



Spatial Audio Presentation

• •

By Jackson, Thomas and Mari



Dramaturgy

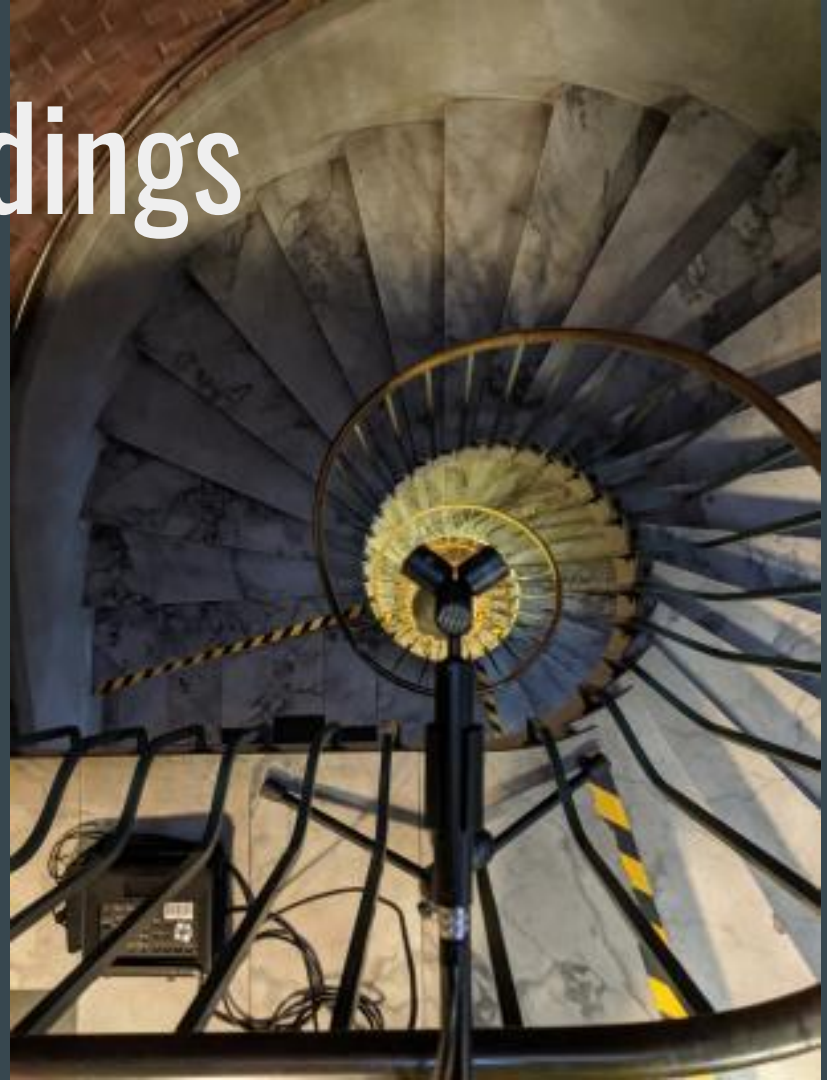
- A journey through space and time:
 1. Guitar in the rain
 2. A surreal elevator
 3. The train station
- Trying to find peace in a disturbing world
- Transitions threaded throughout

Ambisonics recordings

Soundfield microphone

First order, A format (converted to B format)

With four microphone cardioid capsules arranged in a tetrahedron



Thomas' section

Scene rotation



RoomEncoder



Concept

- Searching for calmness - inner turmoil
- Cyclic movements
- Introspective reflections

Aesthetic and technical choices

- Musical spatiality - inability to localize sounds
- Piece in a piece
- Limitations - forced and intentionally
- Spoken words

Evaluation

- The dramaturgy is in place but the technical part could use more work
- Further exploration of the aural architecture
- Limited time due to illness - stay healthy



Jackson's section

An elevator through sound!



Some ideas...

CINEMATIC USE OF SPACE

Some composers use microphone techniques and spatial processing in a manner similar to the cinematic use of camera angle, lens perspective (width), and depth of field. Accordingly, a trend toward cinematic use of space is seen in compositions that feature dramatic contrasts between sounds that are captured close in proximity and those that are distantly reverberated. Luc Ferrari's *Presque rien no. 1* (1970) pioneered this approach. (Notably, Ferrari was also visually sophisticated and directed several important films, including his series *Les Grandes Répétitions* [The Great Rehearsals].) Another classic example of audio cinematics is *Sud* (1985) by Jean-Claude Risset. In the first example, we hear wind in the background and insects in the foreground mixed with high-pitched synthetic flutterings and resonant filter effects.

Composing Electronic Music
Roads, 2015

SPATIAL AUDIO

Peter Svensson, NTNU/IES

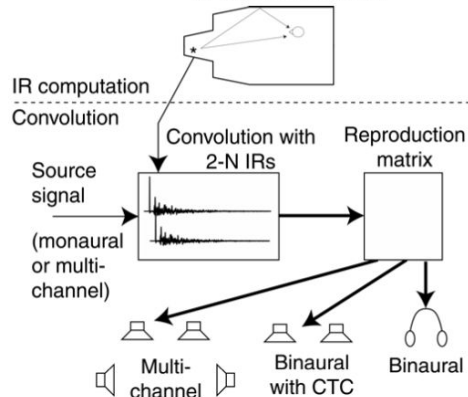


Figure 7 Illustration of the processing involved in auralization of an environment, such as a concert hall. A so-called impulse response (IR) is computed to contain the spatial information about the acoustic information, encoded into some spatial audio signal format. A recorded “dry” signal is then filtered with this impulse response.

Lecture notes
Svensson, 2020

Opening a backpack

The image displays a DAW interface with several tracks and a detailed view of an Ambix-Encoder plugin.

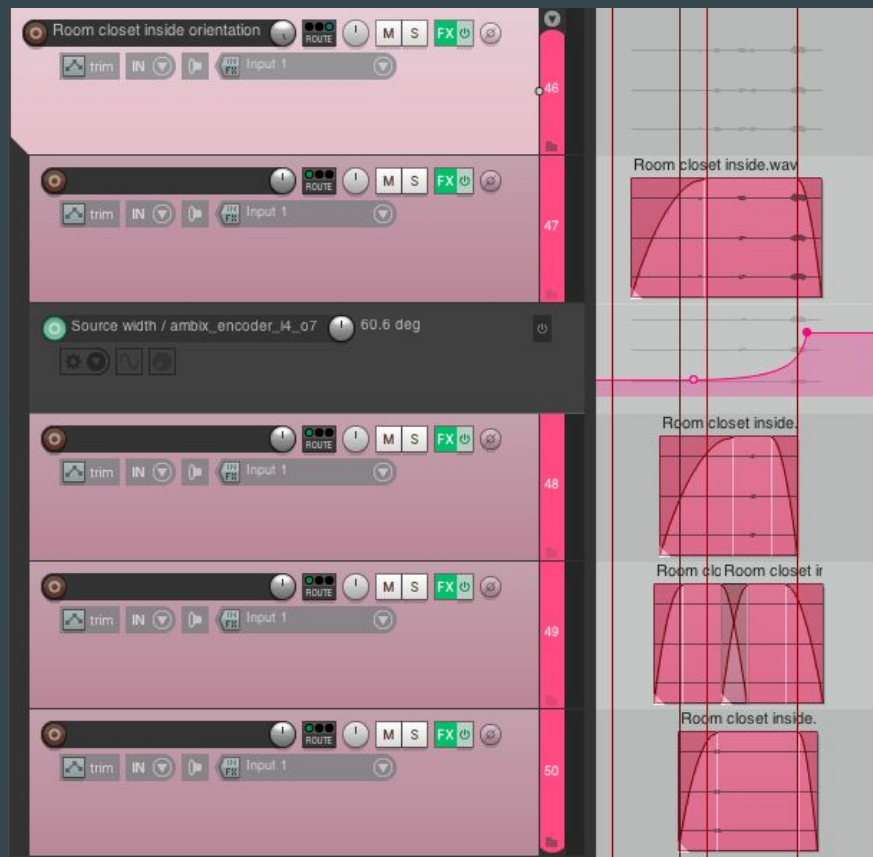
Tracks (Left Panel):

- Guitar (convolved) [chan 1] (39)
- Guitar (convolved) [chan 2] (40)
- Guitar (convolved) [chan 3] (41)
- Room zipper backpack (42)
- Azimuth / ambix_encoder_H_ (72.53 deg) (43)
- Source width / ambix_encode (17 deg) (43)
- Azimuth / ambix_encoder_H_ (132 deg) (44)
- Source width / ambix_encode (24 deg) (44)
- Azimuth / ambix_encoder_H_ (89.03 deg) (45)
- Source width / ambix_encode (19 deg) (45)
- Room closet inside orientation (46)

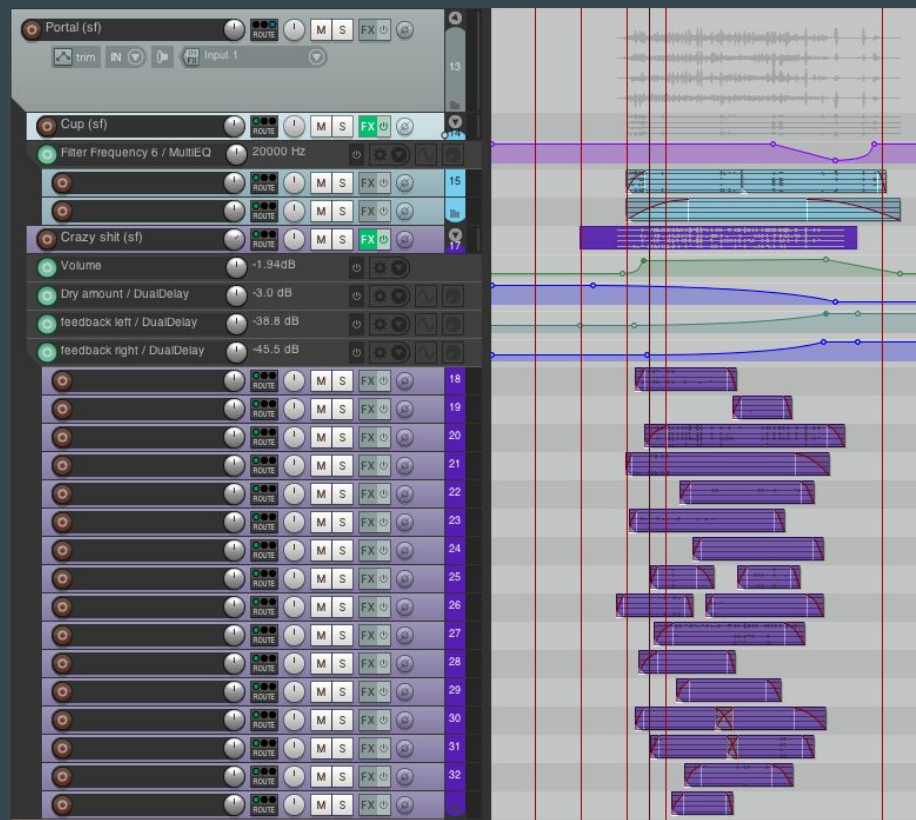
AMBIX-ENCODER (Right Panel):

- FX: Track 43
- VST: ambix_encoder_i4_o7 (kronla)
- No preset | Param | 4 in 64 out | UI | Checkmark
- AMBIX-ENCODER ID: 5
- Visualizer: A 3D sphere with a yellow highlight on its surface.
- Parameters:
 - elevation: 0
 - azimuth: 73
 - azimuth move: 0 deg/s
 - elevation move: 0 deg/s
 - max speed: 90
- Buttons: Add, Remove
- Footer: 2.0%/2.0% CPU 0/0 spls, size multiple source width, v0.2.10

Inside a dresser



Some wild drum sticks



Opening a drawer

The image displays a digital audio workstation (DAW) interface with several key components:

- Drawer (Left):** A vertical list of audio processing modules. The top section shows a 'Drawer' header with 'trim', 'IN', and 'Input 1' options. Below are two 'Filter Frequency 1 / MultiEQ' modules with frequencies of 34 Hz and 1131 Hz. The main list includes:
 - Filter Frequency 1 / MultiEQ (49 Hz)
 - Filter Frequency 6 / MultiEQ (2097 Hz)
 - Azimuth / ambix_encoder_i4_1 (-86.5 deg)
 - Filter Frequency 1 / MultiEQ (27 Hz)
 - Filter Frequency 6 / MultiEQ (1935 Hz)
 - Azimuth / ambix_encoder_i4_1 (-3.81 deg)
 - Filter Frequency 1 / MultiEQ (22 Hz)
 - Filter Frequency 6 / MultiEQ (3011 Hz)
 - Azimuth / ambix_encoder_i4_1 (-117. deg)
 - Filter Frequency 1 / MultiEQ (171 Hz)
 - Filter Frequency 6 / MultiEQ (1903 Hz)
 - Azimuth / ambix_encoder_i4_1 (82.92 deg)
- Central Area:** A piano roll view showing a grid of notes and lines in various colors (pink, purple, blue) across multiple tracks.
- AMBIX-ENCODER (Right):** A control window for 'AMBIX-ENCODER' (ID: 1) on 'FX: Track 59'. It features:
 - Checkmarks for 'VST: MultiEQ (iEM) (64ch)' and 'VST: ambix_encoder_i4_o7 (kronlae)'. CPU usage is shown as 0.6%/1.2% CPU 0/0 spls.
 - A 3D sphere with three yellow dots on its left side.
 - An 'elevation' slider set to 0.
 - An 'azimuth' slider set to -87.
 - Buttons for 'azimuth move' and 'elevation move', both set to 0 deg/s.
 - A 'max speed' slider set to 90.
 - Additional controls for 'size' and 'multiple source width'.
 - Version 'v0.2.10' in the bottom right corner.

Some nice rotations

The image displays four screenshots of the AMBIX-ENCODER software interface, arranged in a 2x2 grid. Each screenshot shows a 3D sphere representing a speaker layout with five yellow dots indicating speaker positions. The interface includes controls for elevation and azimuth, movement speeds, and maximum speed. The top-left screenshot shows an azimuth of -99 and an elevation of 0. The top-right screenshot shows an azimuth of -127 and an elevation of 0. The bottom-left screenshot shows an azimuth of -11 and an elevation of 0. The bottom-right screenshot shows an azimuth of 68 and an elevation of 0. The interface also features buttons for 'Add' and 'Remove', and a 'max speed' slider set to 90. The version number v0.2.10 is visible in the bottom right of each screenshot. The CPU usage is shown as 0.4%/1.3% for the top row and 0.3%/1.0% for the bottom row.

AMBIX-ENCODER ID: 1
elevation 0
azimuth -99
0 deg/s azimuth move
0 deg/s elevation move
max speed 90
size multiple source width v0.2.10
0.4%/1.3% CPU 0/0 spls
Add Remove

AMBIX-ENCODER ID: 1
elevation 0
azimuth -127
0 deg/s azimuth move
0 deg/s elevation move
max speed 90
size multiple source width v0.2.10
0.3%/1.0% CPU 0/0 spls
Add Remove

AMBIX-ENCODER ID: 1
elevation 0
azimuth -11
0 deg/s azimuth move
0 deg/s elevation move
max speed 90
size multiple source width v0.2.10
0.3%/1.0% CPU 0/0 spls
Add Remove

AMBIX-ENCODER ID: 1
elevation 0
azimuth 68
0 deg/s azimuth move
0 deg/s elevation move
max speed 90
size multiple source width v0.2.10
0.3%/1.0% CPU 0/0 spls
Add Remove

Thomas's guitar (with convolution)

FX: Track 38 "Guitar (convolved SF)" (folder)

- VST: sparta_multiconv (AALTO) (64ch)
- VST: sparta_matrixconv (AALTO) (64ch)
- VST: MultiEQ (IEM) (64ch)
- VST: mcfx_convolver4 (kronlachne)
- AU: SurroundZone2 (SoundField L)
- VST: ambix_converter_o3 (kronlachne)
- VST: ambix_rotator_o3 (kronlachne)
- VST: MultiEQ (IEM) (64ch)

0.4%/3.6% CPU 1536/2048 spls

MCFX-CONVOLVER
multichannel non-equal partitioned convolution matrix

Preset: **3_b_format (saved within project)** open

Save preset within project

OSC receive port: 7200

Input channels: 3

Output: zeb_ir3_b_format

Impulse: zeb_ir3_old_b_format

- Lady-Chapel-StAlbans-Cathedral
- R1-Nuclear-Reactor-Hall
- st-patricks-church-patrington
- terrys-typing-room
- uhj_ambisonics
- ZEB**

Configuration loaded, maximum filter length: 1.16(s), 558
Plugin Latency: 1536 [smples]

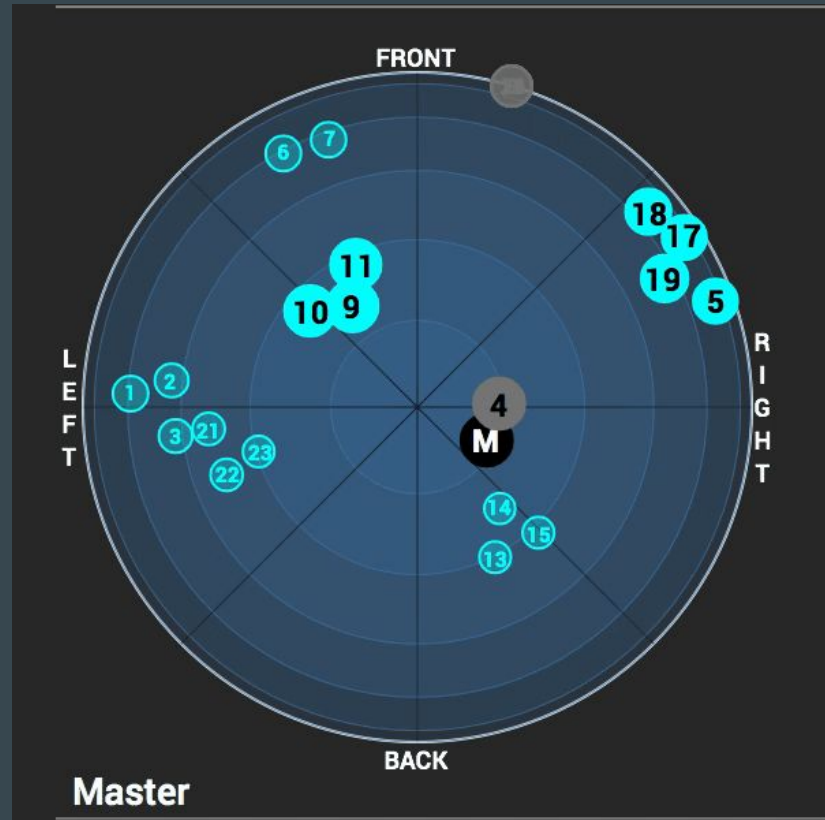
conv # 12
/Users/jacksongoode/Library/Caches/mcfx_convolver4/temp_7a94
Zebb/ZEB_IR3_SN3D.wav (55878 smples) loaded

conv # 11
/Users/jacksongoode/Library/Caches/mcfx_convolver4/temp_7a94

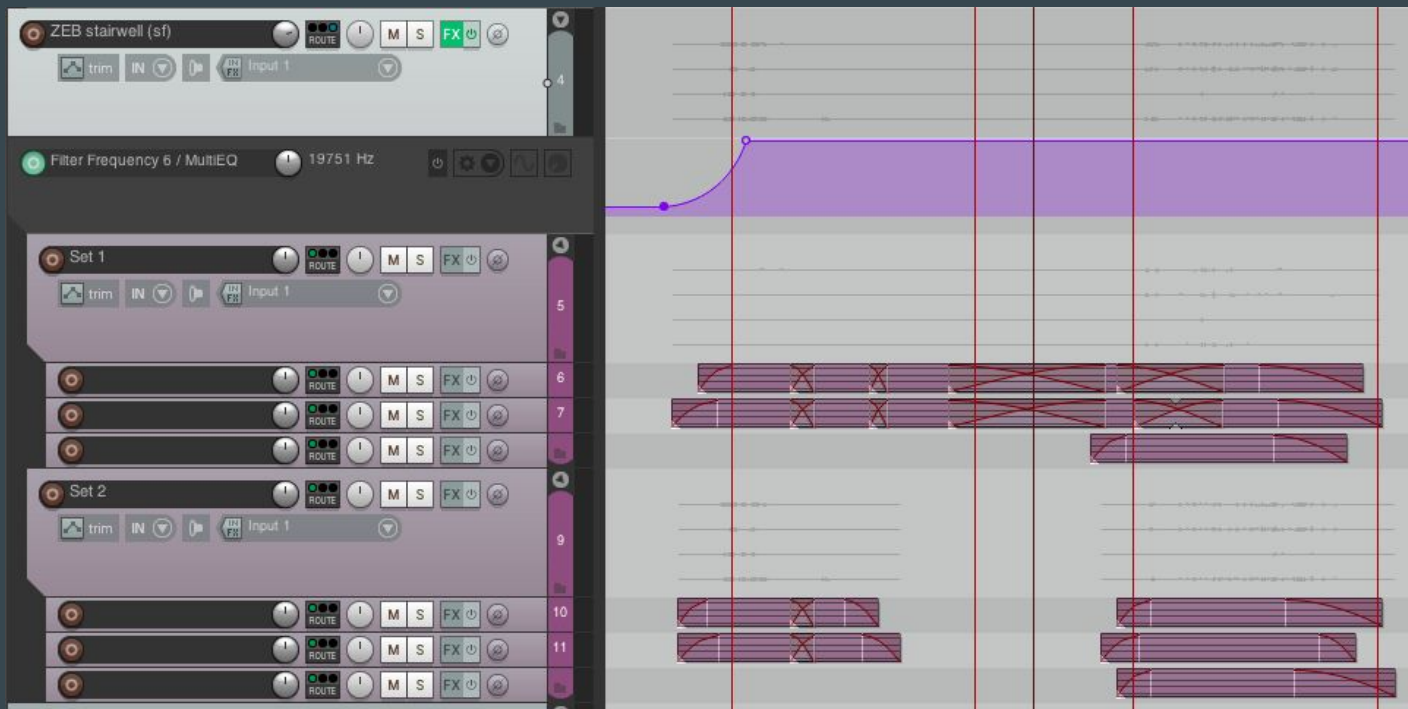
debug window skipped cycles: 0 v0.5.11

Rotating a plastic bag

Looks cool!



Recording in ZEB



Evaluation

In reflection:

- Impossible spaces, and disorienting transitions
- Some spatial manipulations: cool in theory, boring in practice

In reality...

- Some plugins are frustrating (looking at you Sparta!)
- I need a newer laptop
- Shortcuts are your friend (and worth setting up)
 - Much of this workflow changed choices both from an artistic and technical project



“... we can consider the following tactics when composing immersive sound-fields: an awareness of lateral reflections and late reverberation (from room acoustics), an avoidance of directionally emphasised variations in spectral content (from perception), an understanding of the space as both listener and composer, and if we wish to surround the listener with sources, the number should be significant so that our attention cannot fall on any one direction for any length of time.” (Barrett, forthcoming, p.10)

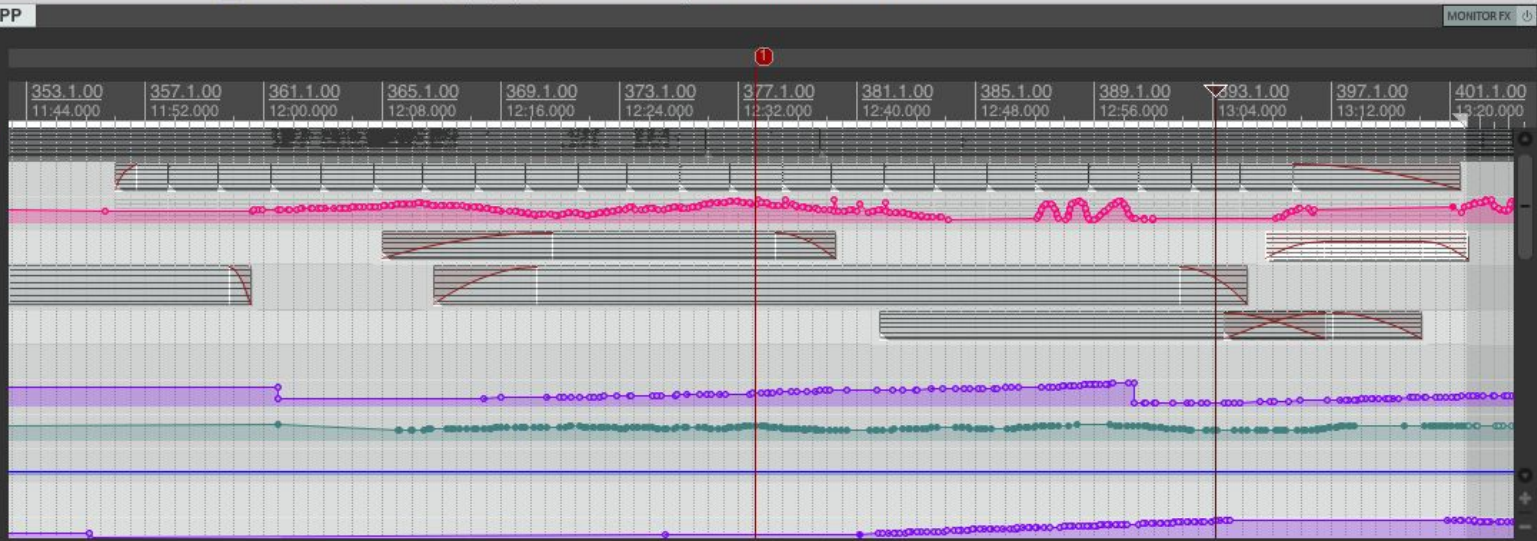


Acoustic Sculpture / Train Station

Week-2 example1.RPP *Train_station.RPP

200102_014_6ch 1 M
 stamps 2
 1: Shift (full range) / -16.86 s@
 tog 3
 vocals 4
 vocals2 5
 ambix encoder 6
 Azimuth / ambix_en -157. deg
 Elevation / ambix_e -32.5 deg
 Size / ambix_encod 0.01
 ambix encoder2 7
 Azimuth / ambix_en 174 deg

mono-encoder [Input] Input 1



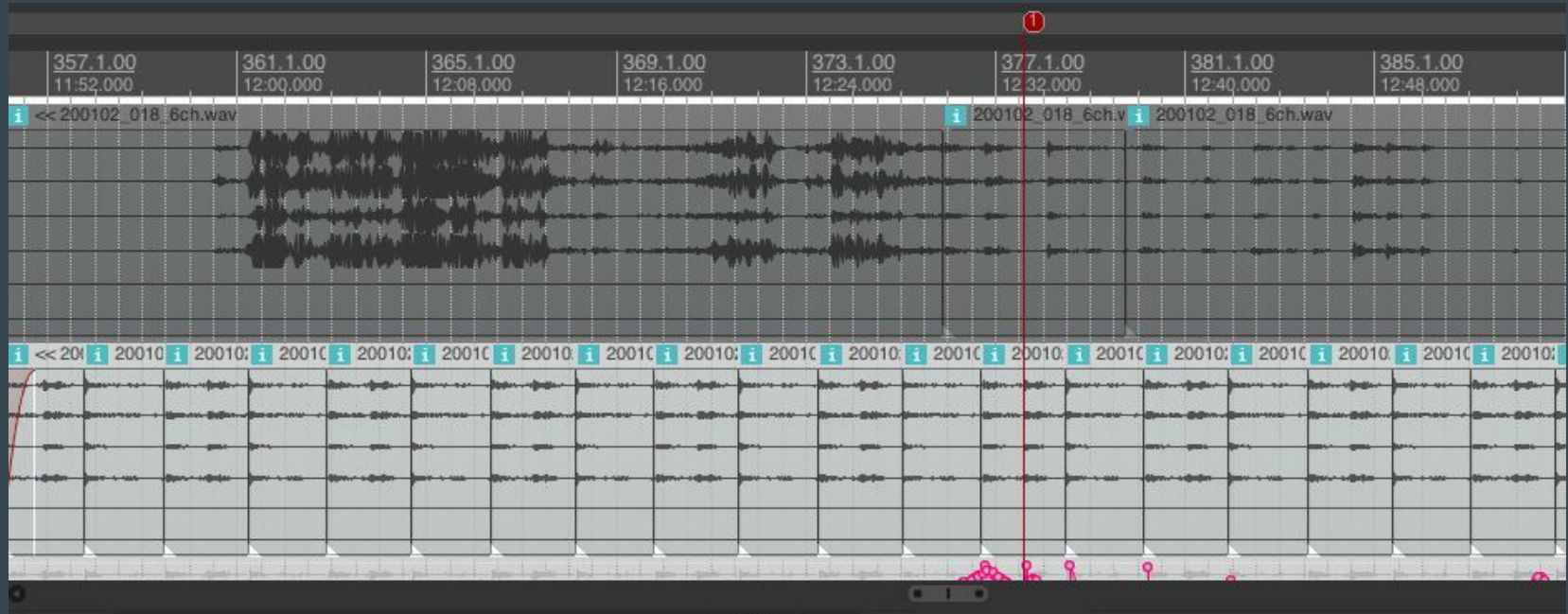
393.1.40 / 13:04.198 [Stoppec] BPM 120 4/4 Rate: 1.0 Selection: 351.2.03 401.3.32 50.1.29

FX ROUTING MONO

MASTER 200102_014_6c stamps tog vocals vocals2 ambix encoder ambix encod...2 decoder mono sound mono sound2 mono sound3 mono sound4 mono-encoder

Mixer section with 13 channels, each with gain, pan, and solo controls.

1. All of the recordings are from Nationaltheatret train station.
2. Trample sounds forms a slow beat (action sounds).
3. Reverberation from acoustic sculpture





AMBIX-CONVERTER

convert between Ambisonics formats

Presets

	Input	Output
Channel sequence	ACN	ACN
Normalization	SN3D	SN3D
	<input type="radio"/> 2D	<input type="radio"/> 2D

Mirror

- left <> right
- front <> back
- top <> bottom

Invert Condon-Shortley

v0.2.10

FX: Track 2 "stamps"

No preset Param 6 in 6 out UI

INPUT

B FORMAT

W X Y Z TRIM

INVERT END FIRE HI PASS

OUTPUT

5.1

L/R C LFE LS/RS

S M S M S M S M

SURROUND CONTROLS

MIC ORIENTATION

ROTATION

FRONT TILT

REAR TILT

ZOOM

WIDTH

L / R

LS / RS

POLARS

L / R

C

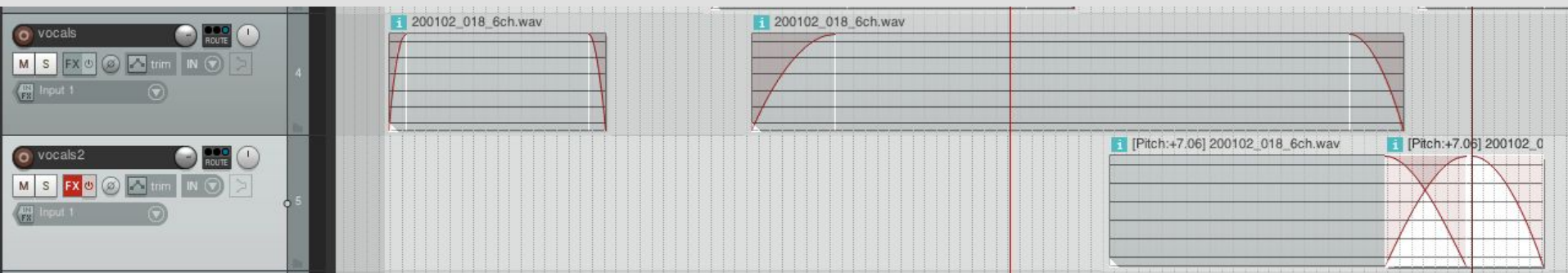
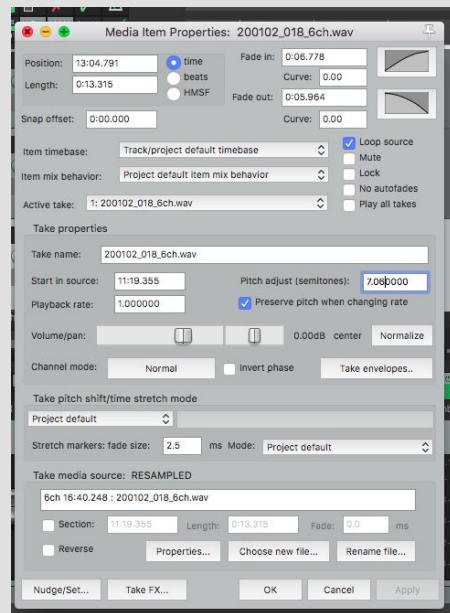
LS / RS

SURROUND ZONE 2

V: 1.0.0 64 bit AU

© 2013 SoundField TSL

Vocal recordings from the Acoustic sculpture





Routing for track 6 "ambix encoder"

Master send Parent channels: 1-16
+0.00 dB Track channels: 16
Pan: center Width: 100%

- Sends -
Add new send...

- Audio Hardware Outputs -
Add new hardware output...

- MIDI Hardware Output -
<no output>
Send to original channels

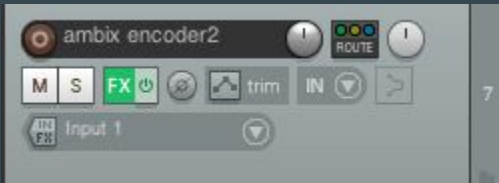
- Receives -
Add new receive...

Receive from track 1 "200102_014_6ch" (6 ch) Delete
+0.00 center M Post-Fader (Post-Pan)
Audio: 1-4 MIDI: All

Receive from track 3 "log" (6 ch) Delete
+0.00 center M Post-Fader (Post-Pan)
Audio: 1-4 MIDI: All

Receive from track 4 "vocals" (6 ch) Delete
+0.00 center M Post-Fader (Post-Pan)
Audio: 1/2 MIDI: All

Receive from track 6 "vocals2" (6 ch) Delete
+0.00 center M Post-Fader (Post-Pan)
Audio: 1/2 MIDI: All



Routing for track 7 "ambix encoder2"

Master send Parent channels: 1-16
+0.00 dB Track channels: 16
Pan: center Width: 100%

- Sends -
Add new send...

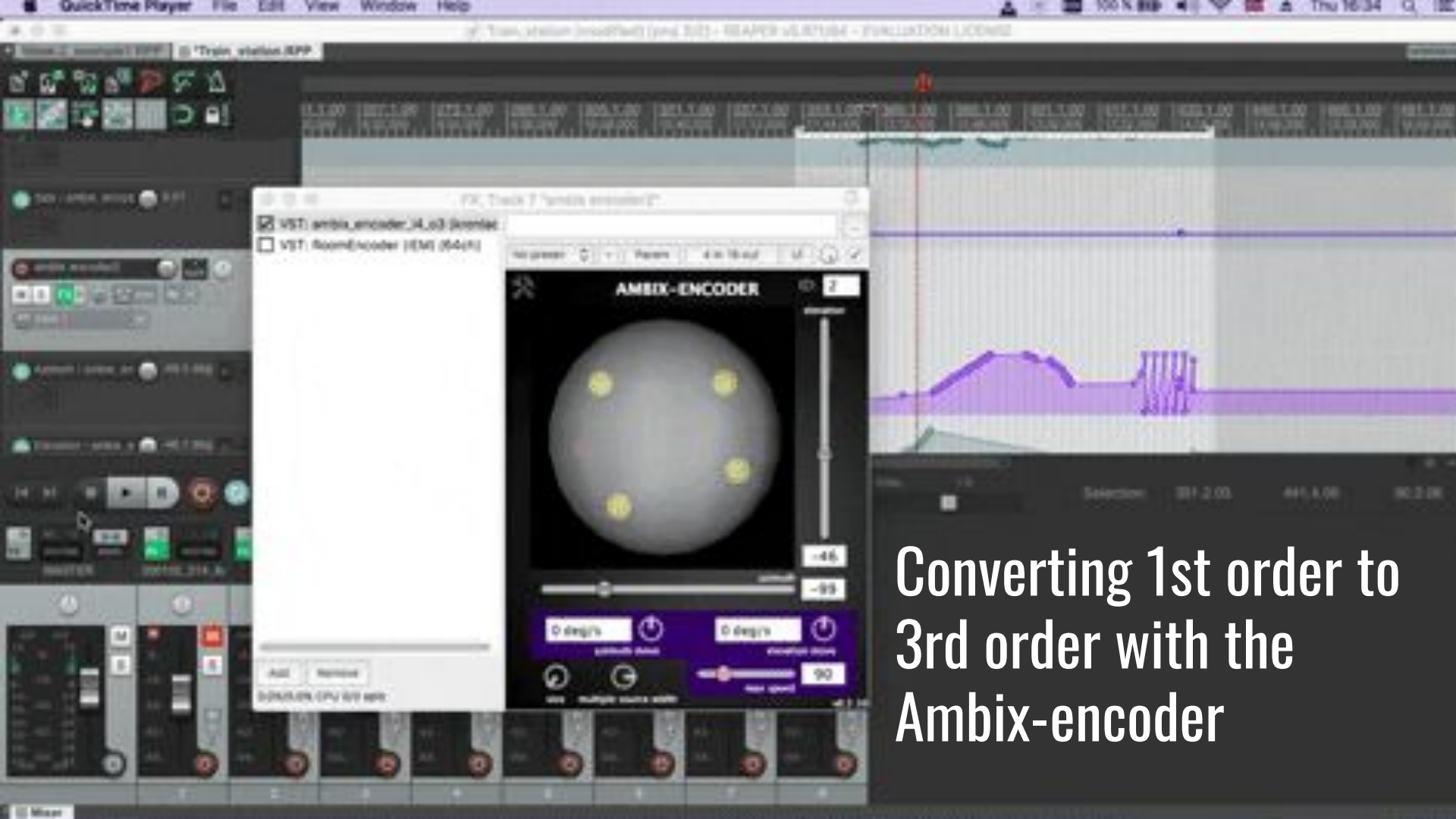
Send to track 8 "decoder" (4 ch) Delete
+0.00 center M Post-Fader (Post-Pan)
Audio: 1-4 MIDI: All

- Audio Hardware Outputs -
Add new hardware output...

- MIDI Hardware Output -
<no output>
Send to original channels

- Receives -
Add new receive...

Receive from track 2 "stamps" (6 ch) Delete
+0.00 center M Post-Fader (Post-Pan)
Audio: 1-4 MIDI: All



Converting 1st order to 3rd order with the Ambix-encoder

FX: Track 7 "ambix encoder2"

VST: ambix_encoder_i4_o3 (kronlac)

VST: RoomEncoder (IEM) (64ch)

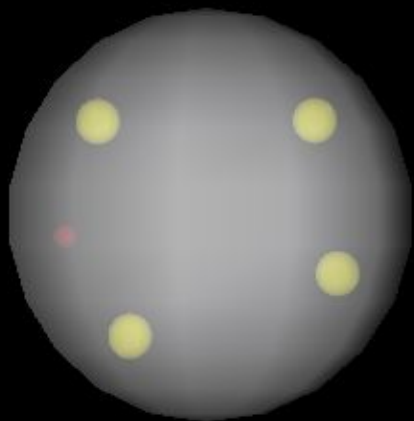
No preset



Param

4 in 16 out

AMBIX-ENCODER



azimuth



0 deg/s



azimuth move

0 deg/s



elevation move



size



multiple source width



90

max speed

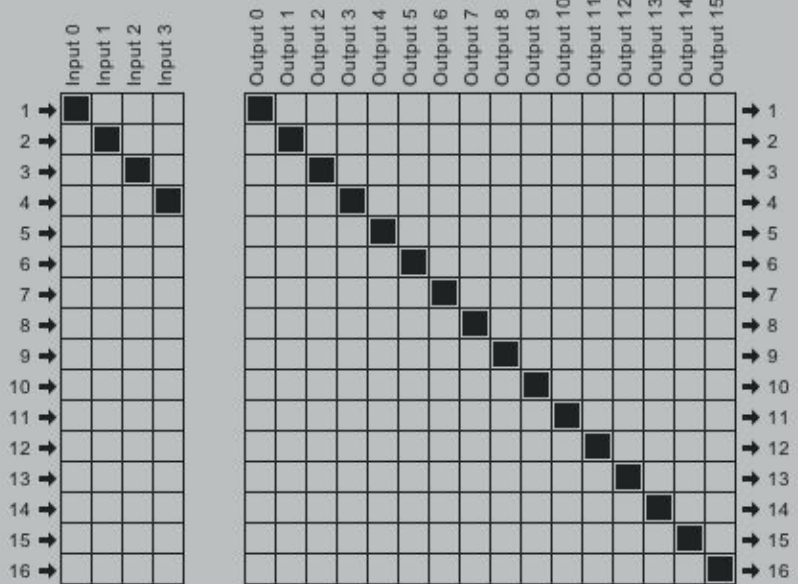
v0.2.10

Add Remove

0.2%/0.2% CPU 0/0 spls

Plug-in pin connector

I/O ?



Selection: 351.2.03 441.4.09 90.2.06

Evaluation

- If more time, more processing of sound, e.g. EQ, compressor, more effects, etc.
- A lot of background noise in the acoustic sculpture from the escalators down to the train platform. Adds a “disturbing” background layer to the whole piece
- Could have explored hybrid recording techniques during ambisonics recording section, e.g. the use of mono microphones as explained in Barret “Spatial Music Composition” (Barrett, forthcoming, p. 7)
- Many different plugins and parameters to keep track of - easy to do mistakes when you’re supposed to learn it in only two weeks with very little hands-on time

Reflections on the project in whole

- Corona restriction: limited access to portal
- Difficulties due to sickness in group
- Different kind of workflow compared to ordinary music production
- Plugins that are specific for ambisonics
- Production techniques have to be altered to work with multi-channel
- Routing is essential
- Satisfied with the final result - regarding all the struggle :D



References:

- Barrett, N. (forthcoming): “Spatial Music Composition”, in Paterson, J. & Lee, H. (Eds.), 3D Audio, Routledge
- Blesser, Barry. (2008). Aural architecture: The missing link.. The Journal of the Acoustical Society of America. 124. 2525. 10.1121/1.4782966.
- Svensson, Peter. (2020). Lecture notes.