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Music and Engineering

**Homework 2 Write Up**

This document is an opportunity for explaining some of the aspects of the code that I wrote about.

**< Editing the Script>**

I have implemented audioplayer function because when I ran each function with soundsc, they all happened to come out at the same time. Similar to Q 1~4 , Q5 also introduced same approach.

**Q1. Additive Synthesis**

My implementation of this question is Bell from Figure 4.28 of Jerse. I followed the steps exactly from the book suggested. When I played it through Matlab, it sounds more like hitting medal object, not exactly a bell that I expected. However some of my roommates suggest that it sounds somewhat similar to ‘bell’. For this synthesis method, I used the fact that strings are stored as an array of ASCII values.

**Q2. Subtractive Synthesis**

I have implemented a square sine wave with filter without amplification. I used equation from this website which I got suggestion from my friends who also studied similar topics in UIUC. URL of the website is following: <https://projectdspicguitareffects.wordpress.com/2011/04/21/varying-the-center-frequency-of-a-resonator/>

I tried to stick with the original equation as much as possible. Since they suggested that cos(theta) values from -1 to 0.7 it sounds more like wah wah guitar effect.

**Q3. FM modulation**

For this question, I have implemented the book for ‘Bell’ in Jerse. When I tried to put fm\*IMAX like book suggested, it creates noise sounds. So I played around the function to make it as similar as possible to the ‘bell’ sound and found that if I change IMAX to 7, it sounds much better after the changes. I compared the sound output of this to Q1. As I compared both ‘Bell’ sounds, sound output from FM modulation sounds much smoother than additive synthesis output.

**Q4. Wave Shaping**

For this question, I have implemented Clarinet from Figure 5.28. It was simple instruction of the wave shaping. There wasn’t particular addition to it. They didn’t sound exactly clarinet I was listening to, but they sounds similar to wind pipe music instruments.

**Q5. Chords.**

Sounds same all similar to what I wrote above. Particular specifications are going to be in the Discussion. However Chords are somewhat different like as piano functions.

**Q6. Discussions**

1. For additive synthesis, I couldn’t hear any differences between major and minor chords. They sound all the same. For Subtractive synthesis, FM modulation and wave shaping, I heard clear differences between major and minor chords. For subtractive synthesis, Equal tempered major and minor sounds similar, but just tempered has some noise in it. For equal tempered major, it has some vibration at the end. For FM modulation, they sound more like ‘bell’ and sound clear and like I said above, they sounds different for major and minor chords. Lastly for Wave Shaping, they sound more like clarinet and similar to FM modulation, they have clear difference between major and minor chords.
2. Equal tempered sounds much better because I could listen to them sharper and clearer sounds than just tempered.
3. For additive, I could not listen any differences. For subtractive synthesis, equal tempered minor chords sound like regular minor chords, but for just tempered, they have some weird noise in it. For FM modulation, I can’t differenciate between just and equal temperament. For wave shaping synthesis, I heard that equal temperament sounds deeper and larger sounds and could listen to vibration at the end.
4. Equal temperament sounds much bettet because I could listen to much clearer sounds.