

# SUFFICIENCY PROJECT TITLE PAGE

## An Electronic Music Composition

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Sufficiency Course Sequence:

Course Number	Course Title	Term
MU1611	Fundamentals of Music I	A99
MU2611	Fundamentals of Music II	B99
MU3611	Computer Techniques in Music	A00
MU3613	Digital Sound Design	B00
MU3612	Computers & Synthesizers in Music	D01

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## **1. Abstract**

In this sufficiency, a musical composition was created on the computer. It was approximately five minutes in length and attempted to simulate the sounds of early analog synthesizers, such as the modular Moog and the modular Arp. The music composed is contemporary, yet it is harmonic in nature and uses conventional time.

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### **3. Acknowledgments**

- My Parents: One night I frantically drove home and dominated my parent's computer for three hours because my place of residence had a scheduled power outage.

### **4. Statement of the Problem**

To state the problem before approaching the piece:

The goal of this sufficiency is to compose a piece of electronic music. The music will be contemporary, harmonic, and written in to conform to the rules of musical time. It will follow the compositional form of theme and variation. Additionally, it will primarily use the sounds that early analog synthesizers created, such as the modular Moog and the modular Arp. Finally, the piece will be produced and recorded to compact disk in two-channel stereophonic form.

#### ***4.1. Musical Form***

For the sake of simplicity, I decided to base my form on theme and variation. It is a musical technique that I have worked with in the past, and I find that writing music in this style lends itself to a pleasurable composition. Also, theme and variation was a predominant style in the baroque era, with which some of the music that I modeled the project after was written in. (See the section Models for the Problem) In the end, I settled on an ABABC(ab)A system, where (ab) is a part that combines aspects of both the A and B themes.

#### ***4.2. Orchestration***

All recorded music must be orchestrated for at least one instrument, for it is impossible to record music without a medium play it on. Because the composition is electronic, I didn't want it to mimic conventional "real" instruments. I chose to orchestrate for early analog synthesizers because their sound does not attempt an imitation and, more importantly, I find the sound from these instruments to be quite beautiful. If

I were to compose for real instruments, I would not be able to call my composition electronic; the synthesis would solely be a tool to hear the composition without the burden of hiring musicians to play the music.

### **4.3. Problems of Realization**

The analog synthesizers that I adore so much are quite expensive and impractical for a college student to maintain. In some cases, they are labeled as an instrument in their own right. For example, the DVD-Audio disk of Emerson, Lake, and Palmer's Brain Salad Surgery credits Keith Emerson as playing the Moog instead of playing a synthesizer.

In order to realize my piece, I had to find a way to *synthesize the synthesizer*. I attempted three different methods; the first two are digital variants of the type of synthesis that the Moogs and Arps used, known as Subtractive Synthesis. These methods proved futile. The final method that I used involved a standalone synthesizer unit owned by WPI. I am unsure of how "true" it is to analog synthesis, I suspect that it uses a combination of subtractive and sampling.

## **5. Models for the Problem**

### **5.1. Existing Recordings**

I chose a few models that I wished to emulate for the creation of the piece of music. The influences for choosing to emulate analog synthesis were two albums of Moog performances, "Switched On Bach" and "The Well-Tempered Synthesizer," both by Wendy Carlos. Another inspiration is the progressive rock band Emerson, Lake, and Palmer. Keith Emerson played the Moog in many of their compositions, including one that influences the beginning and end of my piece, Tarkus.

While producing the piece, I came into a situation where I was choosing a patch to use for a bass-line in the second version of the A-theme. The name of the patch is "Pulser", and it reminded me of the low, pulsating bass used in the beginning of Pink Floyd's Welcome to the Machine. This part of the music is partially influenced by their song.

## **5.2. Research**

Before starting to compose the piece, I did a small amount of research on composition and Theme and Variation. The research showed itself to be interesting, but it didn't lend itself to exerting an impact on the actual music. Musical Composition, by Smith Brindle made a few suggestions for varying the timing. I read about Theme and Variation with regards to Bach and the Baroque period; it would have been beneficial if I were attempting to write a piece of music that followed the style of the Baroque period.

## **6. Discussion of the music created**

To paraphrase Fantasia's introduction to Bach's Toccata and Fugue, the music that I wrote is abstract, it is music solely for the sake of music. It doesn't tell a story, nor does it have any special meaning or association, other than the type of sounds used. The keys used in this piece were primarily chosen at random or derived from keys used in other parts of the music. The music is modern, yet conventional in nature; it adheres to guidelines of using melody, chords, and major and minor keys, and it uses the standard 12-tone scale. There is a clear influence from Bach with the use of multiple independent voices that harmonize at specific intervals.

I borrowed two concepts from Tarkus, by Emerson, Lake and Palmer. The first concept is the fade-in for the opening of the song. Tarkus uses tones that almost sound like singing; I use winds and a deep, pulsating base sound with a hint of the melody. After 30 seconds, the main theme begins.

The main theme starts in E major, and later modulates to B major. After it ends, the second theme abruptly starts in B major and then modulates to C sharp major. Both the main and secondary themes are in  $\frac{3}{4}$  time and are played on the computer at 120bpm. Printouts of both themes are available in sheet-music form in the appendix.

16 17 18 19 20 21 22 23

pp mp

Detailed description: This musical score shows measures 16 through 23. It consists of three staves. The top staff contains the melody, starting with a half note G4 in measure 16 and moving through various intervals. The middle staff contains a harmonic accompaniment with chords and moving lines. The bottom staff contains a bass line with eighth and sixteenth notes. Dynamic markings 'pp' (pianissimo) and 'mp' (mezzo-piano) are present. Measure 20 shows a key signature change from one sharp (F#) to two sharps (F# and C#).

23 24 25

Detailed description: This musical score shows measures 23 through 25. It consists of three staves. The top staff contains the melody, which continues from measure 23. The middle staff contains a harmonic accompaniment. The bottom staff contains a bass line. The key signature remains two sharps (F# and C#).

Above: Images of sheet music captured from Noteworthy to show the modulation in the main theme.

15 16 17 18 19 20 21 22

23 24

Detailed description: This musical score shows measures 15 through 24. It consists of three staves. The top staff contains the melody, starting with a half note G4 in measure 15. The middle staff contains a harmonic accompaniment. The bottom staff contains a bass line with eighth and sixteenth notes. Measure 23 shows a key signature change from one sharp (F#) to two sharps (F# and C#).

Above: Images of sheet music captured from Noteworthy to show the modulation in the secondary theme.

The main and secondary themes are repeated again, but transposed to minor keys. The second main theme is played at a slightly randomized tempo to give it a rough feel, and the second instance of the secondary theme is accelerated to 150bpm to give it a slightly nervous aspect. The transpositions were performed algorithmically via Digital Performer; sheet music from Noteworthy is unavailable.

After both the main and secondary themes play twice in both major and minor keys, I then introduce a new, softer theme. This theme plays in A minor and operates in 4/2 time. It is meant to be a soft interlude, and contains a reprise of wind sounds similar to those used in the introduction. Towards the end of the soft theme, I include a hint of the main and secondary themes. A sample of the sheet music is available in the appendix.

At the conclusion of the soft theme, I use my second borrowed concept from Tarkus, the gong. The gong is the only “real” instrument used in this piece. After the gong sounds, I reprise the main theme. For the finale, I transposed the original theme up 3 half steps, and concluded the piece at measure 27.

## **7. Synthesizing a Synthesizer**

The major problem with the project is that the desired instrument is an early analog synthesizer. These machines are expensive and require a lot of maintenance. They are monophonic, which means that they can only reproduce one note at a time. I, the creator of the music, cannot play a keyboard, nor can I afford such an instrument. My only means of creating music is to write sheet music and then to control a synthesizer through MIDI. In order to achieve the desired analog sound, I would have to find a midi-controlled modular synthesizer and then make multiple recordings of each part of the song.

Thus, in order to obtain the sound that is required for the project, I had to figure out how to synthesize a synthesizer. Current digital synthesizers work by employing a few methods to create their sounds. One popular method is sampling, where a short audio clip is digitally processed to create the desired pitch and length. I decided to find a synthesizer that uses subtractive synthesis. Subtractive synthesis is the term that is applied to the digital algorithm that mimics the way that the original analog instrument works.

There were a few approaches that I could use in order to achieve my desired sound. They are listed as follows:



1. Use a program named Stomper that creates short samples via subtractive synthesis, and then use the samples in a program called a tracker.
2. Run a program on my program that emulates an analog synthesizer. These are also known as software synthesizers that use subtractive synthesis, and can be played with a keyboard via a computer's MIDI port, or by a sequencer program using a set of virtual MIDI ports..
3. Use WPI's synthesizer modules and hope that they could create my desired sounds.

I elected to use the third choice because the first two had too many bugs. Stomper could not create an envelope that lent itself well for music. The analog emulators fell into a few different categories:

- They did not sound good.
- They were unstable, and thus unusable.
- They required a more powerful computer than I own.
- They could only run one synthesizer at a time, instead of running multiple synths that operate on separate MIDI channels.

## **8. Equipment Used**

To compose the music for the sufficiency, I used two different settings for composition. The first setting, my personal computer, was used primarily to write the music. The second setting, WPI's lab, was where I produced the music.

### ***8.1. My Personal Computer***

The first setting that was used is my personal computer. I wrote the themes as sheet music on my personal computer using Noteworthy Composer, and used some simple synthy sounds, such as square waves and triangle waves as the orchestration. The themes were finished on my parent's computer because the power company scheduled a blackout when I had time to work on them. Both machines are simple P.C.s running variants of Microsoft Windows.

## **8.2. WPI's Studio B**

The final production occurred in Studio B. It is a lab in Alden Hall, one of the buildings at WPI. The lab contains equipment that isn't heavily used by students in WPI's electronic music classes, and due to the lack of abuse, is in "tip-top" working condition. In addition to equipment owned by WPI, Fredrick Bianchi owns some of the equipment available in the lab. The equipment available for use included a Macintosh computer with Digital Performer, a rack-mounted Kurtzweil synthesizer, a rack-mounted Proteus synthesizer, a mixing board, a full-range midi controller keyboard, and a pair of Yamaha self-powered speakers. (Wendy Carlos, the creator of two of the influences for this piece, also uses Digital Performer. [[Wendy Carlos, www.wendycarlos.com](http://www.wendycarlos.com)])

At the point of entering the lab, I only had themes written in Noteworthy, but no actual music. To finish the music, I imported MIDI files exported by Noteworthy into Digital Performer. Within Digital Performer, I re-assigned the instruments to analog-sounding patches on the Kurtzweil. I avoided the Proteus; it primarily contained imitations of real instruments, and I didn't like the way that it sampled the analog ones. I did, however, find a patch on the Proteus named "Tarkus Twin"; thus I decided that it had to be used in the parts of the song that were influenced by the piece.

Prof. Bianchi and I had a short discussion with regards to the mixing of the piece. I prefer to mix electronic music so that some instruments are panned all the way to one speaker or the other, although this isn't common practice in modern recordings. Prof. Bianchi commented that many producers do not pan all the way to one side or another when making professional recordings. With regards to electronic music, the only instrument is the speaker, and thus I decided that isolating a sound to one speaker was justified. Instead of trying to emulate a soundstage with instruments via a recording, the listener's playback equipment become the instruments and the room becomes the soundstage. Every playback is "live," in the listener's personal auditorium.

## **9. Conclusion**

The Electronic Music created for the sufficiency contains primarily the desired electronic sound. It is a pleasing piece of abstract music that cycles through a few different themes and variations of those themes.

The sound and form follow a few influences, Wendy Carlos and Emerson, Lake, and Palmer. A few of my friends comment that it sounds like it's New Age. Overall, it is a pleasing five-minute audio experience.

## **Appendix: Sheet music**

### ***Main Theme***

This is the main theme that opens the composition after about 30 seconds of wind sounds. It is repeated again in the composition transposed to a minor key, and is repeated a final time at the end of the composition transposed up three half-steps. On the final reprise, it ends at measure 27.

## ***Second Theme***

This theme originally appears after the main theme. It is repeated in the composition transposed to a minor key.

### ***Soft Theme***

This theme plays near the end of the piece. It incorporates parts of the main and secondary themes in the bottom staff.

## Works Consulted

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