Jagjit Singh (V00865544)

CSC – 575 (Assignment -1)

Question1:

Question2:

Question3:

For purpose of answering the question, I have selected the GTA San Andreas (Theme Song) - https://www.youtube.com/watch?v=W4VTq0sa9yg

Part -1
Time Scales – Short, Middle and Long Term
Dimensions – Timber, Orchestration, Acoustics, Rhythm, Melody, Harmony and Structure.

The opening of the music starts with Chimes followed by repetitive drum beats and piano.

Rhythm – The music has a time scale – Middle Term, where a sound is being repeating multiple times. The entire Sequence is coming back again.
Melody – The music after the initial opening has a middle term melody repetition, that is high and low drum beats.
Timber – There is a lot of classification in Timber (Short term) when the opening comes from the Chimes.
Structure – When seen for the long term the music has a lot of time scale differences.

Part – 2
Casual Users – Since casual users like listening and collecting music their request will be like (Finding the song that sounds like this) (I like this one, what other songs I may like)(I have to organize my collection)
Professional Users – They may be using music in advertisement and production, they need music for an application, their request information will be like (Given a rhythm give me the music that matches it) (I need this kind of soundtrack with this instrument)
Music Scholars – These kinds of people and interested in studying music, developing music (analysis of music tools)(I don't want the music but the pitch it was sung in)

Part – 3

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Query By humming – Humming is a way where in a casual user will use a combination of whistling and singing to produce a melody. Then that melody will be used to search/query the sound/music database to find the full version of the song/music corresponding to the melody.
Query by Example – When a part of the music/example of the music is used to query the database to retrieve the full music it is termed as query by example. This will avoid mismatching of the retrieved music.

Part- 4
Music XML- This is a type of music representation which used XML as portable format for exchange of information. The best part is the industry wide support including the open-source and commercial projects. Since we can write XML in Latex so we can represent this using the latex.
MIDI- it stands for Musical Instrument Digital Interface. This is format where we do the data exchange within digital instruments. This requires sequential information transfers. SMF-Standard Midi File will be used for the future information transfer.

Part-5
Since this entire document deals with MIR and we are doing MIR for the end users, for me that's the best part of explaining various users that uses MIR. There are three levels of users starting from the most basic going to the most complex ones. The casual users are the one who need music for fun and hobbits. The second level is for the professional student that may need music for their professional purposes, they are commercial users of music. The music scholars are most advanced users; they are one who study music and its composition. It also includes musicians.

Part-6

Question4:
Part - 1
Additive Synthesis Instrument: The actual concept is to have n number of sin wave generator using the defined frequency and helper function – Mixture ()

Code:
```
import numpy as np
import matplotlib.pyplot as plt
import math
import mir
from mir import Sinusoid
from mir import Signal
from mir import Mixture

#Declare the frequency and amplitude array
freq = [100,200,300,400,500]
amp = [10,20,30,40,50]
```

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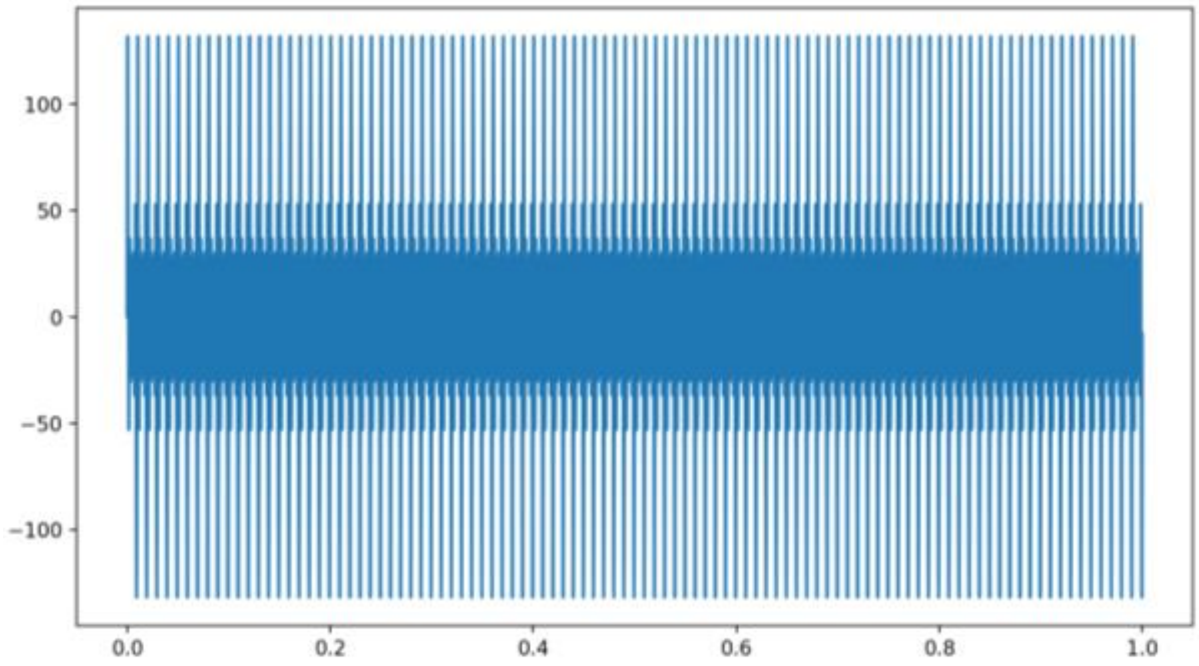
```
#Declare the empty list
list = []
#Making a list of all 5 sinusoids
for n in range (5):
    sin = Sinusoid(amp=amp[n], freq=freq[n])
    list.append(sin)
#Making a mixture using the helper function in mir.py
mix = Mixture(*list)
#Plot the mixture of all 5 waves
mix.plot()
```

Plot:



Part - 2

Different Sounds of Same Pitch – passing them to additive Instrument.

Sound 1 = Flute D Tone

Sound 2 = Violin D Tone

Spectrum Analysis Sound 1

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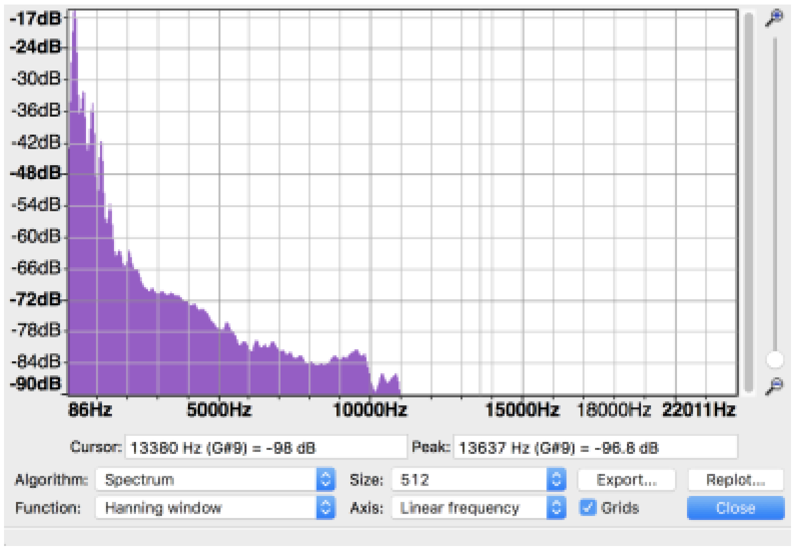


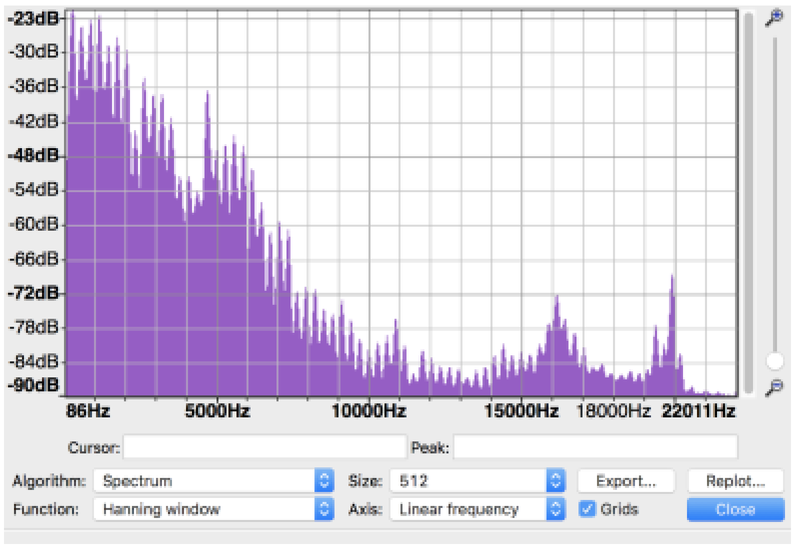
Cursor: 13380 Hz (G#9) = -98 dB Peak: 13637 Hz (G#9) = -96.8 dB

Algorithm: Spectrum Size: 512

Function: Hanning window Axis: Linear frequency

freq = [292,563,869,1160,1439,1767,2064,2828,3159,3447]
amp =
[0.15488166189124816,0.03162277660168379,0.019275249131909367,0.008511380382023767,0.0023173946499684774,0.0007328245331389037,0.0007673614893618193,0.0003388441561392024,0.0003198895109691397 3,0.0003054921113215515 7]

Spectrum Analysis Sound 2



Cursor: Peak:

Algorithm: Spectrum Size: 512

Function: Hanning window Axis: Linear frequency

freq = [295,572,882,1165,1460,1764,2052,2343,2633,2931]
amp =
[0.0812830516164099,0.06165950018614822,0.06095368972401691,0.07852356346100718,0.03890451449942807,0.042169650342858224,0.03388441561392025 6,0.006760829753919818,0.022130947096056376,0.01428893958511103]

Code:

```
import numpy as np
import matplotlib.pyplot as plt
import math
import mir
from mir import Sinusoid
from mir import Signal
```

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```
from mir import Mixture

#Frequency and Amplitude for Sound 1
freq = [292,563,869,1160,1439,1767,2064,2828,3159,3447]
amp =
[0.15488166189124816,0.03162277660168379,0.019275249131909367,0.008511380382023767,0.0023173946499684774,0.000732
8245331389037,0.0007673614893618193,0.0003388441561392024,0.00031988951096913973,0.00030549211132155157]

list = []
for n in range (10):
    sin = Sinusoid(amp=amp[n], freq=freq[n])
    list.append(sin)
#make signal mixture
mix1 = Mixture(*list)

sig1 = Signal(data=mix1.data)
#output new audio file
sig1.wav_write('flu_new.wav',normalize=False)

mix1.plot()
#Frequency and Amplitude for Sound 2
freq = [295,572,882,1165,1460,1764,2052,2343,2633,2931]
amp =
[0.0812830516164099,0.06165950018614822,0.06095368972401691,0.07852356346100718,0.03890451449942807,0.04216965034
2858224
    ,0.033884415613920256,0.006760829753919818,0.022130947096056376,0.014288939585111103]

list1 = []
for n in range (10):
    sin = Sinusoid(amp=amp[n], freq=freq[n])
    list1.append(sin)
#make signal mixture
mix2 = Mixture(*list1)

sig2 = Signal(data=mix2.data)
#output new audio file
sig2.wav_write('voi_new.wav',normalize=False)

mix2.plot()
```

Plot :

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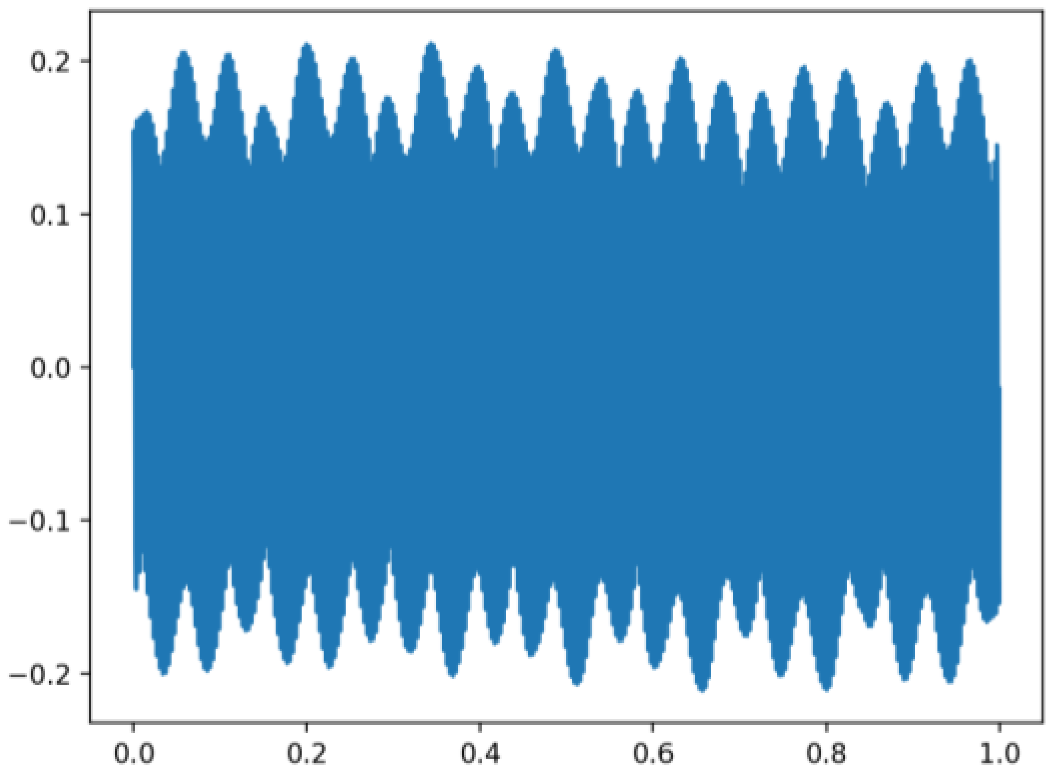

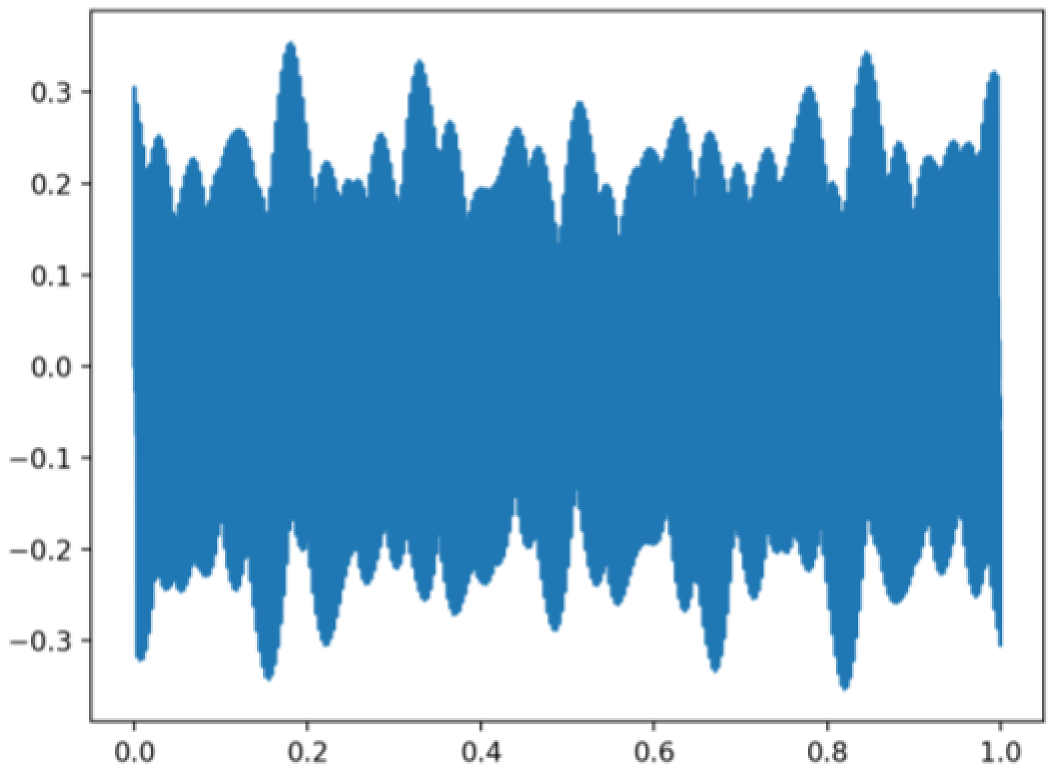

Part 3

Question5:

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