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Electronic String Quartet #1

A Composition
Presented to the Graduate Division of the
Mary Pappert School of Music
of Duquesne University

As a partial fulfillment for the degree
of Master of Music Technology

By
Ted Smoker
May, 2005

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DEGREE: Master of Music Technology
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Abstract

Electronic String Quartet #1 by Ted Smoker incorporates the expressiveness of live string performance with the sonic capabilities of music technology through the use of effects processing. This piece incorporates pitch set theory, polytonality, Lydian and Phrygian church modes, microtonal pitch sweeps, and percussive effects. The effects used in the Electronic String Quartet #1 are reverb, delay with tempo control, tube-amplifier distortion, and flanger or filter sweep generator. It is intended to be played by five performers, string instrumentalists and sound engineer. A notation for the effects was invented to provide a clear, simple, and precise system for manipulating the effects in real-time.

Performance Notes





Instrumentation

Violin 1
Violin 2
Viola
Cello

Technological Considerations

Electronic String Quartet #1 is written for strings with electronic processed effects. It was written with the intention that a sound engineer would perform the effects from a mixer console while the instrumentalists perform with pickup microphones. This situation is ideal, but it is possible to perform this without an engineer by choosing moderate settings as appropriate. For more adventurous ensembles, it is possible to perform with “stomp-boxes” usually associated with electric guitarists.

The effects are notated on a scale of 0 to 5, where 0 is off, and 5 is the maximum. As for the delay effect, 5 would indicate unending feedback. The effects are indicated using the following shapes:

-  Reverb amount
-  Delay feedback amount
-  Distortion gain
-  Other effects

The delay should approximate the tempo of the movement. In the first movement it should be set to the eighth note triplet, around 260 milliseconds. In the second movement it should approximate the quarter-note, around 800 milliseconds. In the third movement the time should be set to the eighth note, around 210 milliseconds.

The distortion should resemble a basic tube amp distortion effect. It is possible to expand on this with a flange or phase effect in order to produce a distinctive sound. This is especially true in the first movement in which the closing phrase should remind the listener of the distinctive opening motif.

The “other effects” indication refers to the first and third movements. In the first movement, any type of automated filter sweep effect should be used. The modulation source should be a sine wave with a period of one measure in length, around (approximately 3 seconds). In the third movement a flanging effect should be used.

Performance Techniques

In the second movement the x-note shapes indicate a percussive effect. The instrumentalist should hit the strings sharply with the hair of the bow, so as to produce an un-pitched, short noise.

The violin 1 part in the second movement includes a pitch sweep. The violinist should attempt to approximate the curve, within the range of about an octave.

Electronic String Quartet #1

movement 1

Ted Smoker

♩ = 80

Violin 1

Violin 2

Viola

Cello

3 3

5

5

0 2 2

0 4

mp *f* *mp* *mp*

mf *mp* *mf* *mp*

f *mp* *mf*

mp *mf*

8va *Rough* *8va*

legato *3* *3* *3*

3

6

Vln. I

Vln. II

Vla.

Vc.

p *f* *ff*

mp *mf* *mp* *mf* *mf* *ff*

mp *mf* *mp* *mf* *f* *ff*

mp *mf* *mp* *mf* *mp* *ff*

dolce *dolce*

3 *3*

8va

Musical score for measures 13-17. The score is for a string quartet with parts for Violin I (Vln. I), Violin II (Vln. II), Viola (Vla.), and Violoncello (Vc.).

- Measure 13:** Vln. I has a circled '1' and a circled '4'. Vln. II has a circled '1' and a circled '4'. Vla. has a circled '1' and a circled '4'. Vc. has a circled '2' and a circled '5'. All parts are marked *p*.
- Measure 14:** Similar to measure 13, all parts are marked *p*.
- Measure 15:** Similar to measure 13, all parts are marked *p*.
- Measure 16:** Similar to measure 13, all parts are marked *p*.
- Measure 17:** Vln. I has a circled '4' and a circled '4'. Vln. II has a circled '4' and a circled '4'. Vla. has a circled '4' and a circled '4'. Vc. has a circled '4' and a circled '4'. Vln. I is marked *mp*, Vln. II is marked *p*, and Vc. is marked *mp*.

Musical score for measures 18-22. The score is for a string quartet with parts for Violin I (Vln. I), Violin II (Vln. II), Viola (Vla.), and Violoncello (Vc.).

- Measure 18:** Vln. I has a circled '0' and a circled '4'. Vln. II has a circled '3' and a circled '0'. Vla. has a circled '0' and a circled '4'. Vc. has a circled '3' and a circled '0'. Vln. I is marked *legato*, Vln. II is marked *pizz. p*, Vla. is marked *pizz. p*, and Vc. is marked *pizz. p*.
- Measure 19:** Vln. I is marked *sub. f*, Vln. II is marked *pizz. p*, Vla. is marked *pizz. p*, and Vc. is marked *pizz. p*.
- Measure 20:** Vln. I is marked *sub. f*, Vln. II is marked *sub. f*, Vla. is marked *mf*, and Vc. is marked *mf*.
- Measure 21:** Vln. I is marked *sub. f*, Vln. II is marked *sub. f*, Vla. is marked *p*, and Vc. is marked *mf*.
- Measure 22:** Vln. I is marked *sub. f*, Vln. II is marked *p*, Vla. is marked *p*, and Vc. is marked *p*.

24

Vln. I

Vln. II

Vla.

Vc.

mf

29

Vln. I

Vln. II

Vla.

Vc.

mf

pizz.

mf

p

pizz.

arco

35

Vln. I

Vln. II

Vla.

Vc.

2

5

f *mp*

f *mp*

mf

*mf*³ *f* *mp*

*mf*³ *f* *mp*

*mf*³

mf *f* *mp*

mf *f* *mp*

mf

mf *f* *mp*

mf *f* *mp*

mf

42

Vln. I

Vln. II

Vla.

Vc.

1

2

4

4

f *p*

f *p*

mf *pizz.*

mf *pizz.*

arco mp

f

mf *pizz.*

arco mp

pizz. *mf*

expressivo

arco f

47

Vln. I

Vln. II

Vla.

Vc.

mf *pizz.* *f* *mp* *f* *mp* *mf* *mp* *mf*

53

Vln. I

Vln. II

Vla.

Vc.

f (*pizz.*) *mp* *mf* *mf* *f* *mf* *f* *mf* *f*

59

Vln. I

Vln. II

Vla.

Vc.

pizz. *mf*

arco *f*

arco *mp f*

pizz. *mf*

arco *mf*

2 2

3 3

3 3

Detailed description: This system contains measures 59 through 63. The first violin (Vln. I) part begins at measure 59 with a pizzicato (*mf*) triplet. The second violin (Vln. II) part starts at measure 60 with an arco (*f*) triplet. The viola (Vla.) part starts at measure 60 with an arco (*mp f*) triplet. The cello (Vc.) part starts at measure 59 with a pizzicato (*mf*) triplet. Measure 63 ends with an arco (*mf*) triplet in the cello. Rehearsal marks are indicated by boxed numbers 2 and 2 above the first violin staff, and boxed numbers 3 and 3 above the second violin and viola staves.

64

Vln. I

Vln. II

Vla.

Vc.

arco *f*

pizz.

arco *f*

3 3

3 3

Detailed description: This system contains measures 64 through 68. The first violin (Vln. I) part starts at measure 64 with an arco (*f*) triplet. The second violin (Vln. II) part starts at measure 64 with a triplet. The viola (Vla.) part starts at measure 64 with a pizzicato triplet. The cello (Vc.) part starts at measure 64 with a triplet. Measure 68 ends with an arco (*f*) triplet in the viola. Rehearsal marks are indicated by boxed numbers 3 and 3 above the first violin staff, and boxed numbers 3 and 3 above the cello staff.

70

Vln. I

Vln. II

Vla.

Vc.

rit.

mp

f

2 2

2 2

4 2 2

2 2

Electronic String Quartet #1

movement 2

Ted Smoker

Violin I: $\bullet = 75$, $\textcircled{4}$ $\square{4}$, *p*, *f*, *p*, *f*

Violin II: $\textcircled{2}$ $\square{2}$ $\triangle{5}$, *mf*, *pizz.*, *arco f*, *mp*, *f*

Viola: $\square{2}$, *mf*, *mp*, *f*

Cello: $\textcircled{2}$ $\triangle{2}$, *f*, *p*, *f*, *pizz.*, *arco*, *pizz.*, *arco f*, *pizz.*

Vln. I: $\textcircled{5}$, *p*, *f*, *p*, *f*, \square{A} *p*, *p*

Vln. II: *mf*, *pizz.*, *arco f*, *mp*, *f*, *f*, $\triangle{0}$, $\textcircled{3}$, *p*

Vla.: *f*, *mf*, *mp*, *f*, *f*, $\textcircled{3}$, *p*, *sul tasto*

Vc.: *f*, *arco*, *p*, *f*, *pizz.*, *arco*, *pizz.*, *f*, *arco*, *pizz.*, $\textcircled{3}$, *p*, *sul tasto*

Musical score for Vln. I, Vln. II, Vla., and Vc. from measure 11 to 17. The score includes dynamic markings (*p*, *f*, *mf*, *mp*), articulation (*pizz.*, *arco*), and fingering (circled numbers 2, 4, 5, 0). A box labeled 'B' is present above the Vln. I staff at measure 14. The Vln. II staff includes a triangle symbol at measure 14. The Vc. staff includes a triangle symbol at measure 14.

Musical score for Vln. I, Vln. II, Vla., and Vc. from measure 18 to 24. The score includes dynamic markings (*f*, *p*, *mf*, *mp*), articulation (*pizz.*, *arco*), and fingering (circled numbers 3). The Vln. I staff includes a box labeled 'B' above measure 19. The Vln. II staff includes a triangle symbol above measure 19. The Vc. staff includes a triangle symbol above measure 19.

Musical score for measures 22-29. The score is for four parts: Vln. I, Vln. II, Vla., and Vc. The key signature is one flat (B-flat major/D minor) and the time signature is 4/4. Measure numbers 22, 23, 24, 25, 26, 27, 28, and 29 are indicated. Performance markings include dynamics: *p*, *mp*, *sub.mp*, and *mf*. Fingerings are indicated by circled numbers (0, 4, 2) and boxed numbers (C, 4, 0, 2, 2). A triangle symbol is present in measure 23. The Vc. part includes a *sub.mp* marking in measure 22 and a *mf* marking in measure 24.

Musical score for measures 30-33. The score is for four parts: Vln. I, Vln. II, Vla., and Vc. The key signature is one flat (B-flat major/D minor) and the time signature is 4/4. Measure numbers 30, 31, 32, and 33 are indicated. Performance markings include dynamics: *mf*, *f*, *p*, and *mp*. Fingerings are indicated by boxed numbers (2, 2) and circled numbers (2). The word "legato" is written above the Vln. II, Vla., and Vc. parts in measure 32. The Vln. I part has a *mf* marking in measure 30, a *f* marking in measure 31, and a *mp* marking in measure 32. The Vln. II part has a *mf* marking in measure 30 and a *p* marking in measure 31. The Vla. part has a *mf* marking in measure 30 and a *p* marking in measure 31. The Vc. part has a *p* marking in measure 31 and a *mf* marking in measure 32.

Musical score for strings (Vln. I, Vln. II, Vla., Vc.) from measures 35 to 40. The score is in 4/4 time and features dynamic markings (mf, f, p, mp) and fingering instructions (5, 2) in circles and squares. Measure 35 starts with a *mf* dynamic. Measure 36 has a *f* dynamic. Measure 37 has a *mf* dynamic. Measure 38 has a *p* dynamic. Measure 39 has a *mp* dynamic. Measure 40 has a *mf* dynamic. The strings play a rhythmic pattern of eighth notes with various articulations and dynamics.

Musical score for strings (Vln. I, Vln. II, Vla., Vc.) from measures 40 to 45. The score is in 4/4 time and features dynamic markings (p, mf, f, mp) and fingering instructions (3, 5, 2) in circles and squares. Measure 40 starts with a *p* dynamic. Measure 41 has a *mf* dynamic. Measure 42 has a *f* dynamic. Measure 43 has a *f* dynamic. Measure 44 has a *p* dynamic. Measure 45 has a *mp* dynamic. The strings play a rhythmic pattern of eighth notes with various articulations and dynamics. Measure 42 includes a *pizz.* marking and a *f* dynamic. Measure 44 includes a *f* dynamic and a *pizz.* marking. Measure 45 includes a *pizz.* marking and a *arco* marking.

46

Vln. I

Vln. II

Vla.

Vc.

f

p

ff

arco

pizz.

4

3

3

3

Electronic String Quartet #1

movement 3

Ted Smoker

4 $\bullet = 140$

Violin I *mp*

Violin II *mp* 3

Viola *mp* 2

Cello *mp* 2

8 Vln. I *mp* 3 A *mf* 5

Vln. II

Vla.

Vc.

Detailed description: This is a musical score for a string quartet. It consists of two systems of four staves each. The first system includes Violin I, Violin II, Viola, and Cello. The second system includes Violin I, Violin II, Viola, and Cello. The score is in 4/4 time with a tempo of quarter note = 140. The first system starts with a boxed number '4' and a tempo marking. Violin I has a melodic line with accents and a dynamic of *mp*. Violin II, Viola, and Cello have accompaniment patterns, with boxed numbers '3' and '2' respectively. The second system starts with a measure rest of 8 measures. Violin I has a melodic line with accents and a dynamic of *mp*, leading to a phrase marked 'A' with a boxed '3' and a dynamic of *mf*. Violin II, Viola, and Cello continue their accompaniment patterns.

Musical score for measures 15-21. The score is for four parts: Vln. I, Vln. II, Vla., and Vc. The key signature has one flat (B-flat). Measure 15 starts with a treble clef and a *mp* dynamic. Measure 16 has a circled '4' above it, indicating a fourth measure rest, with a *legato* marking and a *mf* dynamic. Measure 17 has a *f* dynamic. Measure 18 has a *mf* dynamic. Measure 19 has a *f* dynamic. Measure 20 has a *mf* dynamic. Measure 21 has a circled '0' above it, indicating a whole measure rest, with a *mp* dynamic. The time signature changes from 2/4 to 3/4 between measures 18 and 19, and back to 2/4 between measures 20 and 21. Dynamics include *mp*, *mf*, and *f*. Markings include *legato*, *mf*, *f*, and *mp*.

Musical score for measures 22-28. The score is for four parts: Vln. I, Vln. II, Vla., and Vc. Measure 22 starts with a treble clef and a *mp* dynamic. Measure 23 has a circled '4' above it, indicating a fourth measure rest, with a *mf* dynamic. Measure 24 has a *mf* dynamic. Measure 25 has a *f* dynamic. Measure 26 has a *mf* dynamic. Measure 27 has a *f* dynamic. Measure 28 has a *mf* dynamic. The time signature changes from 2/4 to 3/4 between measures 25 and 26, and back to 2/4 between measures 27 and 28. Dynamics include *mp*, *mf*, and *f*. Markings include *legato*, *mf*, and *f*.

Musical score for measures 29-35. The score is for four parts: Vln. I, Vln. II, Vla., and Vc. The time signature changes from 2/4 to 4/4 at measure 31. A circled '0' is above measure 31. Dynamics include *mf*, *mp*, and *mp* with a 5-measure slur. There are also accents and hairpins throughout.

Musical score for measures 36-42. The score is for four parts: Vln. I, Vln. II, Vla., and Vc. The time signature is 4/4. A boxed 'B' is above measure 36. A circled '4' with 'legato' is above measure 37. Dynamics include *mf*, *p*, and *mf*. There are triplets and slurs throughout.

Musical score for measures 44-50, featuring Vln. I, Vln. II, Vla., and Vc. parts. The score includes fingerings (0, 4, 2) and dynamics (mp, mf, p).

Vln. I: Measures 44-50. Fingerings: 0, 4, 2. Dynamics: *mp*, *mf*, *p*. Includes slurs and triplets.

Vln. II: Measures 44-50. Fingerings: 0, 4, 2. Dynamics: *mp*, *p*, *mf*. Includes slurs and triplets.

Vla.: Measures 44-50. Fingerings: 0, 4, 3. Dynamics: *mp*, *mp*. Includes slurs and triplets.

Vc.: Measures 44-50. Dynamics: *mp*. Includes slurs and triplets.

Musical score for measures 51-57, featuring Vln. I, Vln. II, Vla., and Vc. parts. The score includes dynamics (mf) and the instruction *poco a poco crescendo*.

Vln. I: Measures 51-57. Dynamics: *mf*, *poco a poco crescendo*. Includes slurs and triplets.

Vln. II: Measures 51-57. Dynamics: *mf*, *poco a poco crescendo*. Includes slurs and triplets.

Vla.: Measures 51-57. Dynamics: *mf*, *poco a poco crescendo*. Includes slurs and triplets.

Vc.: Measures 51-57. Dynamics: *mf*. Includes slurs and triplets.

Musical score for measures 58-64. The score is for four parts: Vln. I, Vln. II, Vla., and Vc. The key signature has two flats (B-flat and E-flat). Measure 58 starts with a forte (*f*) dynamic. The first three measures feature triplets in all parts. Measure 60 contains a circled 'C' above the Vln. I staff. Measure 61 contains circled '0' and circled '0' above the Vln. I and Vln. II staves, and circled '0' and circled '0' above the Vla. staff. Measure 62 contains circled '0', circled '2', and circled '0' above the Vc. staff. Measure 63 contains circled '0' and circled '0' above the Vln. I and Vln. II staves, and circled '0' and circled '0' above the Vla. staff. Measure 64 contains circled '0' and circled '0' above the Vln. I and Vln. II staves, and circled '0' and circled '0' above the Vla. staff. The Vc. part in measure 64 is marked *subito p*.

Musical score for measures 65-71. The score is for four parts: Vln. I, Vln. II, Vla., and Vc. Measure 65 starts with a mezzo-piano (*mp*) dynamic. The first three measures feature a *poco a poco crescendo* in all parts. Measure 66 contains a circled '3' above the Vln. I staff. Measure 67 contains circled '2' above the Vln. II staff. Measure 68 contains circled '2' above the Vla. staff. Measure 69 contains circled '2' above the Vc. staff. Measure 70 contains circled '2' above the Vln. II staff. Measure 71 contains circled '2' above the Vla. staff. The Vc. part in measure 71 is marked *mp poco a poco crescendo*.

Musical score for measures 72-77 of Electronic String Quartet #1 - Movement 3. The score is for four string instruments: Violin I (Vln. I), Violin II (Vln. II), Viola (Vla.), and Violoncello (Vc.).

- Measure 72:** Vln. I has a slur over a sixteenth-note run with a '5' below it. Vln. II, Vla., and Vc. play quarter notes.
- Measure 73:** Vln. I has a rest. Vln. II, Vla., and Vc. play quarter notes.
- Measure 74:** Vln. I has a rest. Vln. II, Vla., and Vc. play quarter notes.
- Measure 75:** Vln. I has a rest. Vln. II, Vla., and Vc. play quarter notes.
- Measure 76:** Vln. I has a rest. Vln. II, Vla., and Vc. play quarter notes.
- Measure 77:** Vln. I has a rest. Vln. II, Vla., and Vc. play quarter notes.

Dynamic markings: *f* (forte) is marked in measures 75 and 76 for all instruments. *mp* (mezzo-piano) is marked in measure 77 for all instruments. A first ending bracket labeled '1' spans measures 77-78.

Musical score for measures 78-83 of Electronic String Quartet #1 - Movement 3. The score is for four string instruments: Violin I (Vln. I), Violin II (Vln. II), Viola (Vla.), and Violoncello (Vc.).

- Measure 78:** Vln. I has a slur over a sixteenth-note run. Vln. II, Vla., and Vc. play quarter notes.
- Measure 79:** Vln. I has a slur over a sixteenth-note run. Vln. II, Vla., and Vc. play quarter notes.
- Measure 80:** Vln. I has a slur over a sixteenth-note run. Vln. II, Vla., and Vc. play quarter notes.
- Measure 81:** Vln. I has a slur over a sixteenth-note run. Vln. II, Vla., and Vc. play quarter notes.
- Measure 82:** Vln. I has a slur over a sixteenth-note run. Vln. II, Vla., and Vc. play quarter notes.
- Measure 83:** Vln. I has a slur over a sixteenth-note run with a 'Glissando' marking. Vln. II, Vla., and Vc. play quarter notes.

Dynamic markings: *f* (forte) is marked in measures 80-82 for all instruments. *ff* (fortissimo) is marked in measure 83 for all instruments. A circled '4' is present in measure 83 for Vln. I, Vln. II, Vla., and Vc.

Analysis Paper

Introduction

Electronic String Quartet #1 is a three-movement work written in partial fulfillment for a Master of Music Technology Degree at Duquesne University. Music technology is an important part of this composition, from the ideas that influenced its conception to the means of its performance. This paper will analyze important aspects of the work and discuss the role of technology in its inception and production.

Technological Aspects

As a result of composing music in a digital medium I have grown accustomed to not only adding effects such as reverb and delay to my music, but also incorporating them integrally in my writing. The goal of Electronic String Quartet #1 was to include these sonic possibilities in an artistic composition for string musicians. Issues arise, however when one attempts to transfer digital recording techniques to live performance. Unlike in a live performance, the atmosphere of the recording studio provides the luxury of working with the material in fine detail. The engineer is able to rewind, pin-point an opportunity for modification, and preview many possibilities before printing the mix. In live performance there is no rewind button; the performance is mixed, mastered, and printed simultaneously.

Another limitation arises when considering dynamic changes in the effects processing. It was my desire to use the technology expressively, controlling it in real-time instead of making a setting and leaving it unchanged for the duration of the performance. However, asking string

musicians to control effects pedals and processors seems implausible knowing that the equipment would be new to most string instrumentalists, if available at all. Furthermore, it would be infeasible to add the task of controlling this equipment to the otherwise intensive concentration required to perform as a quartet. Simplifying or limiting the music in order to facilitate the equipment would be contradictory to the goal of the composition.

The solution to combining quality live performance with dynamic effects processing was brought about in part by the forward-thinking practices of Kronos Quartet. Kronos is a string quartet that has embraced and explored the possibilities of technology in live performance. In his article reviewing a Kronos performance in Ithaca, New York, Paul Lehrman interviewed Scott Fraser, the sound engineer of the ensemble. In many cases it is his responsibility as the “fifth performer” to manipulate the effects processing while the instrumentalists concentrate on their part in the performance (Lehrman 2005).

Electronic String Quartet #1 is intended for a situation like this in which the sound engineer is a vital part of the performance. As a result of the fifth performer, this piece has been written in its full form, without modification to accommodate the technology. The instrumentalists are able to perform instruments they are accustomed to, allowing them to concentrate on performing the music artistically while the effects are controlled responsively and expressively.

Movement 1

The first movement revolves around a four-note pitch set of D-sharp, E, F, and F-sharp



Figure 1. Motif A

referenced as pitch-set A and seen in figure 1. The set is played in

measure 36 to the second occurrence of the quasi-cluster in measure 40. This second and final appearance of the four pitches played simultaneously is expanded through the use of a lower tri-tone in the upper three voices.

The third section is characterized by the repetition of a three-measure canon in the lower voices while the violin 1 plays a melody that, for a variety of reasons, seems out of place. The most apparent cause of this is that it seems distant and somewhat otherworldly as a result of the reverb and delay effects. It also introduces the third pitch set, incorporating all the tones of the chromatic scale. Finally, through a series of “interruptions” in the canon, the violinist seems like an outsider eager to join an exclusive conversation.

The abrupt interruptions of sound are influenced by a technique of music technology – the art of turntable manipulation by hip-hop DJ artists. By stopping and starting a pair of phonograph turntables, DJ’s blend smoothly the sound of two distinct recordings. This style has been revisited using digital techniques, such as that of the compositions of BT.

The section eventually disintegrates into a legato fugue of pitch–set C. As before, the section ends with an augmentation and finally three of the four notes of the opening motif are played to finish the piece.

Movement 2

“The more intense a sound or texture is, the less you can endure it over a period of time.”

This quote by Rimsky Korsakov inspired the second movement of the Electronic String Quartet #1. The movement opens with only three measures of a densely-packed texture. This intense segment, incorporating a wide variety of sounds and phrases incorporating all of the instruments is repeated in its entirety at various points throughout the movement. The complicated nature of this brief section is enhanced by the use of digital effects. Although foreign and difficult to comprehend at first, this section possibly becomes the most anticipated part of the movement.

The repeated use of a very short segment hints at one common trend in music technology sometimes called loop recording. This technique, born from the digital age and more recently popularized by Apple Computer’s “Garage Band,” consists of segments of recorded material that are recycled and mixed creatively to form a new piece of music.

The opening three measures will be referred to as the A section which is printed in its entirety below (figure 4). This section contains an incredible variety in rhythm, dynamics, tessitura, and playing techniques. One notable motif appears at the end of the first measure. This motif

The musical score for Section A is presented in four staves: Violin I, Violin II, Viola, and Cello. The tempo is marked as quarter note = 75. The score is in 4/4 time and consists of three measures. The first measure features a complex texture with various dynamics and playing techniques. The second measure continues this texture with different articulations. The third measure concludes the section with a final motif. The score includes dynamic markings such as *p*, *f*, *mf*, *mp*, and *f*, as well as playing techniques like *pizz.* (pizzicato) and *arco* (arco). The Violin I part starts with a *p* dynamic and a *f* dynamic. The Violin II part starts with a *mf* dynamic and a *pizz.* marking. The Viola part starts with a *mf* dynamic and a *mp* dynamic. The Cello part starts with a *f* dynamic and a *p* dynamic.

Figure 4, Section A

consists of ascending sixteenth notes in parallel motion and is used often throughout the movement. Another prominent feature of the A section is the quintuplet motif found in the second measure.

After repeating the first three measures, the music moves to the contrasting B section. This section is played *sul tasto* (on the fingerboard) and is characterized by sustained whole notes. The section begins on open fifths of D and A and resolves to an E-flat major seventh chord with the fifth in the bass.

Section A is again repeated twice in measures 16 through 22 before section C begins. This is by far the longest and most harmonically functional section of this movement. The tonal center is at first obscured by the heavy use of quartal chords, but eventually the harmony clearly points to the F Lydian mode. In a number of occasions the tri-tone above the root is used in what could otherwise be identified as a major triad as seen in figure 5. Though some might analyze this as a sharp eleventh chord, I prefer to think of it as a sort of Lydian triad because of its distinctive modal sound. Examples of this chord appear in measures 29, 33, 35, 38, 39, and 40.



Figure 5, Lydian chord

A progression of Lydian tonicizations descends through the circle of fifths in measures 32-41. During this time the opening of section A is briefly quoted. The progression of tonal centers would predictably lead to a C-flat Lydian in measure 41, but instead the cello produces a false

cadence with an unexpected B-flat, seen in figure 6. After a short transition, the opening A section is at last repeated to end the movement.

The image shows a musical score for four instruments: Violin I (Vln. I), Violin II (Vln. II), Viola (Vla.), and Cello (Vc.). The score is for measures 39 through 41. Measure 39 is marked with a '3' over a triplet of eighth notes. Measure 40 is marked with 'rit.' and a '3' over a triplet of eighth notes. Measure 41 is marked with 'p' for piano. The key signature has one flat (B-flat). The dynamics for Vln. I and Vln. II are 'p' and 'mf' respectively. The dynamics for Vla. and Vc. are 'mf' and 'p' respectively.

Figure 6, False Cadence

Movement 3

Movement 3 is a sort of dance movement comprised of a parallel ostinato played by the lower three instruments and percussive effects added by the violin and delay effects processor. After the opening introduction, phrase A is stated by the violin in the key of B-flat juxtaposed against the E Phrygian ostinato. The second phrase of the period is in C Major and is accompanied by parallel major triads running in scalar motion. This second phrase contrasts the steady metrical dance rhythm of the other phrase by colliding duple and triple rhythms in succession.

The period is repeated three times, each time the ostinato is modulated up a whole step. The second section develops phrase B through augmentation and modulation. This section explores a number of major key centers, including C, D-flat, B-flat, A-flat, G-flat, and culminates with the entrance of the cello in the key of E-flat. After establishing this key, the piece quickly reverts

back to the opening ostinato in E Phrygian, which modulates rapidly and builds to a dramatic close through the use of irregular eighth-note rhythms.

Conclusion

Electronic String Quartet #1 is a true integration of technology with artistry both in its inception and its production. The merits of this piece do not rest solely on the fact that it has incorporated technology, nor is the piece complete without the intended technology. Music technology is and will continue to have a paradigmatic influence on the history of music theory. It is my hope that this piece will be one contribution to that end.

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