Audio and the GPU

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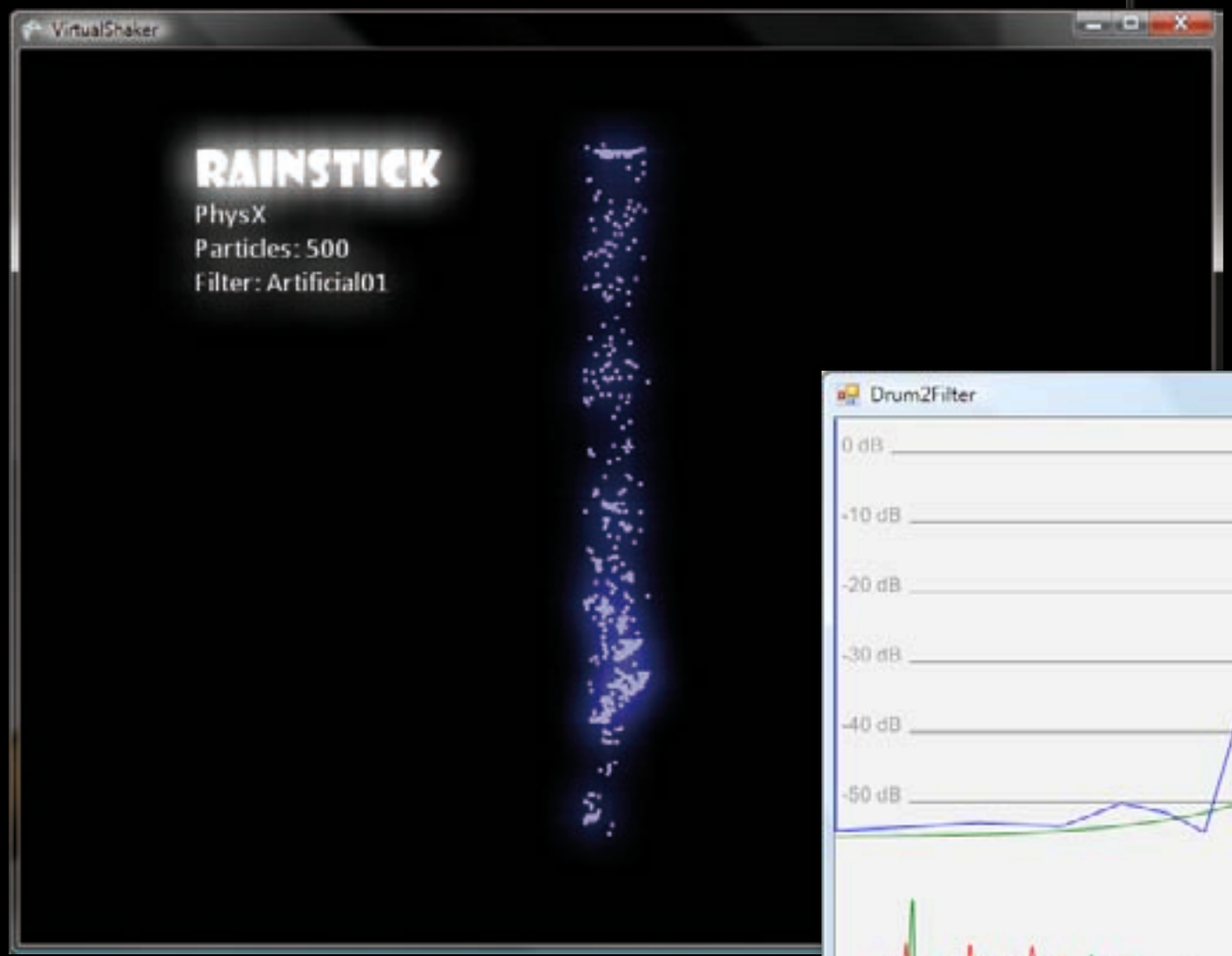
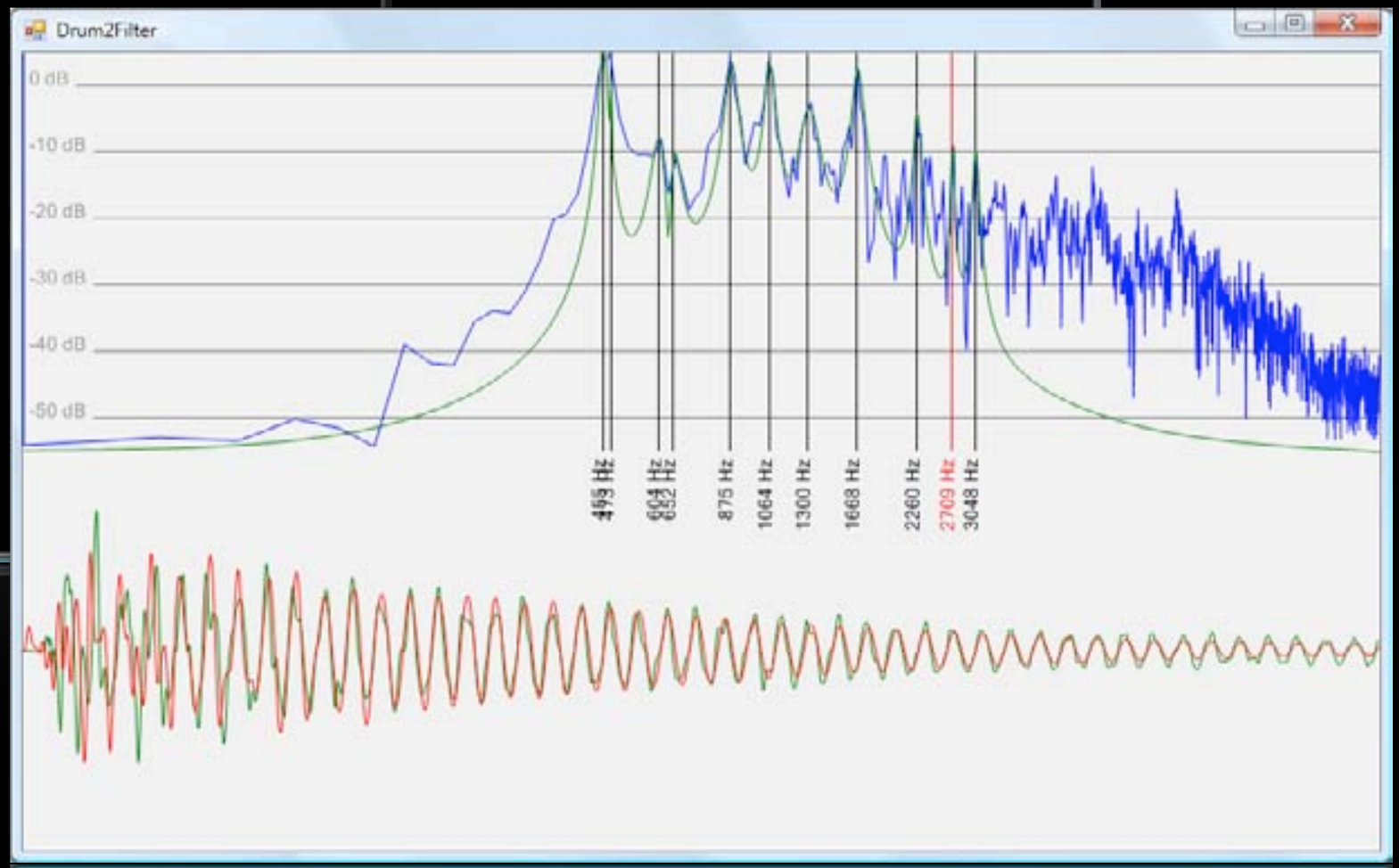
Virtual Shaker

MARACA
PhysX
Particles: 300
Filter: Artificial01

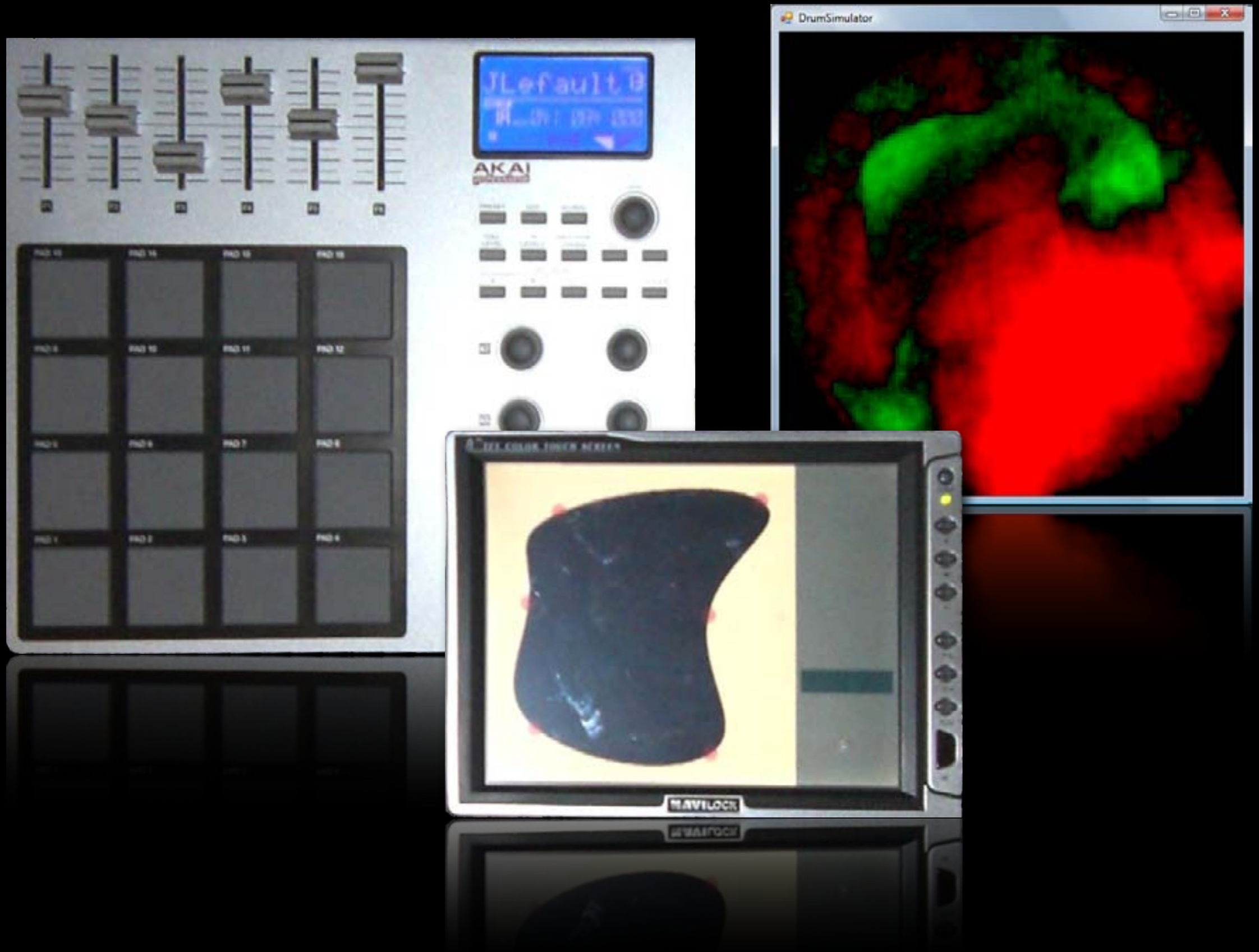

VirtualShaker
RAINSTICK
PhysX
Particles: 500
Filter: Artificial01


Drum2Filter
0 dB
-10 dB
-20 dB
-30 dB
-40 dB
-50 dB
875 Hz
1064 Hz
1300 Hz
1668 Hz
2260 Hz
2709 Hz
3048 Hz

- Particle simulation: PhysX
- CPU allows 100+ particles,
  limited inter-collisions
- Could run on GPU, 1000+ particles?
  inter-collisions?

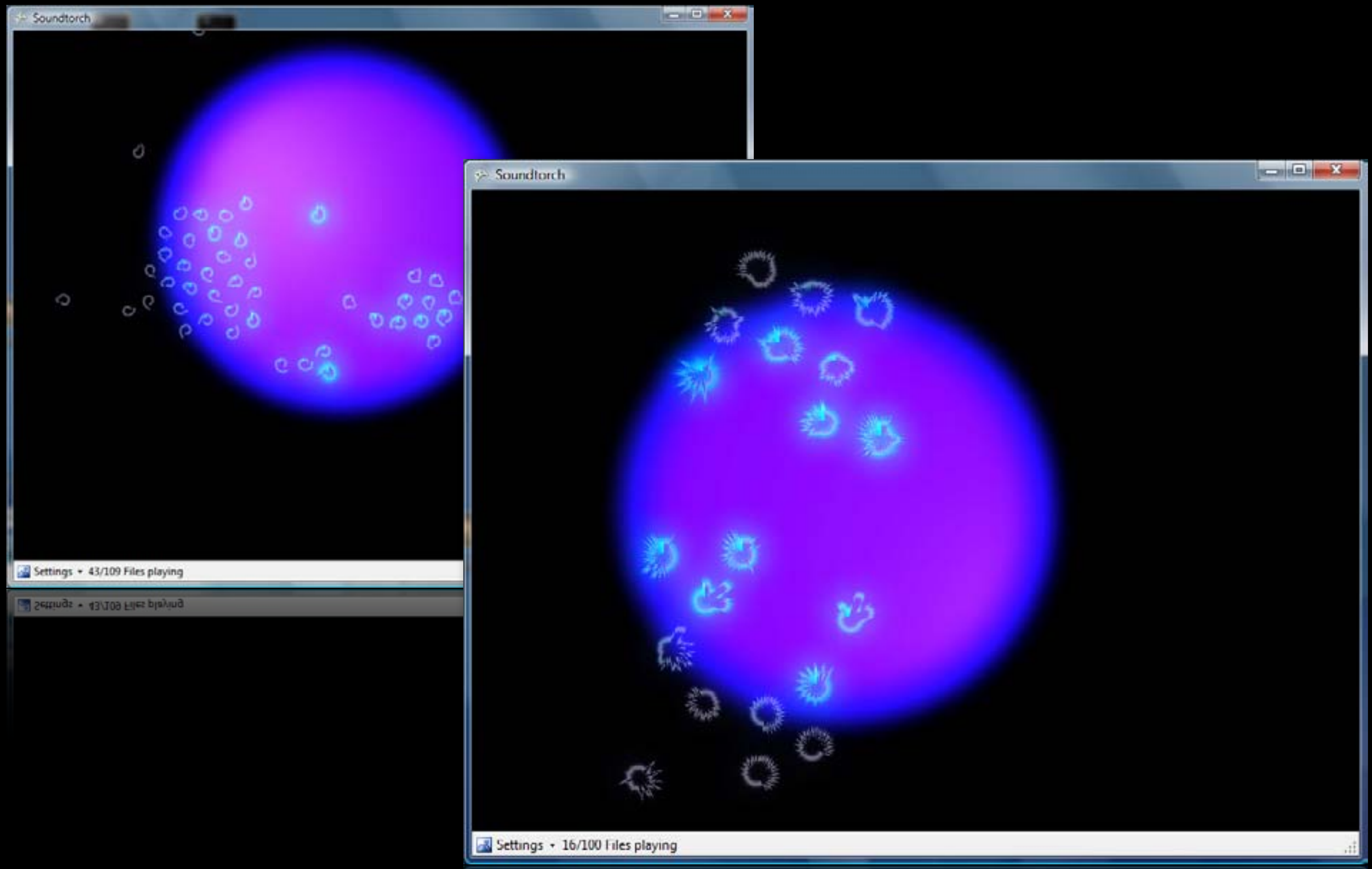
- Audio synthesis is based on filters
- Enhanced synthesis on the GPU?

Malleable Drum


DrumSimulator
AKAI
MAVILOCK

- 64 x 64 mass-spring simulation on GPU
- Proprietary in DirectX
  (CUDA for Vista n/a at that time)
- Computation on 8800 GTS:
  22,050 kHz @ 12 ms block size

SoundTorch

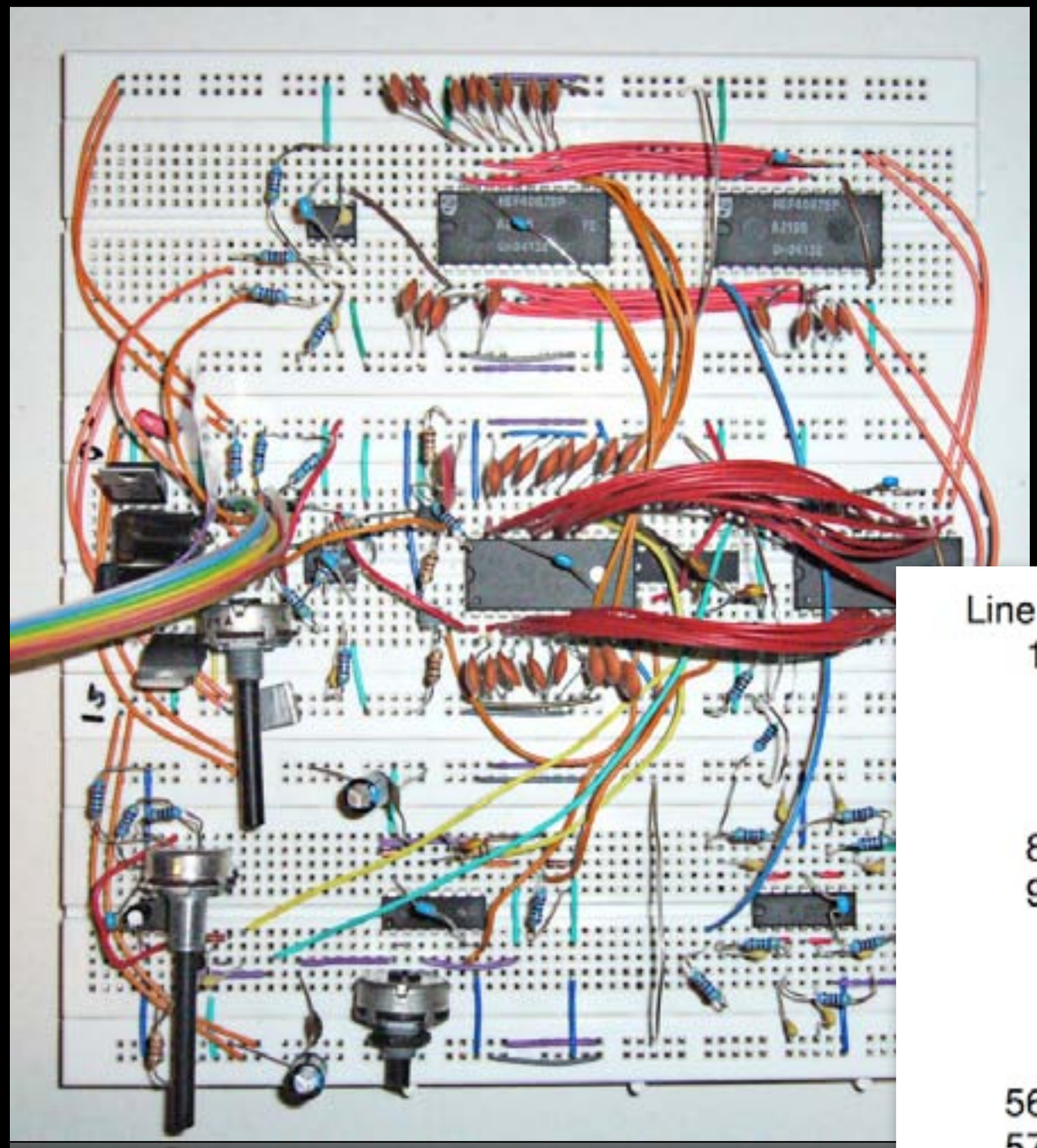

Soundtorch
Settings • 43/109 Files playing
Soundtorch
Settings • 16/100 Files playing

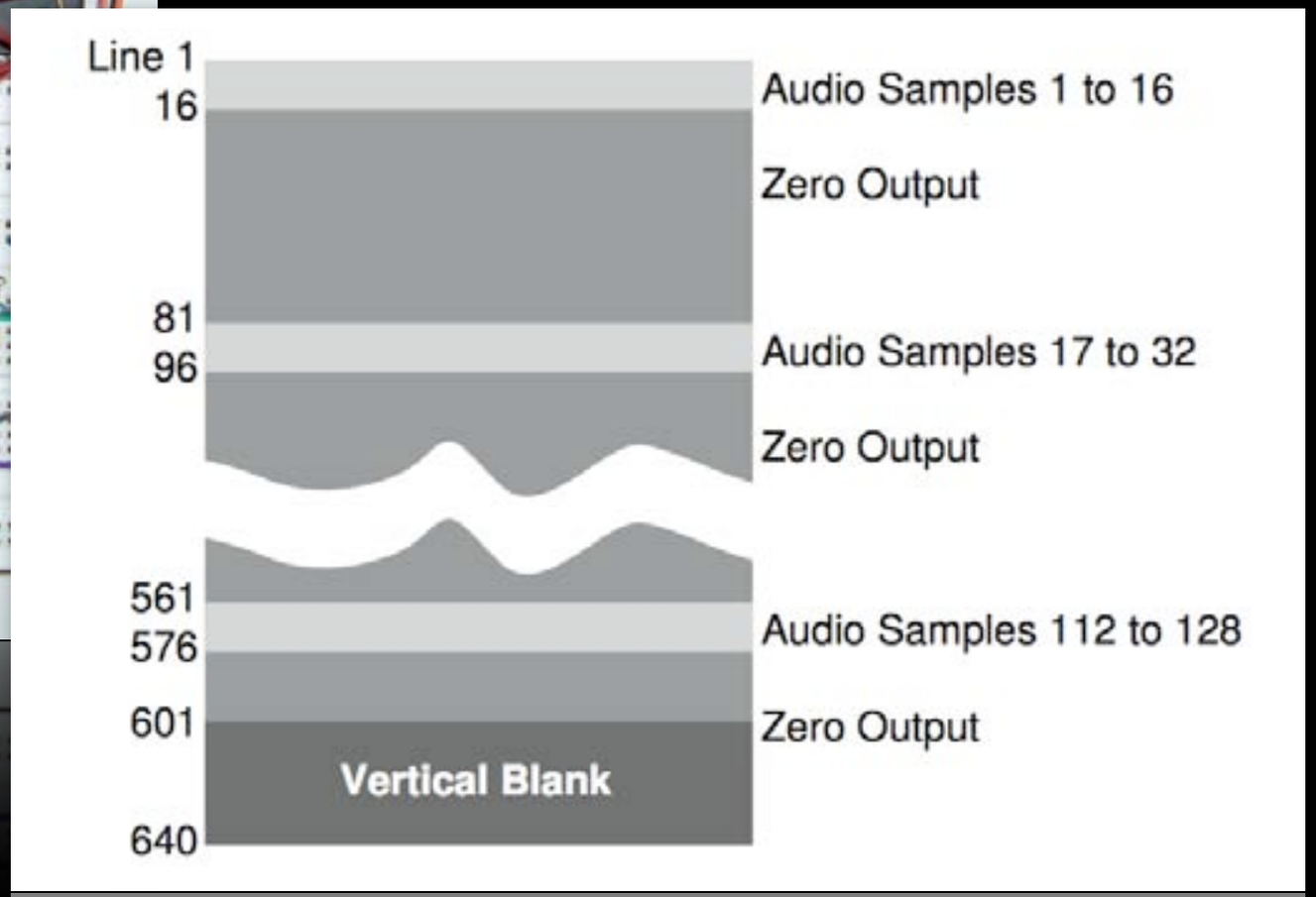
- GPU computes level of each audio file
- Work in progress:
    - Audio mixing on GPU
    - Headphone spatialization on GPU: head-related transfer functions
    - GPU computes self-organizing map

Constraints

- Bandwidth
  - 16 bit @ 44,100 kHz
    = 86 kB/s per channel
  - 1000 channels float = 172 MB/s
    but no issue: PCIe 8 GB/s
- Latency
  - Buffering inevitable
  - 10 ms ⇒ 11 ft distance problematic for live music
  - Limits real-time synthesis;
    much more severe than with video

GPU-based Audio via the VGA Port

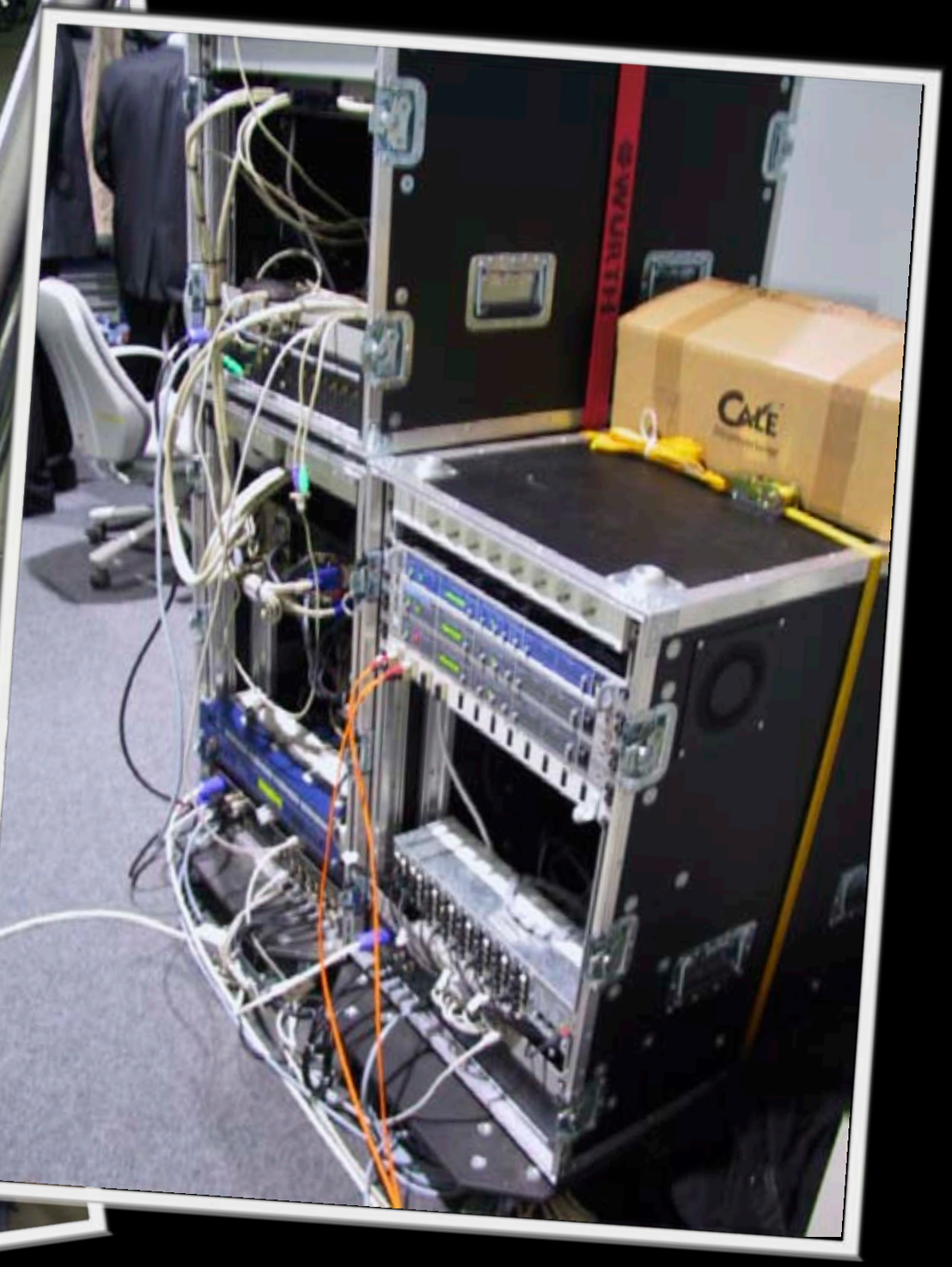



Line 1
16
Audio Samples 1 to 16
Zero Output
81
96
Audio Samples 17 to 32
Zero Output
561
576
Audio Samples 112 to 128
601
Zero Output
Vertical Blank
640

GPU-based Audio via the DVI Port?

1000 Channels of Audio via the Graphics Card

Wave Field Synthesis


CAKE

- Load sounds onto graphics card
- Compute filter kernels in real time
- Filter sounds in real time
- Different kernels for every loudspeaker in parallel
- Output all channels via the GPU

What else at Hochschule Bremen?

File System Tricks for Audio Production

„Diesen Mac" durchsuchen

Suchen nach:

Durchsuchen: Diesen Mac „sld" Inhalt Da

ZCR ist größer als 4300

ZCR ist weniger als 4500

Name	Art
bordsteinkante.wav	WAVE Audiodate
blackmask.wav	WAVE Audiodate
bordsteinkante.wav	WAVE Audiodate
explosion.wav	WAVE-Audiodate
cowbell.wav	WAVE Audiodate
cowbell.wav	WAVE Audiodate

N:\DirectX Effects

Back Search Folders Ordnersynchronisierung

Address N:\DirectX Effects

File and Folder Tasks

Other Places

My Documents
Shared Documents
My Computer
My Network Places

Details

127.0.0.1 / localhost / mysqlfs / tree | phpMyAdmin 2.9.1.1-Debian-7

File Edit View Go Bookmarks Tools Tabs Help

Back Forward Stop Reload Home History Bookmarks Smaller Larger

http://127.0.0.1/phpmyadmin/index.php?lang=en-utf-8&token=bc9ee9db2157296b985f6847d7aa9c4d

Go

phpMyAdmin

Database

mysqlfs (4)

mysqlfs (4)

data_blocks
debug
inodes
tree

	inode	parent	name	tag
	106	41	file_c	project_a
	1	NULL	/	
	41	1	all_files	
	42	1	search	
	104	41	file_a	project_a
	105	41	file_b	project_a
	107	41	file_d	project_a
	108	41	file_e	project_b
	109	41	file_f	project_a project_b
	110	41	file_g	project_b
	111	41	file_h	project_a project_b project_c
	112	41	file_i	project_b project_c
	113	41	file_j	project_c
	114	41	file_k	project_d
	158	42	project_b	
	108	158	file_e	
	109	158	file_f	
	107	150	file_d	
	109	150	file_f	
	111	150	file_h	
	112	158	file_i	
	111	158	file_h	

project_a

6 Objekte, 512 MB verfügbar

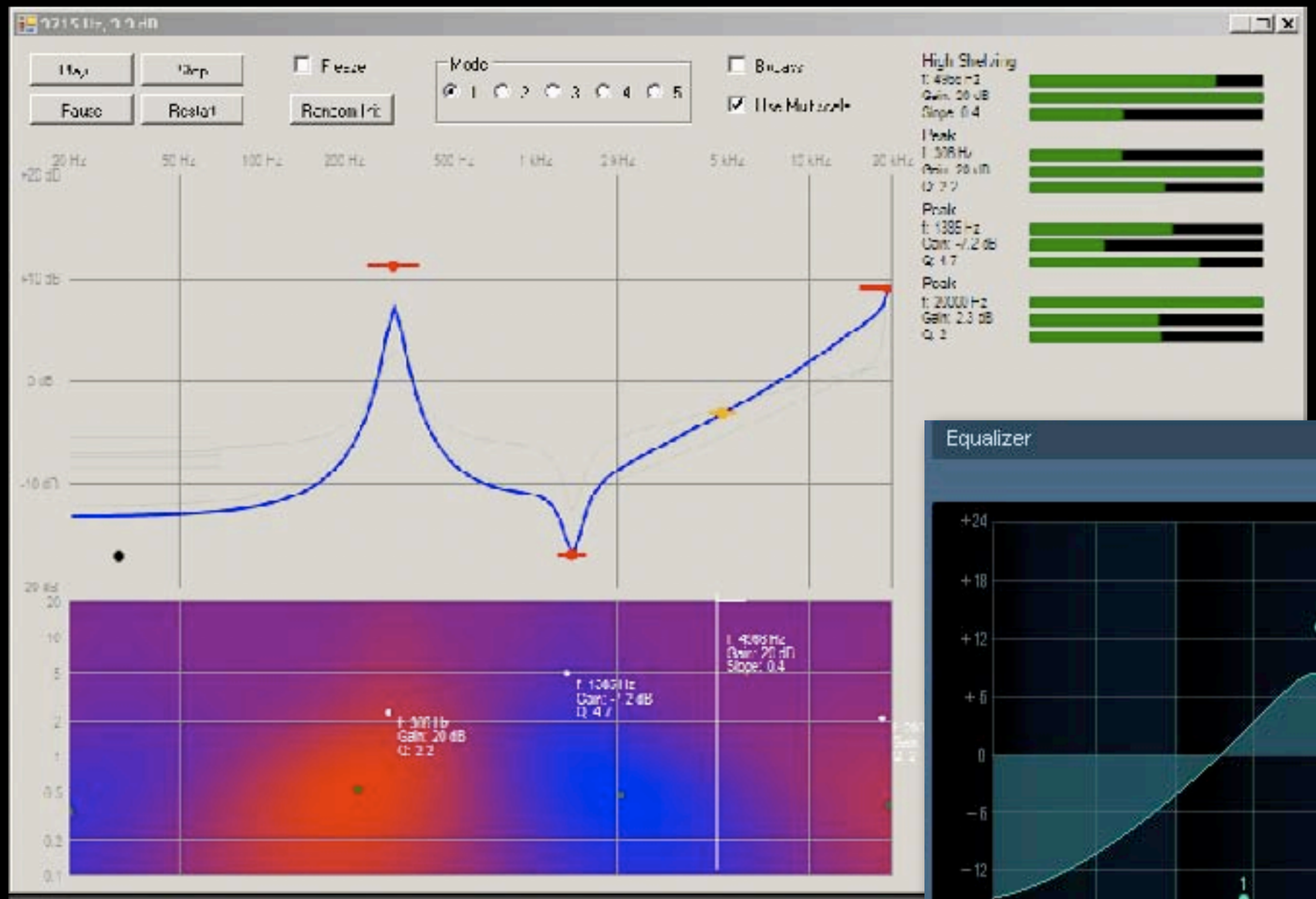
mysqlfs
mysqlfs.log
Recycled
sshfs

all_files
search

project_a
project_b

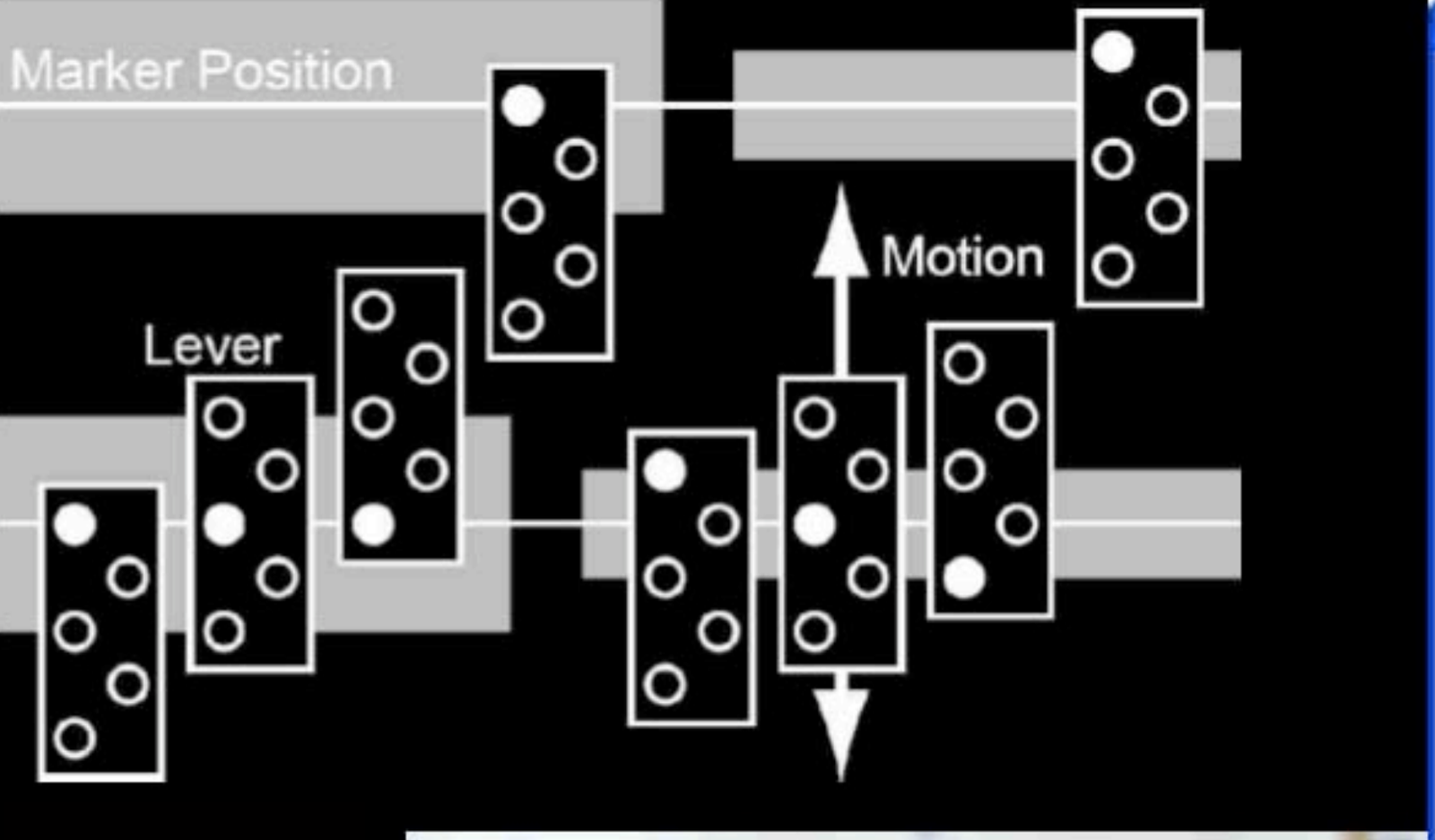
file_a
file_b
file_c
file_d
file_f
file_h

Graphical Control of a Parametric Equalizer

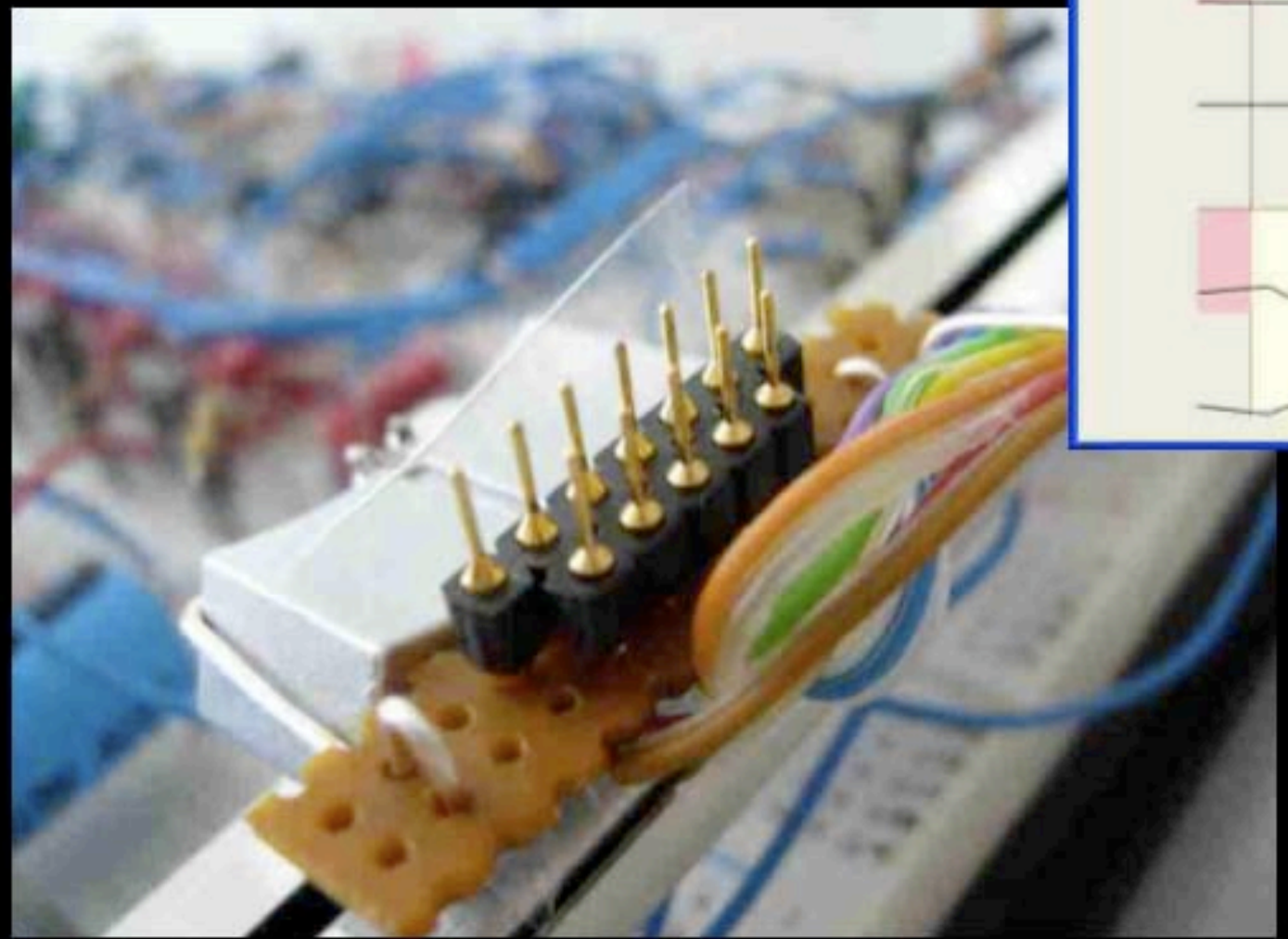

Mode
1
2
3
4
5
Fause
Restart
High Shelving
Peak
Peak
Peak

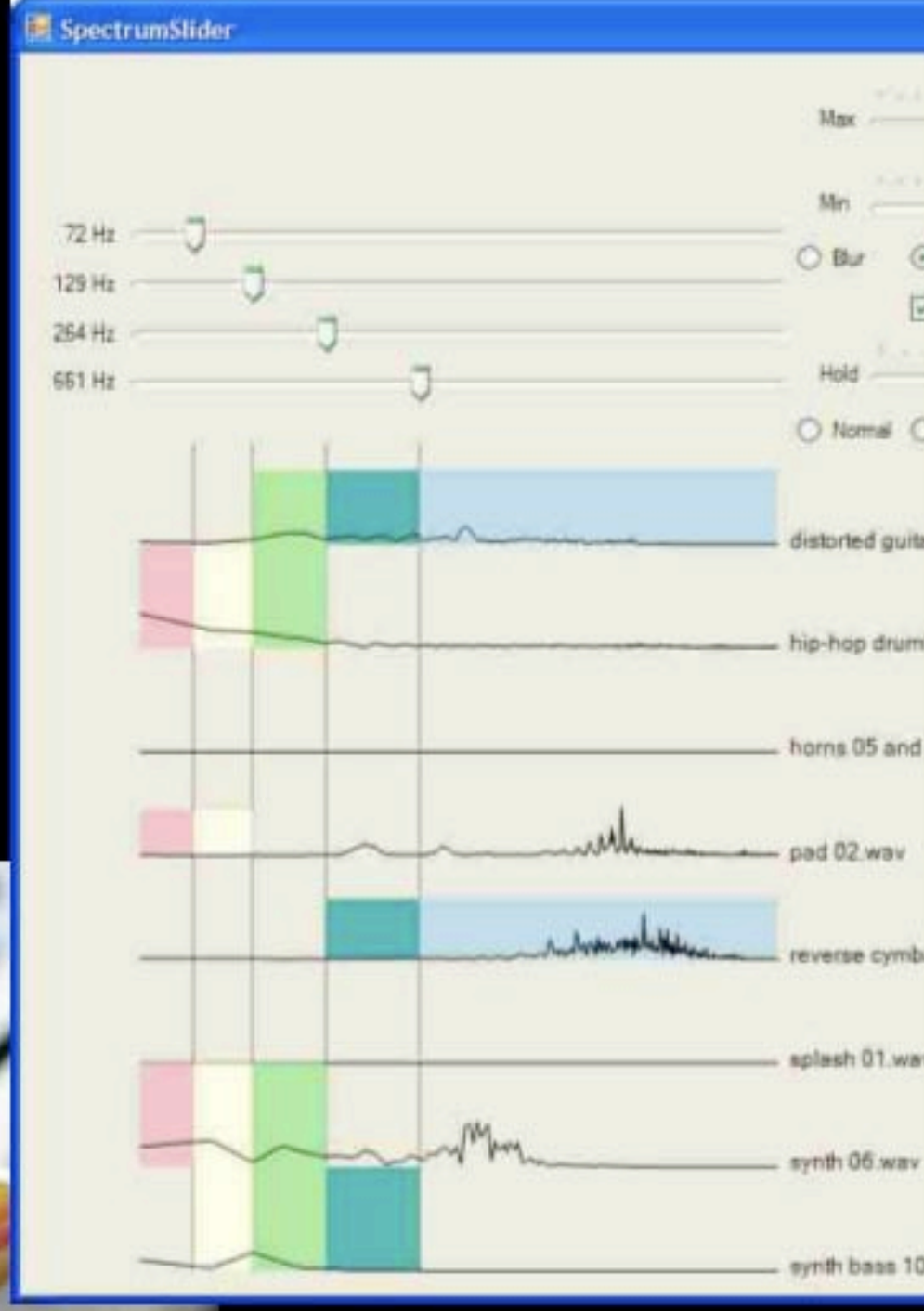
Equalizer
+24
+18
+12
+6
0
−6
−12
−18
−24
20
50
100
200
500
1k
2k
5k
10k
20k
eq 1
-15.0
184.0 Hz
Low Shelf I
6.5
eq 2
13.2
359.0 Hz
Parametric I
1.2
eq 3
-14.6
921.0 Hz
Parametric I
1.7
eq 4
11.6
8220.0 Hz
High Shelf I
7.9

Sound at Your Fingertips: An Electrotactile Fader



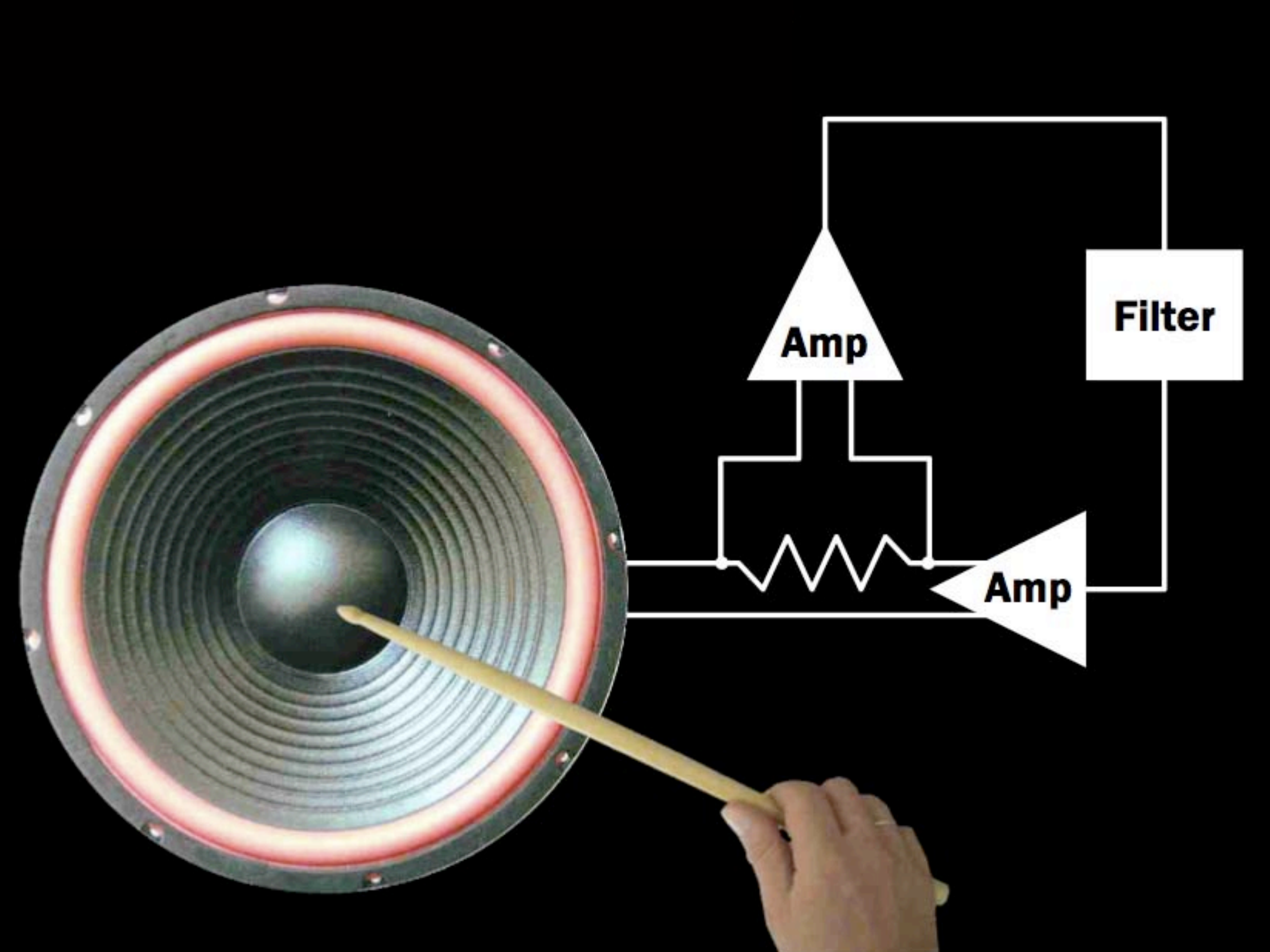
Virtual Detents





Track Identification

Reuniting Sound Control and Sound Creation


Amp
Filter
Amp

Programming a Music Synthesizer through Data Mining

Parameter Change
from Statistics or
Additional UI

Parameter Change
in Standard UI

Additional
User Interface

Statistics Engine

I = 0.53 bit

filter release

amp release

Patch
Data
Text File

VST Host

MIDI Input

VST Synthesizer

Audio Output

Native
Patch
Files

Musical Icons: Procedural Glyphs for Audio FIles

Eigene Musik

Datei Bearbeiten Ansicht Favoriten Extras ?

Musikaufgaben

Alle wiedergeben

Musik online kaufen

Datei- und Ordneraufgaben

Datei umbenennen

Datei verschieben

Datei kopieren

Datei in E-Mail versenden

Datei löschen

Andere Orte

Eigene Dateien

Gemeinsame Musik

Arbeitsplatz

Netzwerkumgebung

Name	Größe
09 Haunted (Instrumental).mp3	2.610 KB
10 - Slave To The Rhythm.mp3	6.197 KB
10 Are you descent .mp3	2.566 KB
10.Edwin Starr - Twenty Five Miles.mp3	3.218 KB
11 Blame it on the love of Rock'n'Roll.mp3	4.155 KB
11 Techno Industry.mp3	2.182 KB
12 Robot Jungle.mp3	2.737 KB
018 - John Parr - St Elmo's Fire (Man in Motion).mp3	4.888 KB
18 footloose.mp3	2.962 KB
72 - Aerosmith - Walk This Way.mp3	8.674 KB
Ain't nobody.mp3	
Chapel Of Love.mp3	
Doobie Brothers - Dan	
Doobie Brothers - Lon	
mp4_cq2.mp3	
The Streets - a grand	
The Streets - a grand	
The Streets - a grand	
The Streets - a grand	
The Streets - a grand	
Whitesnake - Sweet La	
Whitesnake - Youre Go	

Interpret: Aerosmith Albumtitel: Toys in the Attic Jahr: 1980 Titelnummer: 72 D

Eigene Musik

Datei Bearbeiten Ansicht Favoriten Extras ?

Zurück Suchen Ordner

Adresse C:\Dokumente und Einstellungen\Sebastian\Eigene Dateien\Eigene Musik

Wechseln zu

Ordner

Desktop

Eigene Dateien

Eigene Bilder

Eigene Musik

Gamez

Toolz

Arbeitsplatz

Netzwerkumgebung

Papierkorb

01 Titel 1.mp3
Unbekanntes Album (30.09.20...

02 - The Four Tops - Loco In Acapulco - EMG - www.clit...
The Four Tops

02 Crawl.mp3
Parallax Software
Descent II Score

02 Titel 2.mp3
Mitch Hilford
Trouble in Mind

03 Glut.mp3
Parallax Software
Descent II Score

03 Titel 3.mp3
Unbekannter Interpret
Unbekanntes Album (02.06.20...

04 Gunner Down.mp3
Parallax Software
Descent II Score

05 Cold Reality.mp3
Parallax Software
Descent II Score

06 Looking Up.mp3
Michel Petrucciani
Live

06 Ratzez.mp3
Parallax Software
Descent II Score

07 Crush.mp3
Parallax Software
Descent II Score

08 Untitled.mp3
Parallax Software
Descent II Score

Interpret: Helge Schneider Albumtitel: The Best Of Jahr: 2003 Titelnummer: 17 Dauer: 00:03:0 4,23 MB

Arbeitsplatz

Acoustic Features

Icon Parameters

Training

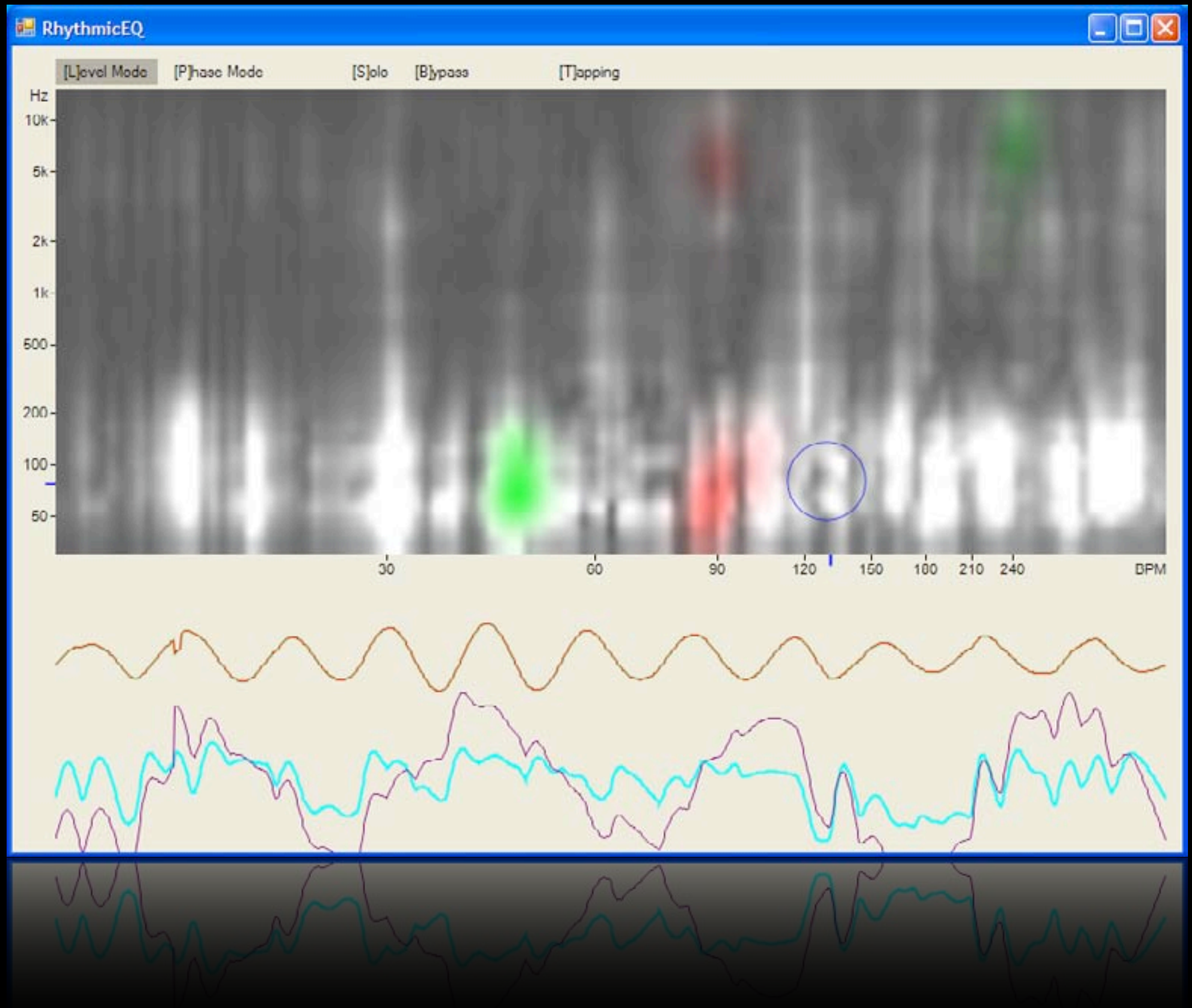
Neural Network

Retrieval

Acoustic Features

Icon Parameters

A Rhythmic Analyzer and Equalizer

Rhythmic Frequency (Beats per Minute)

Audio Frequency