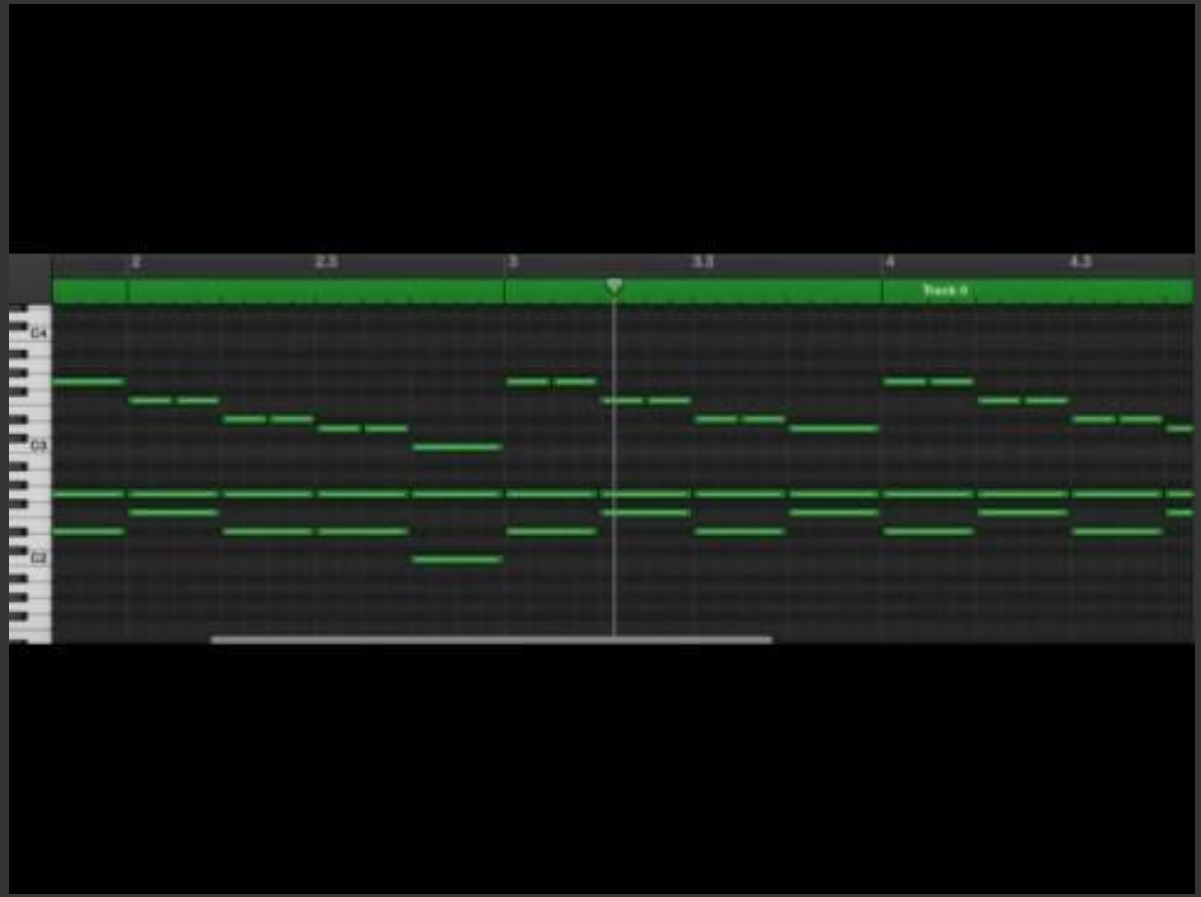
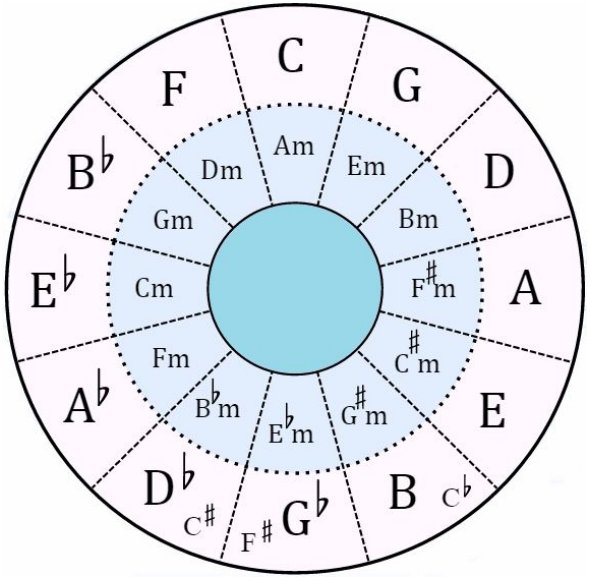
Circle of Fifths

Yanru Chen Suan Chew Junliu Zhang Chris Volar

Program-generated MIDI file

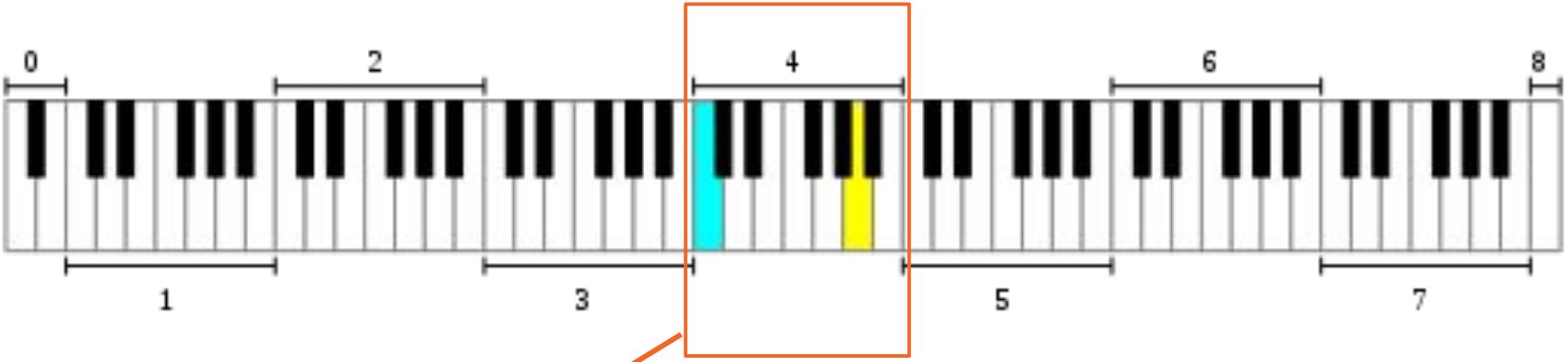


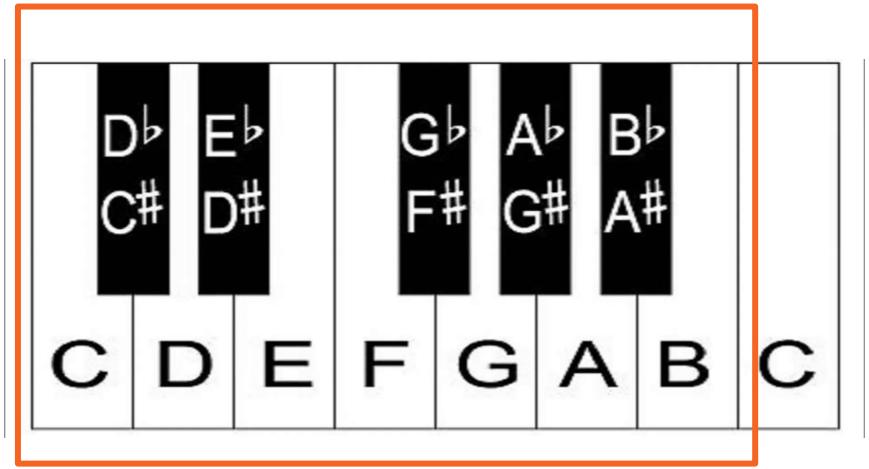
Introduction



12 notes(pitch) vs. 7 letter name

“Perfect fifth”

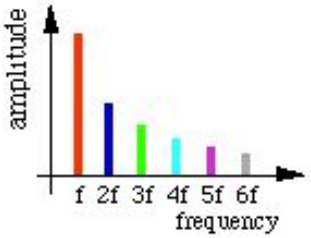


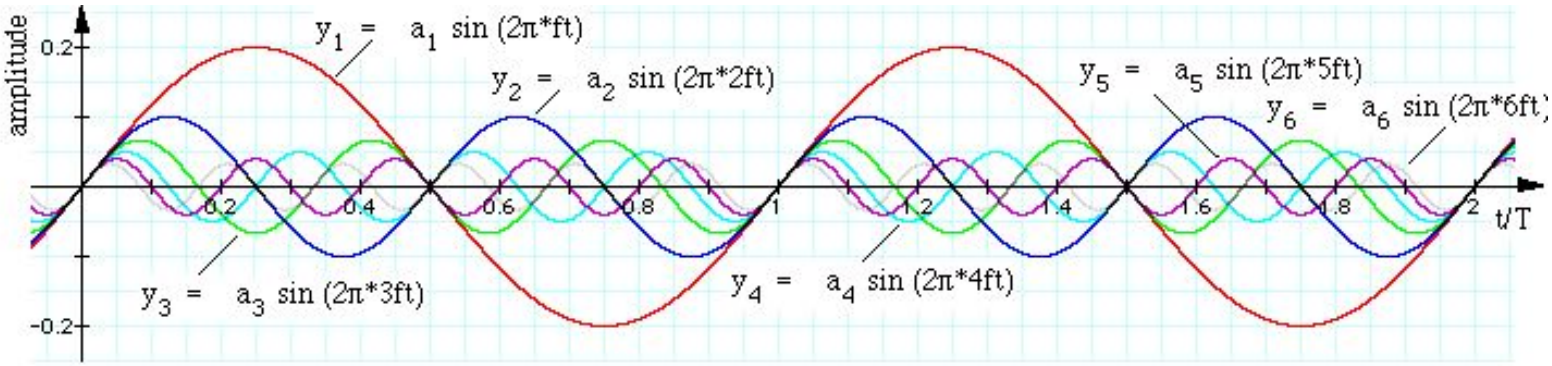


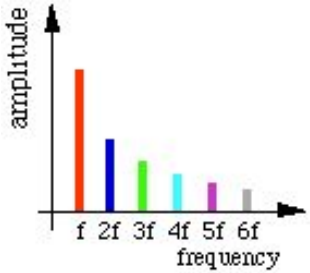
“Octave”

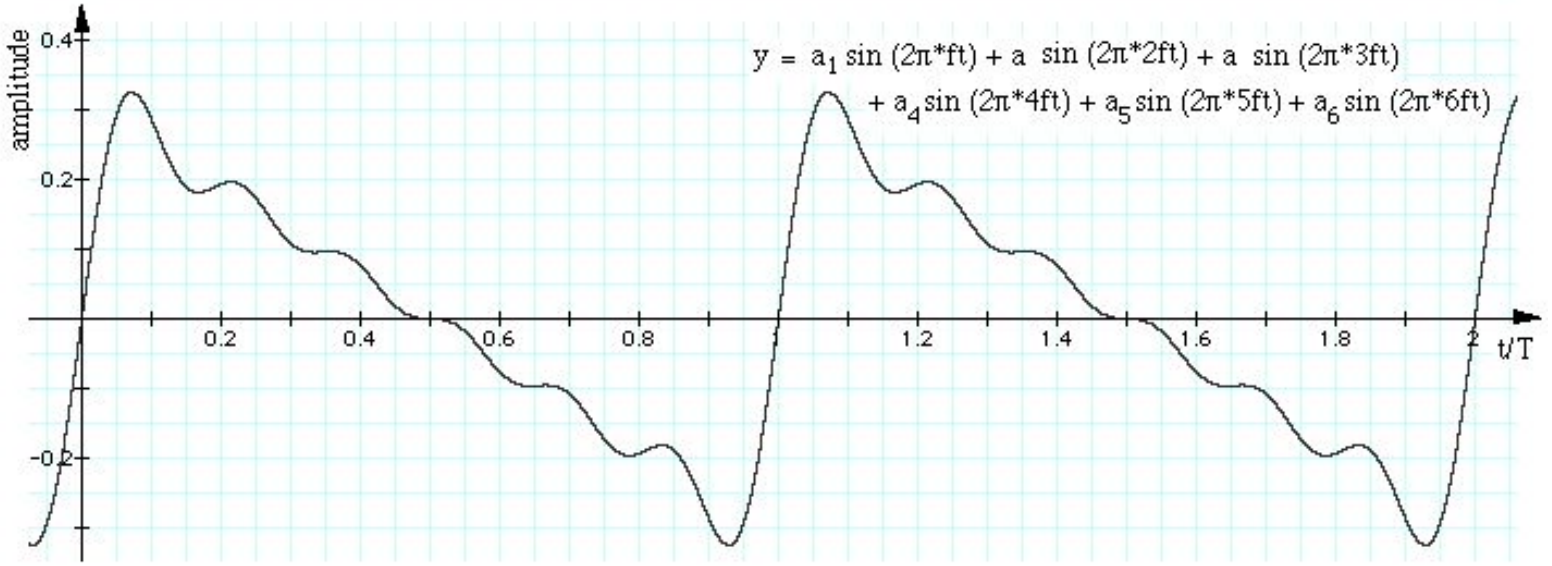
Concerns

- Why Perfect fifth?
- How are they related to harmony?

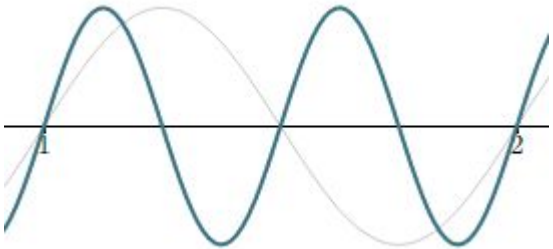

amplitude
f 2f 3f 4f 5f 6f
frequency


amplitude
0.2
-0.2
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
t/T
y1 = a1 sin (2π*ft)
y2 = a2 sin (2π*2ft)
y3 = a3 sin (2π*3ft)
y4 = a4 sin (2π*4ft)
y5 = a5 sin (2π*5ft)
y6 = a6 sin (2π*6ft)


amplitude
f 2f 3f 4f 5f 6f
frequency

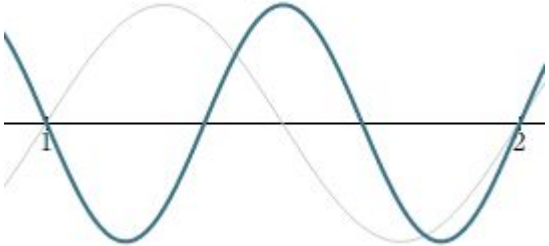

amplitude
0.4
0.2
-0.2
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
t/T
y = a1 sin (2π*ft) + a sin (2π*2ft) + a sin (2π*3ft)
+ a4 sin (2π*4ft) + a5 sin (2π*5ft) + a6 sin (2π*6ft)

Harmony ~ simple ratio



A220
A440

Pitch ratio: 2:1



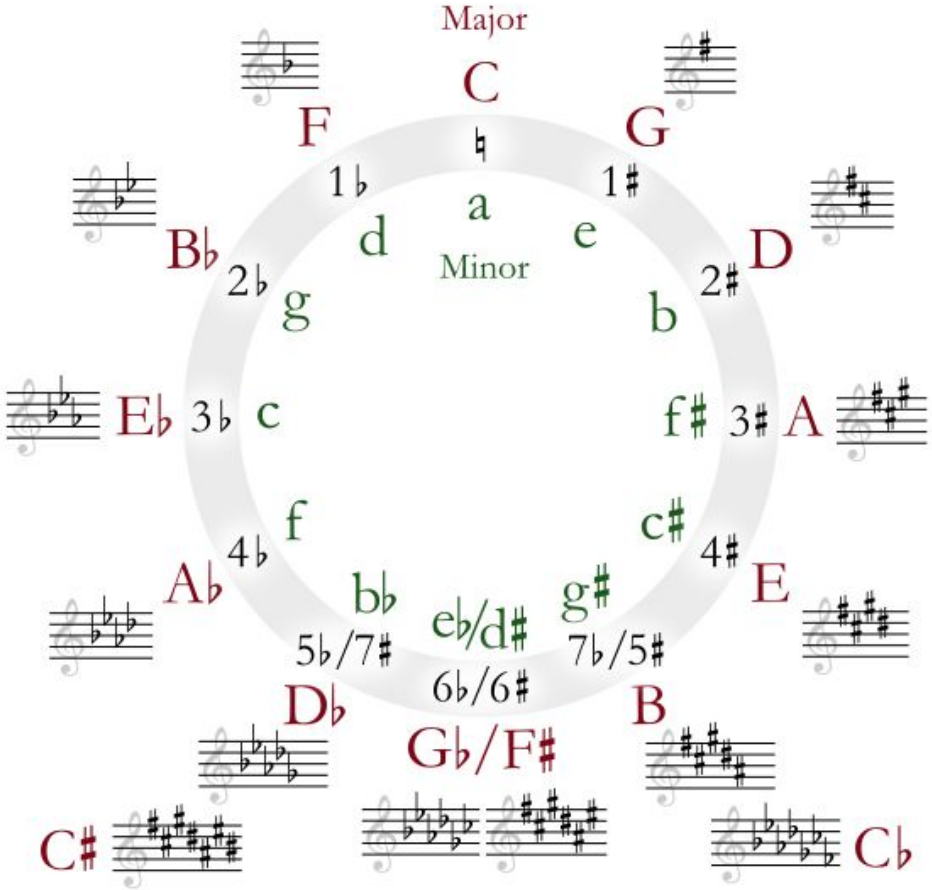
A220
E330

Pitch ratio: 3:2

https://www.intmath.com/blog/mathematics/frequency-notes-piano-interactive-learning-object-11245

	C	C#	D	Eb	E	F	F#	G	G#	A	Bb	B
0	16.35	17.32	18.35	19.45	20.60	21.83	23.12	24.50	25.96	27.50	29.14	30.87
1	32.70	34.65	36.71	38.89	41.20	43.65	46.25	49.00	51.91	55.00	58.27	61.74
2	65.41	69.30	73.42	77.78	82.41	87.31	92.50	98.00	103.8	110.0	116.5	123.5
3	130.8	138.6	146.8	155.6	164.8	174.6	185.0	196.0	207.7	220.0	233.1	246.9
4	261.6	277.2	293.7	311.1	329.6	349.2	370.0	392.0	415.3	440.0	466.2	493.9
5	523.3	554.4	587.3	622.3	659.3	698.5	740.0	784.0	830.6	880.0	932.3	987.8
6	1047	1109	1175	1245	1319	1397	1480	1568	1661	1760	1865	1976
7	2093	2217	2349	2489	2637	2794	2960	3136	3322	3520	3729	3951
8	4186	4435	4699	4978	5274	5588	5920	6272	6645	7040	7459	7902

https://www.seventhstring.com/resources/notefrequencies.html



Pitch ratio: 2:1

“Octave”

Pitch ratio: 3:2

“Perfect Fifth”

Present.. Prototype

Prototype interacts with the user to generate MIDI files.

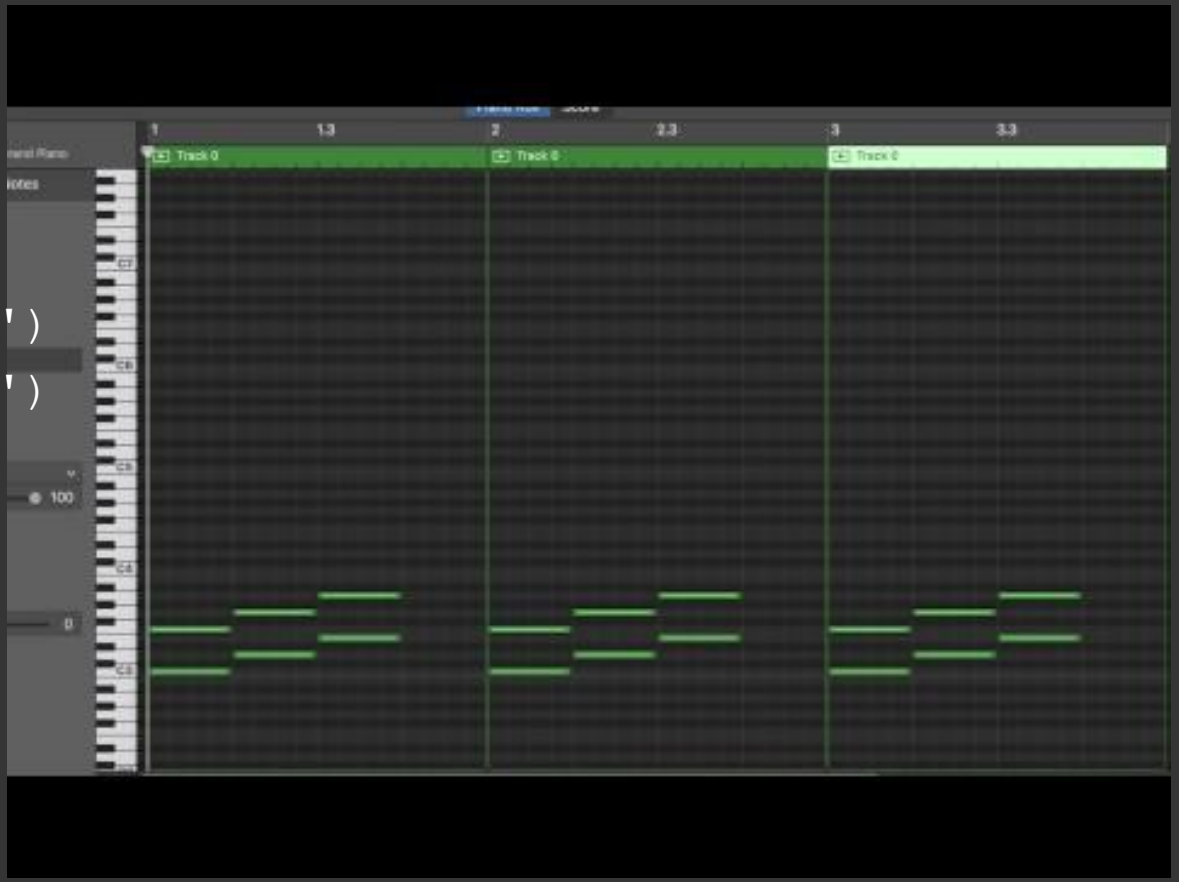
- Input
  - music notes
  - time signatures
  - scale

- Generate MIDI file containing

```
➜  pycharm ls
fhproject-music music           untitled
➜  pycharm fhproject-music
➜  fhproject-music git:(master) ✗ examples
➜  examples git:(master) ✗ python foothilltestmidi1.py
foo.mid
➜  examples git:(master) ✗
```

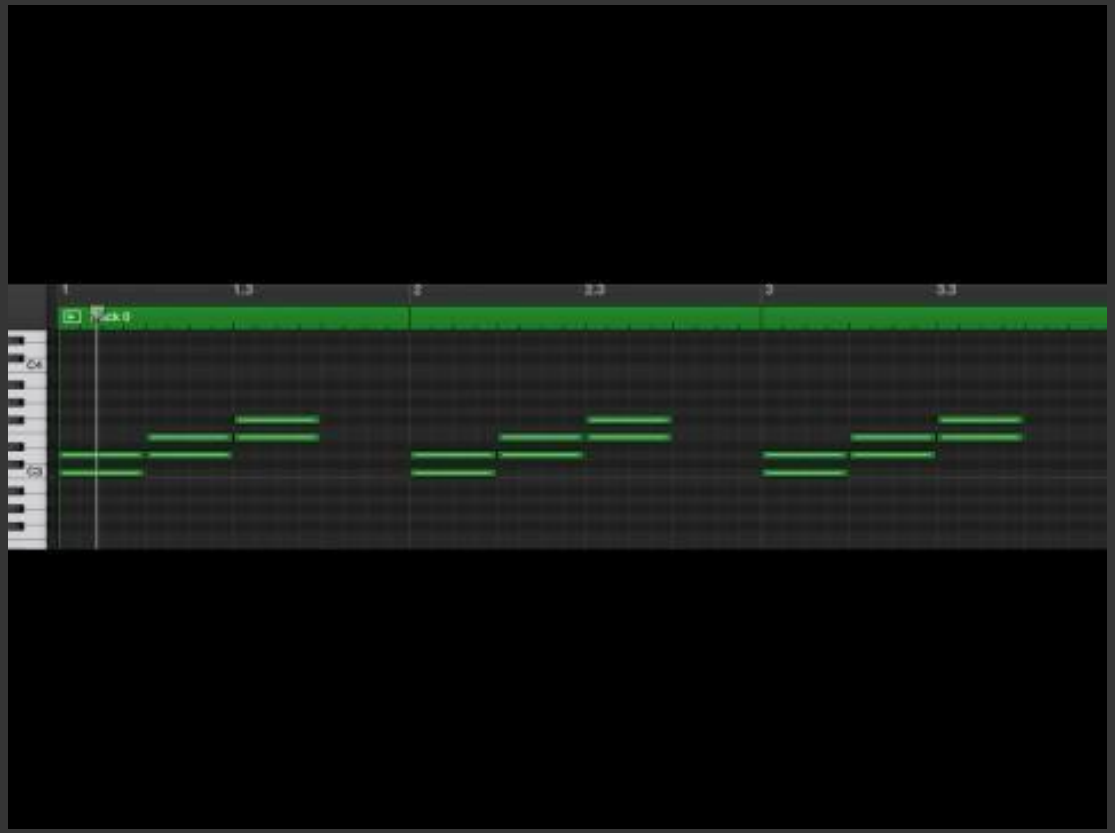
Sample Output

```
seq1 = NoteSeq('C D E')
seq2 = NoteSeq('F G A')
midi = Midi()
midi.seq_notes(seq1)
midi.seq_notes(seq2)
midi.write('foo.mid')
```



Sample Output

```
seq1 = NoteSeq('C D E')
seq2 = NoteSeq('D E Gb')
midi = Midi()
midi.seq_notes(seq1)
midi.seq_notes(seq2)
midi.write('foo.mid')
```



Reference

Dr. Bill Pezzaglia: Wave Superposition & Timber

Mike Sult http://www.guitarland.com/

Eva Palmer “Making MIDI music with python: An Intro to music Theorey”

https://github.com/palmerev/pydx15-music

Acknowledgement

Project advisor: William Pezzaglia

Music advisor: Mike Sult

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