Composition: Electronic Media I Fall 2004 Spectral Analysis in Kyma

- 1. Background
 - a. Jean-Baptiste Fourier



- b. On the Propagation of Heat in Solid Bodies (1807)
- c. Any periodic wave can be represented as a sum of sine waves whose frequencies are integral multiples, and whose amplitudes and phases are properly adjusted.
- 2. Fourier series for middle C, where f = 261.65 Hz

12f	3139.80 Hz	
11f	2878.15 Hz	
10f	2616.50 Hz	
9f	2354.85 Hz	
8f	2093.20 Hz	
7f	1831.55 Hz	
6f	1569.90 Hz	
5f	1308.25 Hz	
4f	1046.60 Hz	
3f	784.95 Hz	
2f	523.30 Hz	
1f	261.65 Hz	C4

- 3. Prepare soundfiles for spectral analysis in Kyma
 - a. Use to **Peak** to isolate individual sounds—create a new mono soundfile for each sound and normalize it.
 - b. Single-pitches work better than complex sounds. A good resource is the Iowa Musical Instrument Samples Database.
- 4. Perform the spectral analysis of your soundfile as follows:
 - a. Launch Kyma.
 - b. Select Tools>Spectral Analysis. A window like the one below will appear:

3 Spectral Analysis	ÐE	
Creating a Spectrum File from a Samples File		
In order to prepare a sample for morphing and spectral manipulation, you must first analyze it and save its time-varying spectrum or quasi-harmonic spectrum on the disk. This spectrum file can then be used in the SumOTSines Sound (as Analysis0 or Analysis1) or in the OscillatorBank (as the Analysis parameter of the SpectrumInRAM that feeds into the OscillatorBank's Spectrum input).		
First, select the samples file that yea vould like to analyze		
Select		
Then, set the delay in seconds between repetitions		
I I		
Click Next to start analyzing. Next		

c. Click "Select" to find a soundfile you wish to analyze, then click "next." A window like the one below will appear:

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15	J Spectral Analysis			EF
	Set Overall Analysis Parameters			
Ш				
Ш		Above 1F (44 hz)	Above 4F (345 hz)	
Ш	Select the highest frequency range that will still include the lowest frequency present in your sample.	Above 2F (87 hz)	Above 5F (690 hz)	
	Select a response that will give you either better time resolution or better frequency resolution. (Heisenberg says you can't have both) You can compensate somewhat for artifacts caused by lower frequency ranges by picking a better time response and vice versa.	🔾 Above 3F (173 hz)		
	Click Audition to hear your choice. Adjust the Level to be as high as possible without causing clipping.		0	
If the sample sounds chorused or reverberated, try a higher frequency range (as long as it still contains the lowest frequency present in the sample). If it sounds high-pass or attenuated, try selecting a lower frequency range.		BestFreq BetterFreq	O Better Time	
	If the attacks sounds smeared or dispersed, try compensating by changing the Response to BetterTime or BestTime. If it sounds amplitude-modulated or burbly, try compensating by choosing BetterFreq or BestFreq.			
Ш				
Ш				
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Ш			Level	
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Ш		Audition		
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Ш		Original Sample		
Ш		Resynthesis		
1				
	When a the first with the activity which would			
	(Click Back to choose a different sample).	Back	Next	
11		L		

d. Click "Audition" to hear the spectral analysis. By ear, select the best settings in the upper right corner. Click "Next." A window like the one below will appear:



- f. Ignore this window for now. Uncompile the sound with command K.
- 5. Save the spectrum as the one below:



- 6. Open the **Spectrum Editor** as follows.
 - a. Select **Open>Spectrum File**. Use the dialog window to find the spectrum file that you just created.
 - b. A window like the one below will appear:



- c. The **spectral editor**, shown above lets you select:
 - i. Single harmonics by clicking one each track.
 - ii. Multiple harmonics by shift-clicking on other harmonics you wish to add.
 - iii. Bands of harmonics by drawing a box around the the band of harmonics you wish to select.
 - iv. Once you have select several harmonics, then select Save. A window like the one below will appear:

📾 Desktop 🗢	📼 Moog.059
📾 Moog.059	Eject
📾 Moog.05X	
📾 Moog.Scratch	Desktop
📾 Moog.Users	New 🛅
💮 NEW 🔽	
Save the selected part of the	Cancel
BassTromboneEb1 s256 subset	Save

- v. Notice that the word "subset" has been appended to the end of file name (you will also see "subset 2," subset 3," etc. when you save other changes.
- 7. Next, the **Sum of Sines** module.