrument simultaneously. Buffer is where data are stored for a short amount of time, typically in the computer’s memory (RAM) (Christensson, 2006). Christensson (2006) stated that the purpose of a buffer is to hold data right before it is used. The Csound “Schedkwhen opcode” can help to trigger a Csound instrument to record incoming sound to a buffer which also can be used to start a granulation process of the recorded sound (Ervik and Bradsegg, 2011). “Schedkwhen” mean a new score event was added when generated by a k-rate trigger (Ekman, n.d.). Granulation process is the process of forming grains (Granulation, 2010).

CHAPTER 2

RESEARCH METHODOLOGY

2.0 Introduction

Content analysis is a method used to quantify the qualitative data collected, a researcher normally will “systematically word through each transcript assigning codes, which may be numbers or words, to specific the characteristics within the text” (Ahmad & Usop, 2011). This research is a case study research where the researcher will only focus on the “grain opcode” from the score and orchestra files, from the Csound and both will be analyse through content analysis. Purposive sampling will be carried out by select three pieces from Iain McCurdy, which are “Grain”, “Grain2”, and “Grain3” as the basis for primary data collection.

Qualitative methodology and quantitative methodology are used to collect data for this research. Whereby, the qualitative methodology will be carried out through interviewing two experts⁴ who has the experience working with Csound to help me to go through the programming in Csound. Three expert panels also will be involved to validate my research. The quantitative methodology will be carried out through questionnaire.

Comments and ideas gathered from the expert panel will be used to validate the piece composed. All the comments received will be compared to the data collected during the audience’s feedback during the concert.

⁴The author wish to acknowledge Iain McCurdy for advice and discussion on the orchestra and the score file for the project.