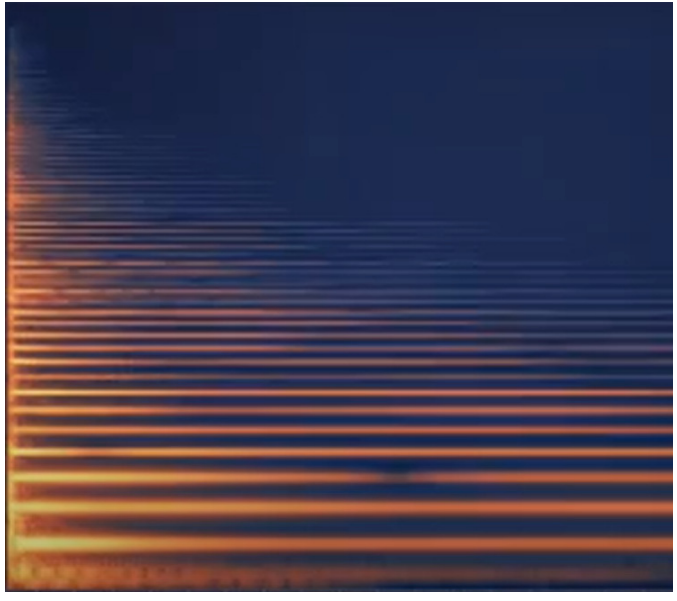
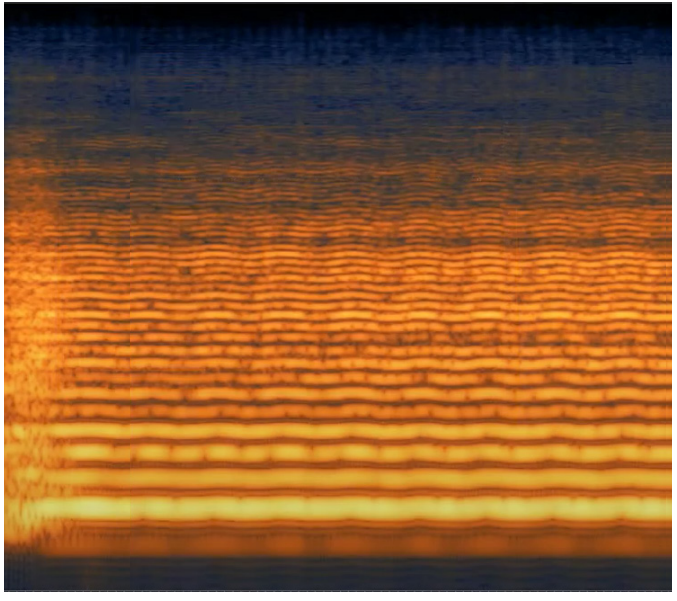
DIGITAL SOUND SYNTHESIS
03

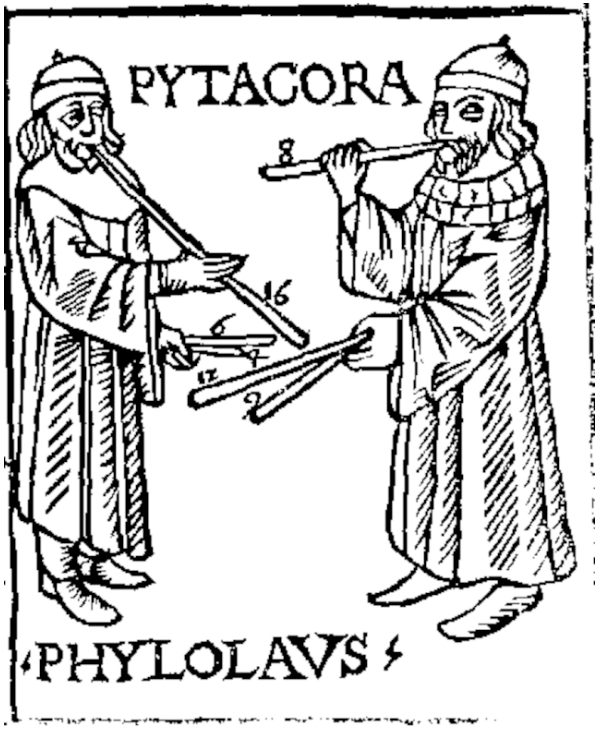




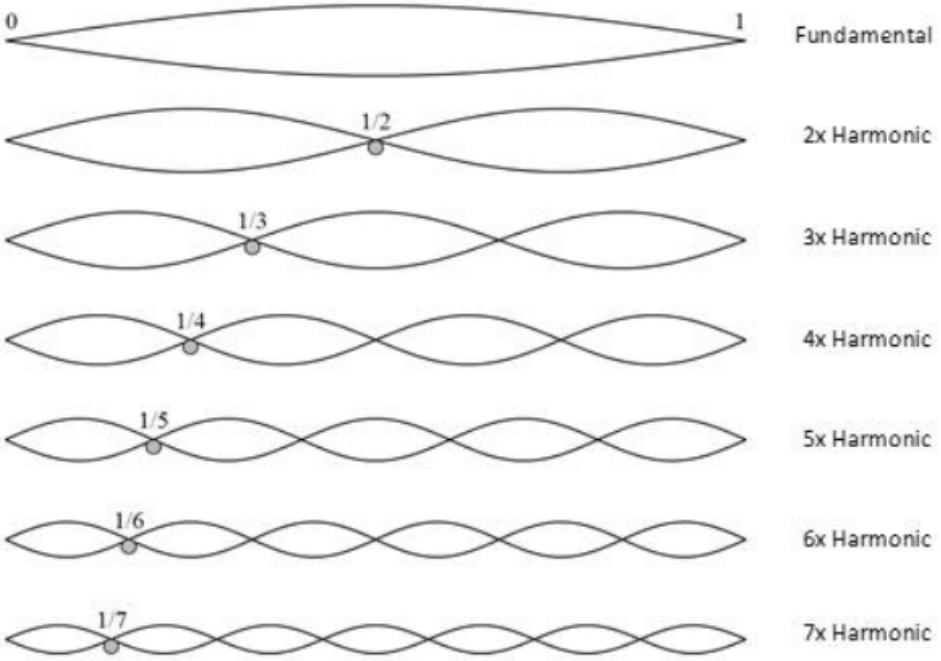
Additive synthesis

PYTHAGORAS

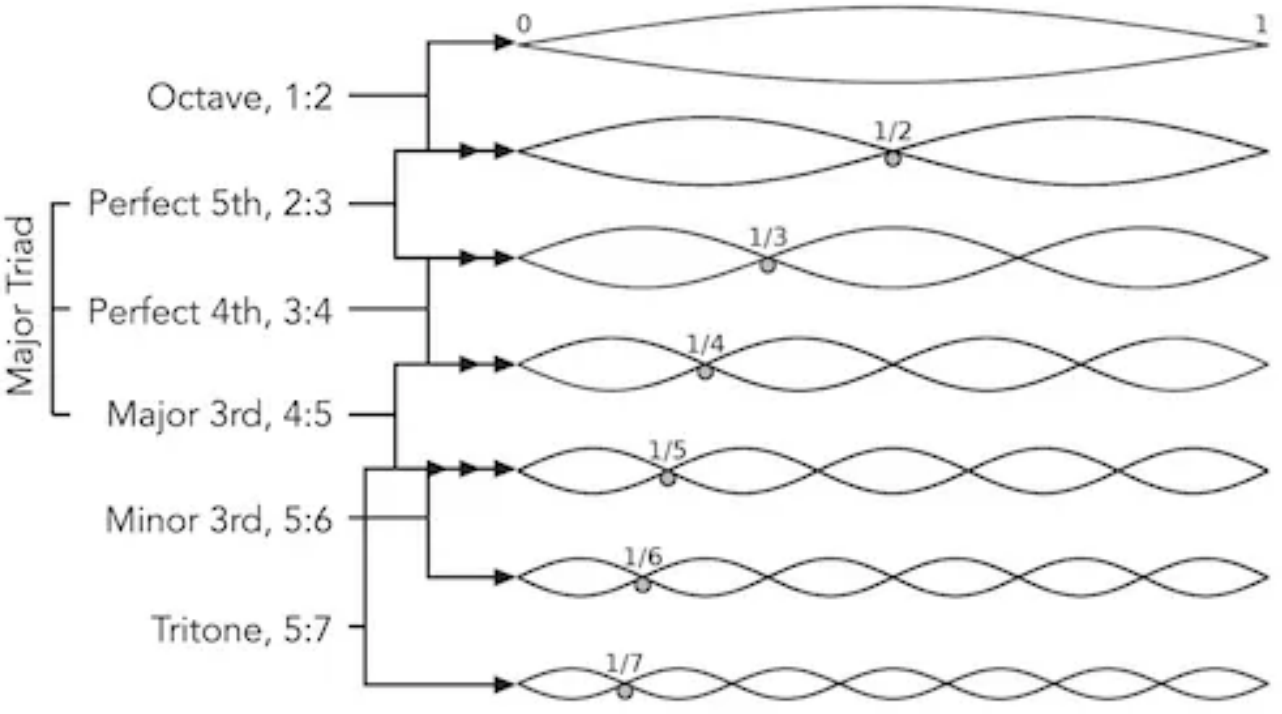
experimenting with musical pipes



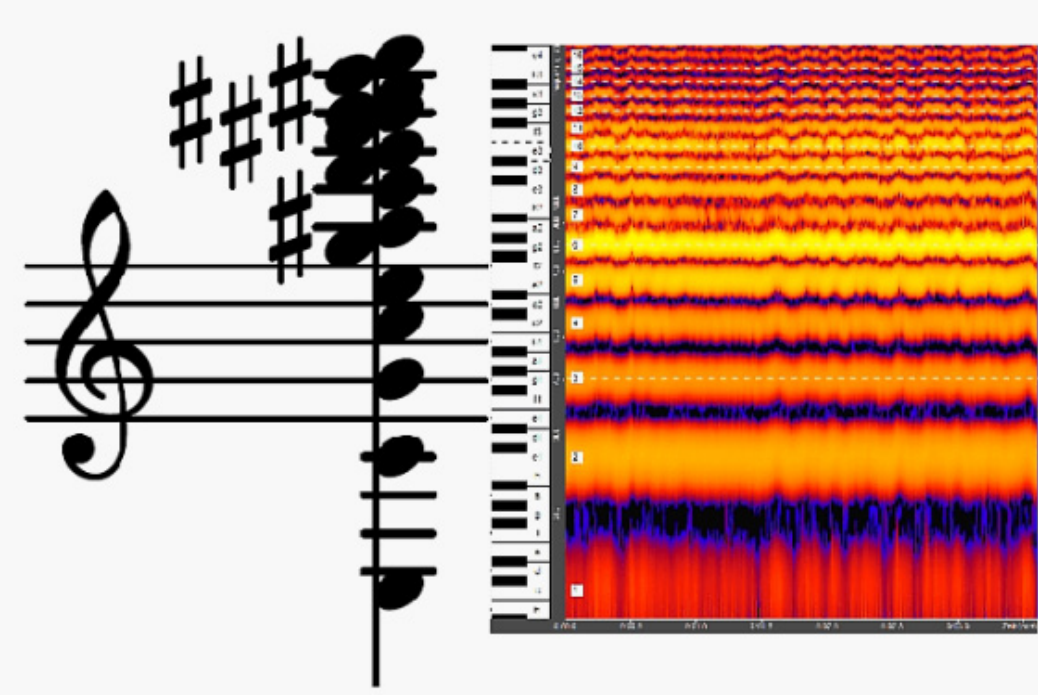
HARMONICS OF A STRING



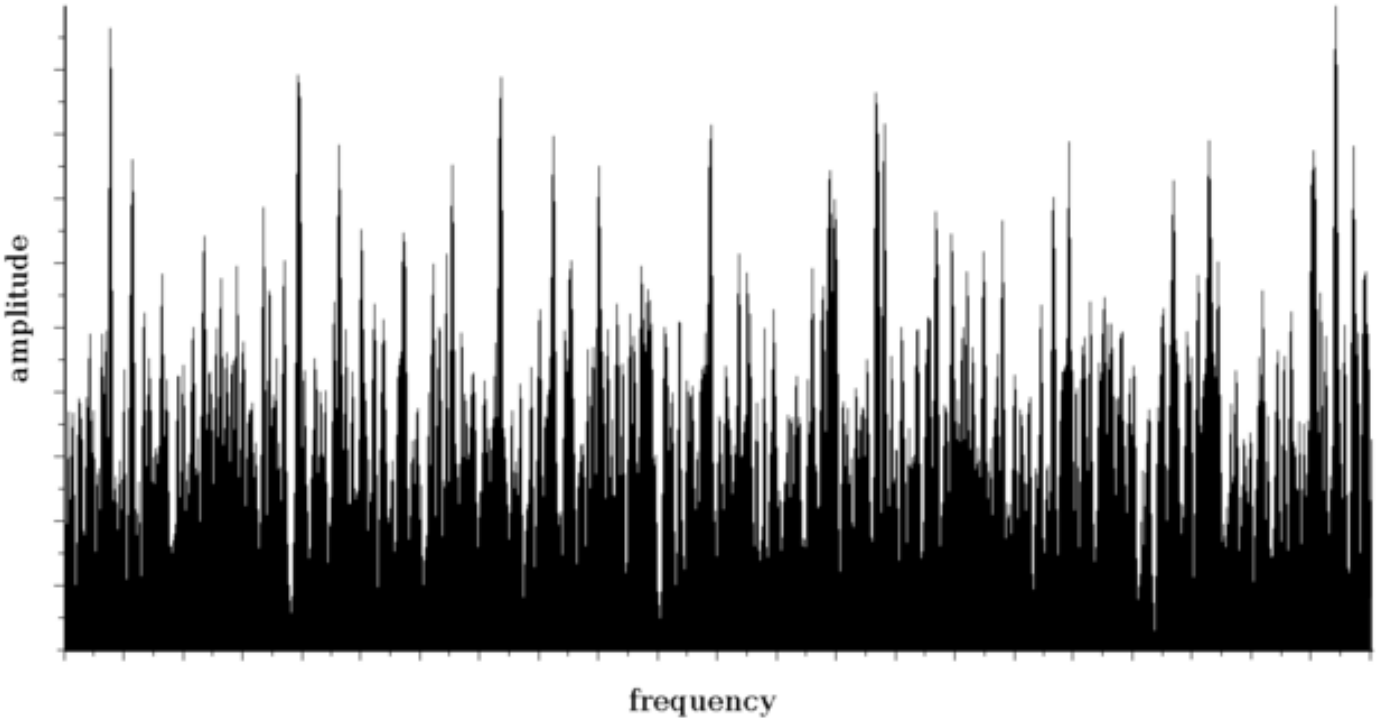
HARMONIC SERIES



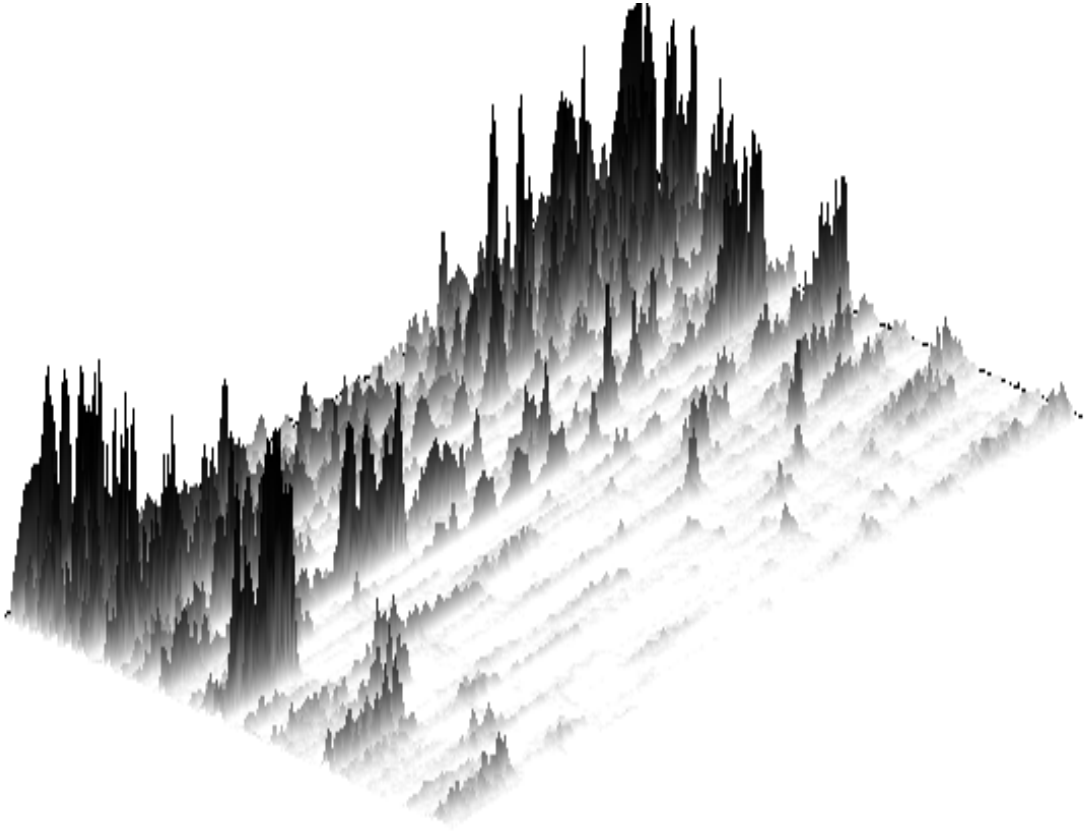
SERIES OF OVERTONES WHEN SINGING TONE C4



SPECTROGRAM

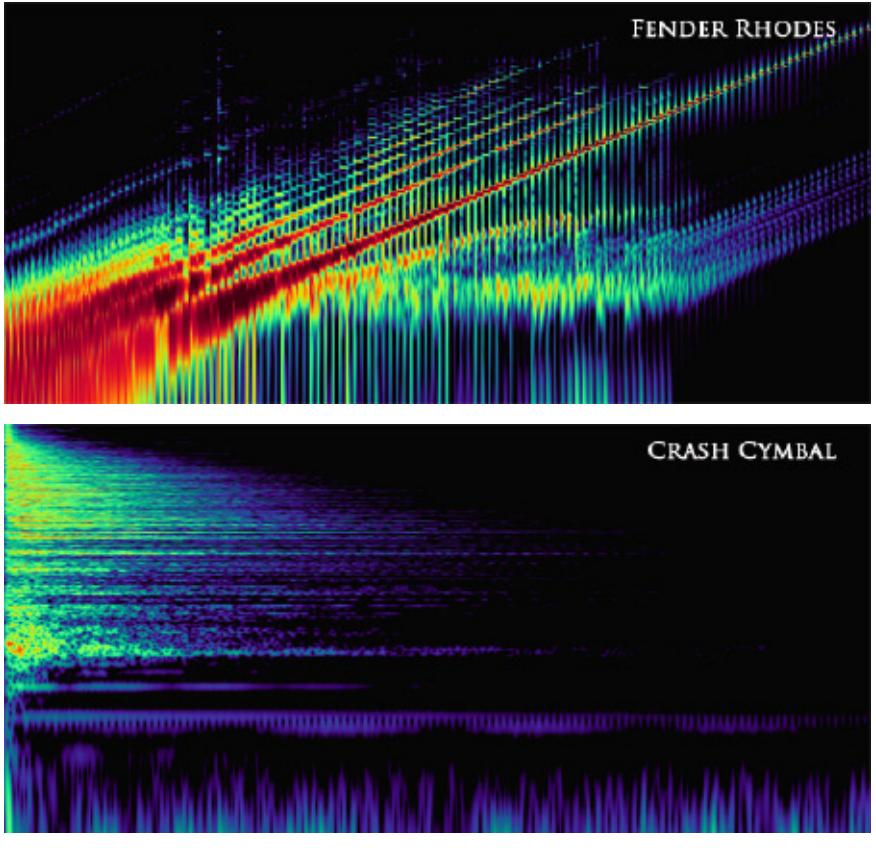


3D SPECTROGRAM



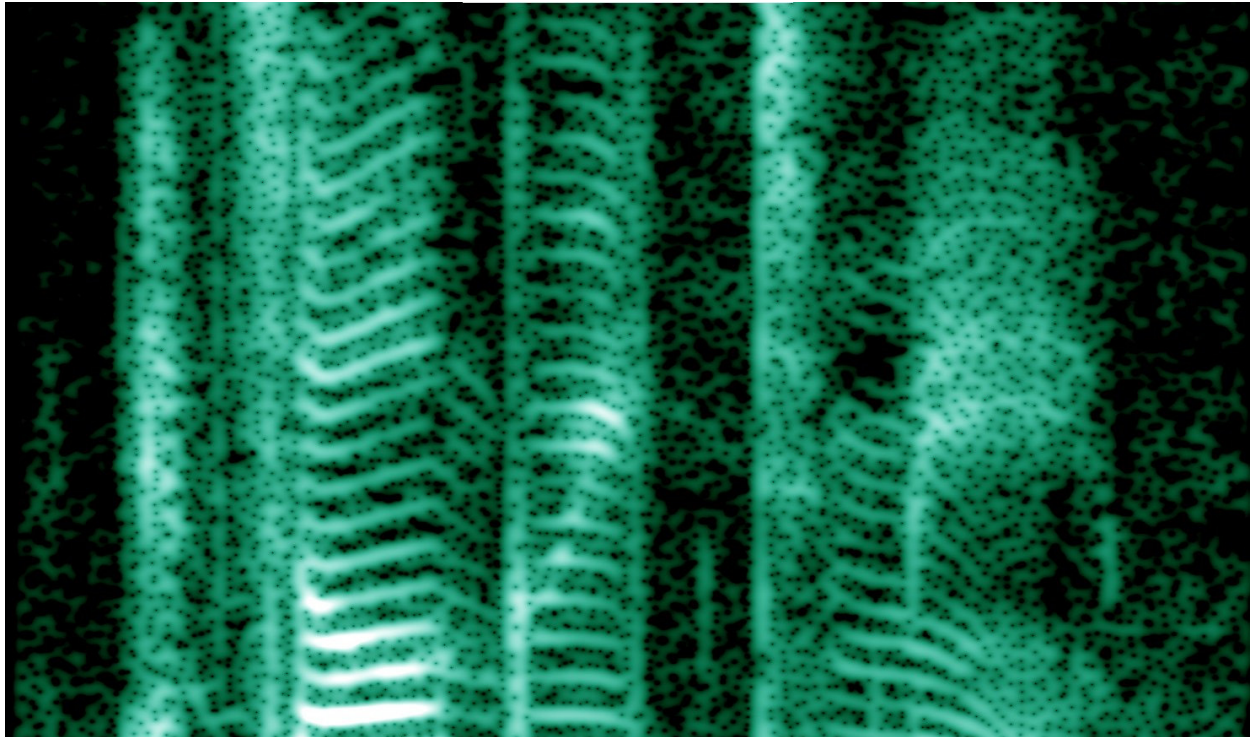
INSTRUMENTS

spectrograms



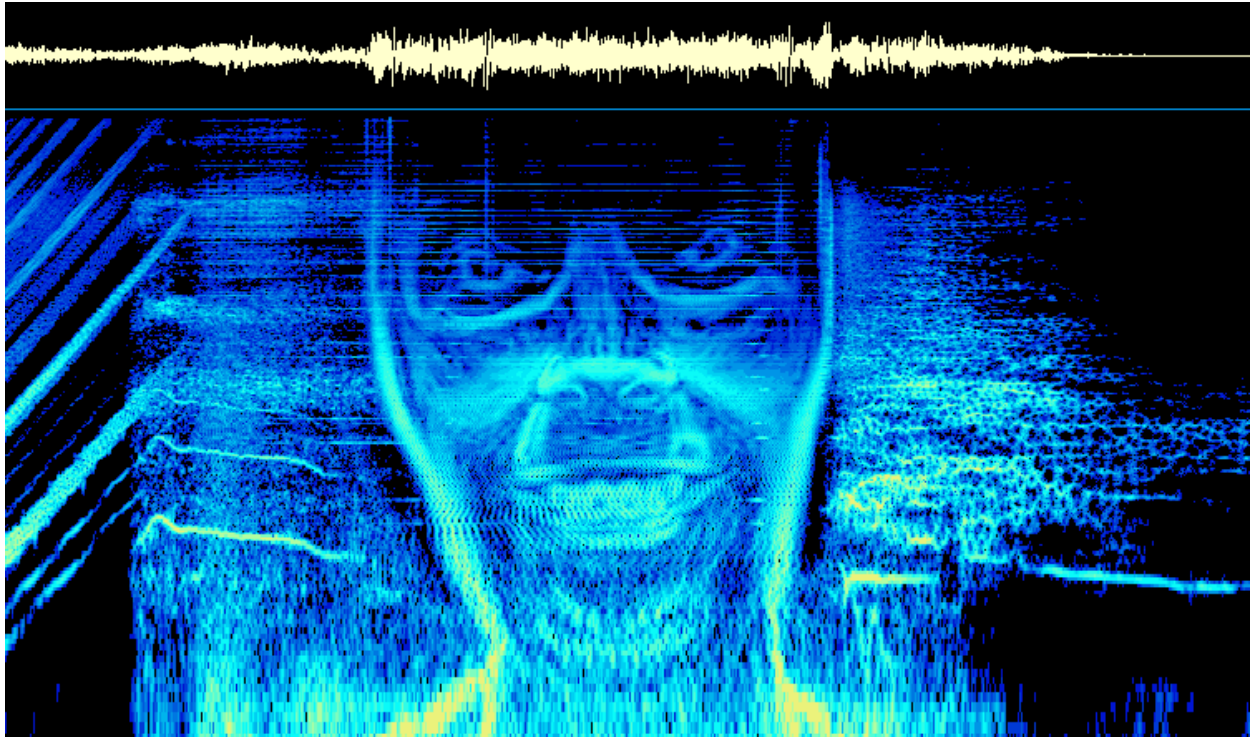
HUMAN VOICE

spectrogram



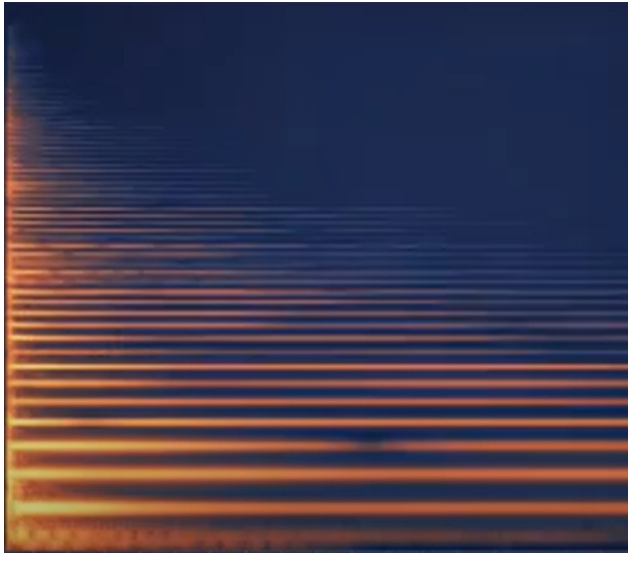
APHEX TWIN

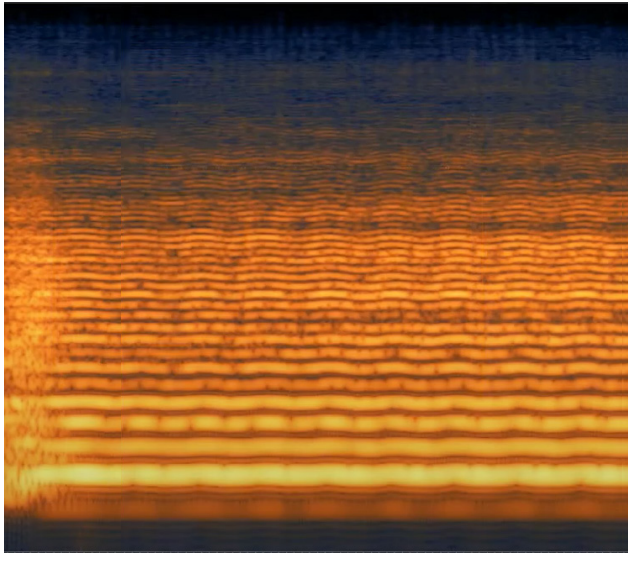
Equation



PIANO & VIOLIN

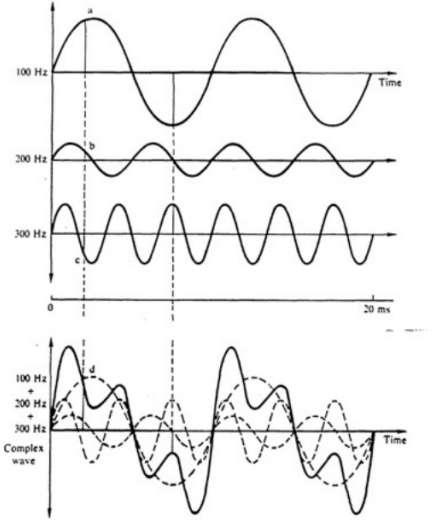
playing the same note





JEAN-BAPTISTE JOSEPH FOURIER

Complex waves consist of many simple waves



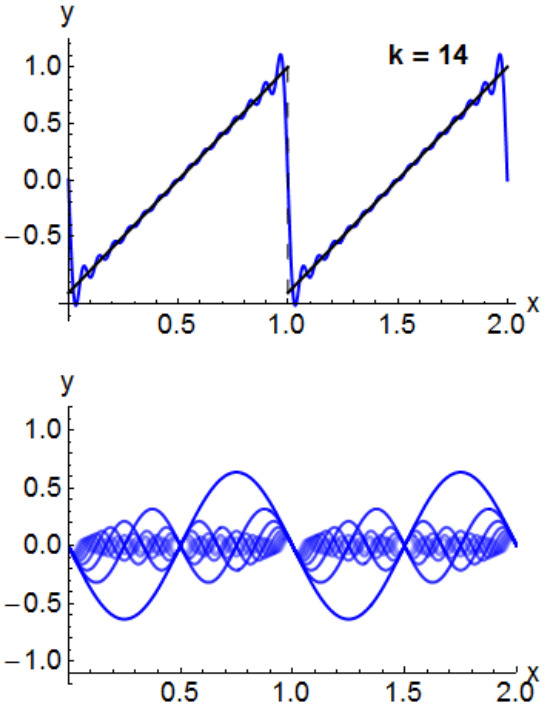
HERMANN VON HELMHOLTZ

Complex tones are made up of harmonics

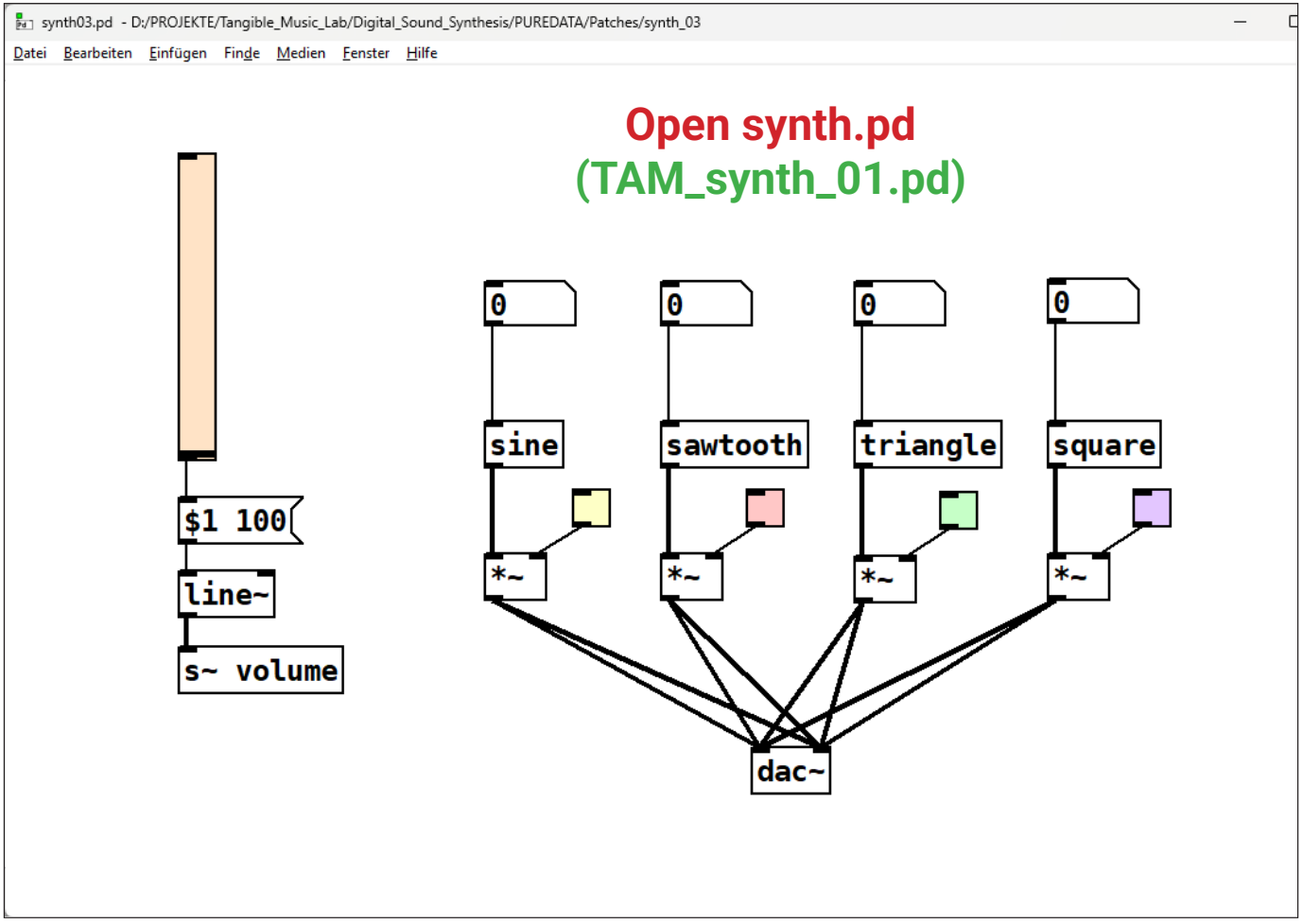
https://www.youtube.com/watch?v=U6uTkYrwMkg

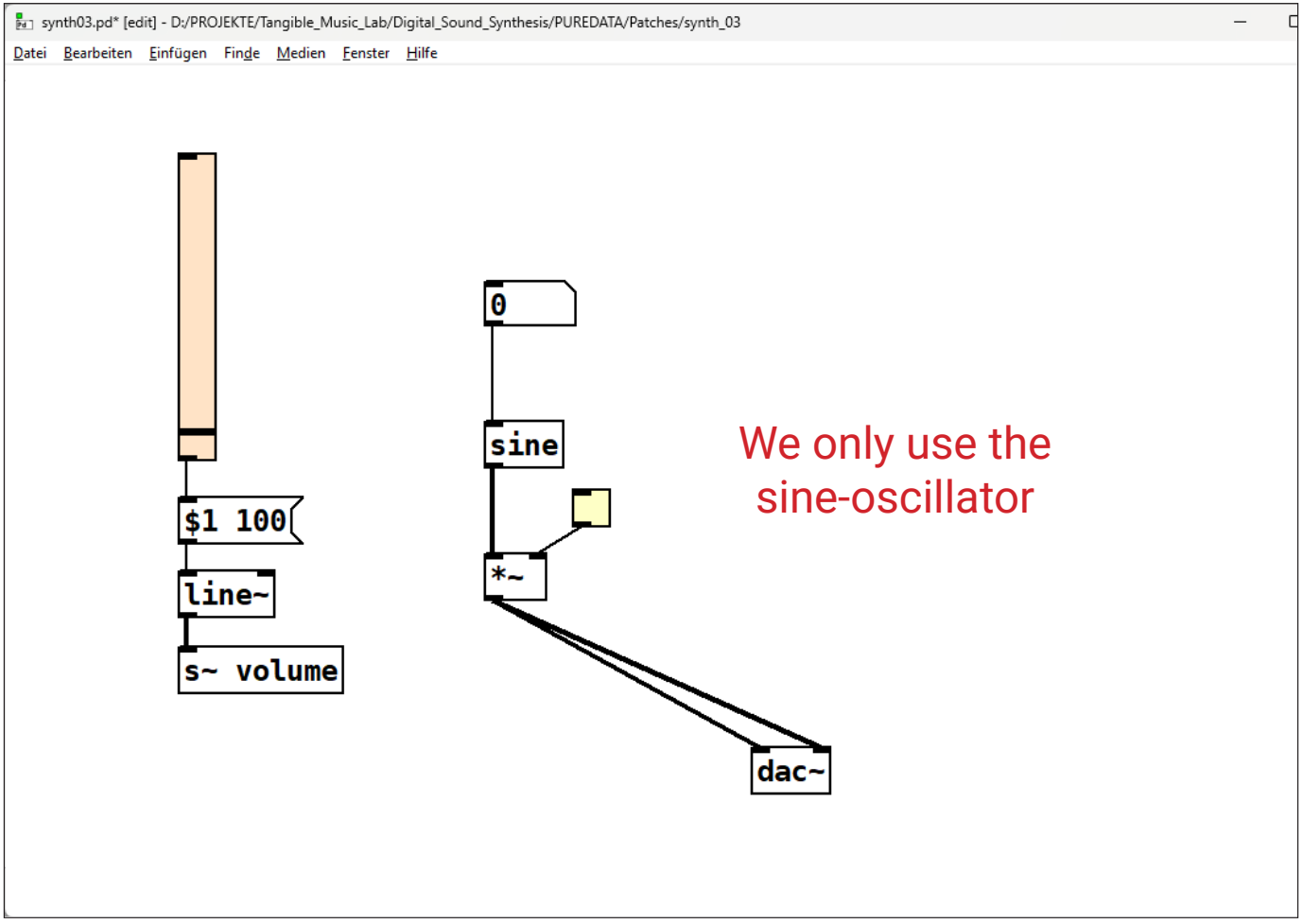
SAWTOOTH WAVEFORM

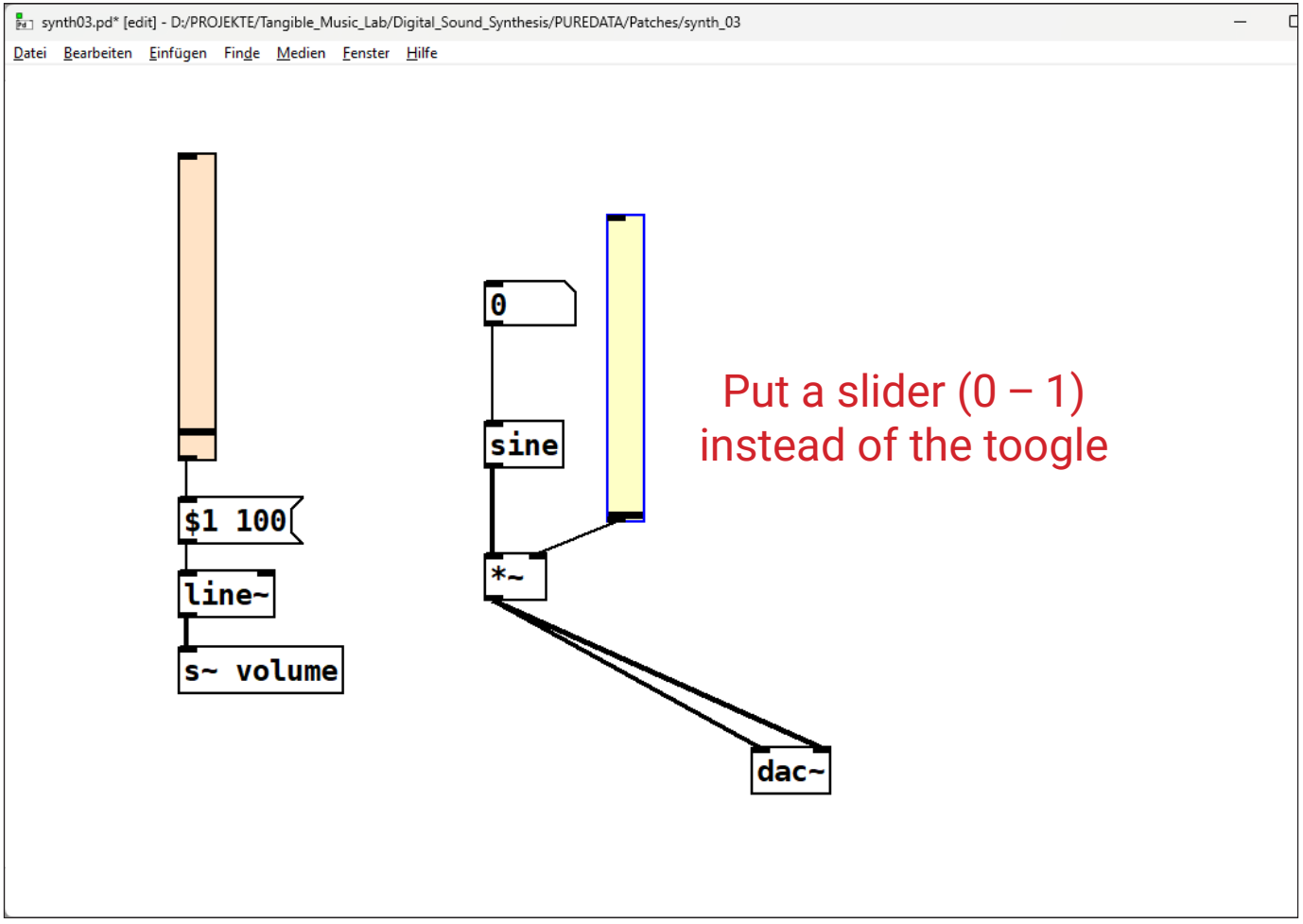
consisting of sine waves

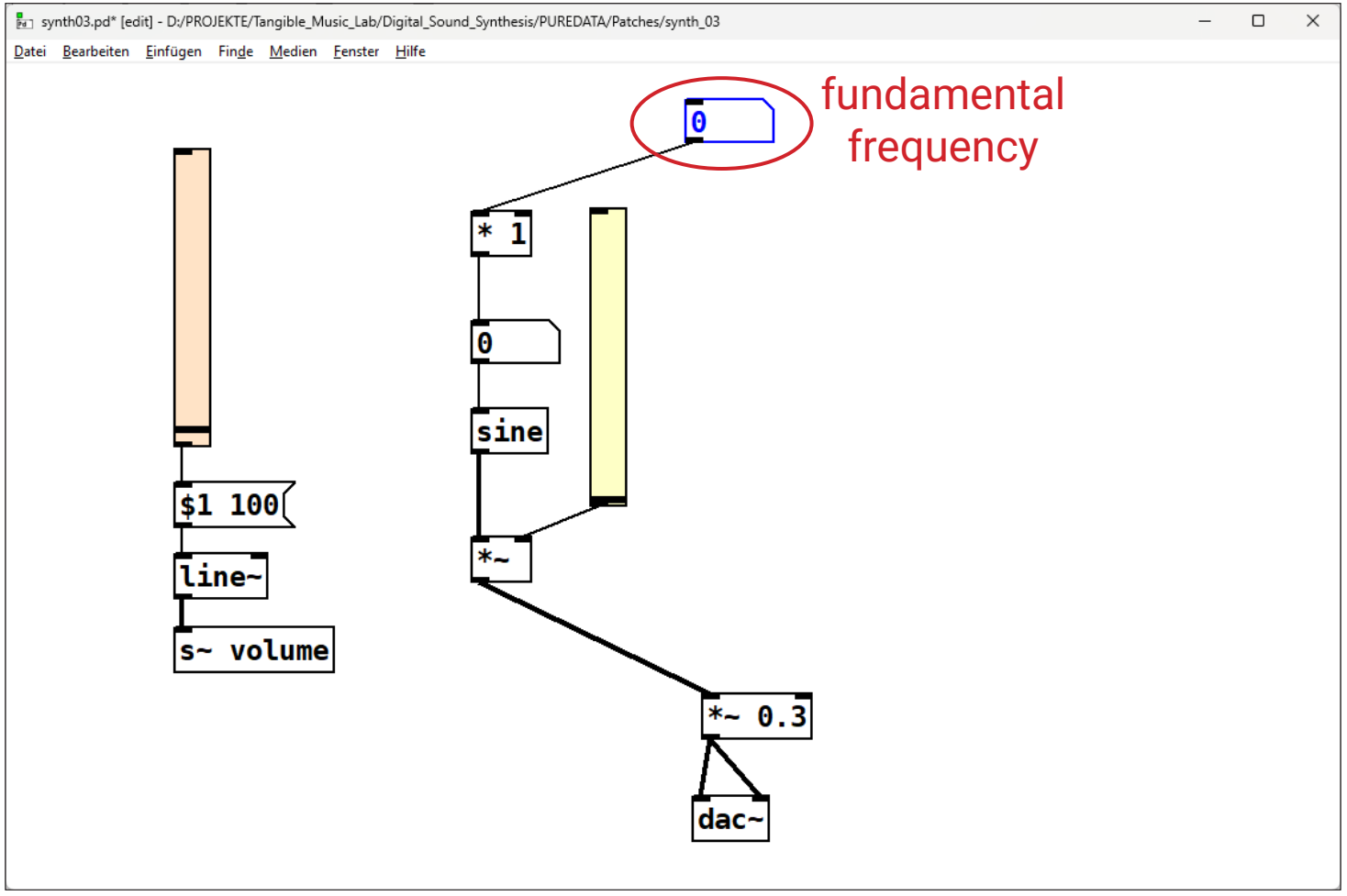


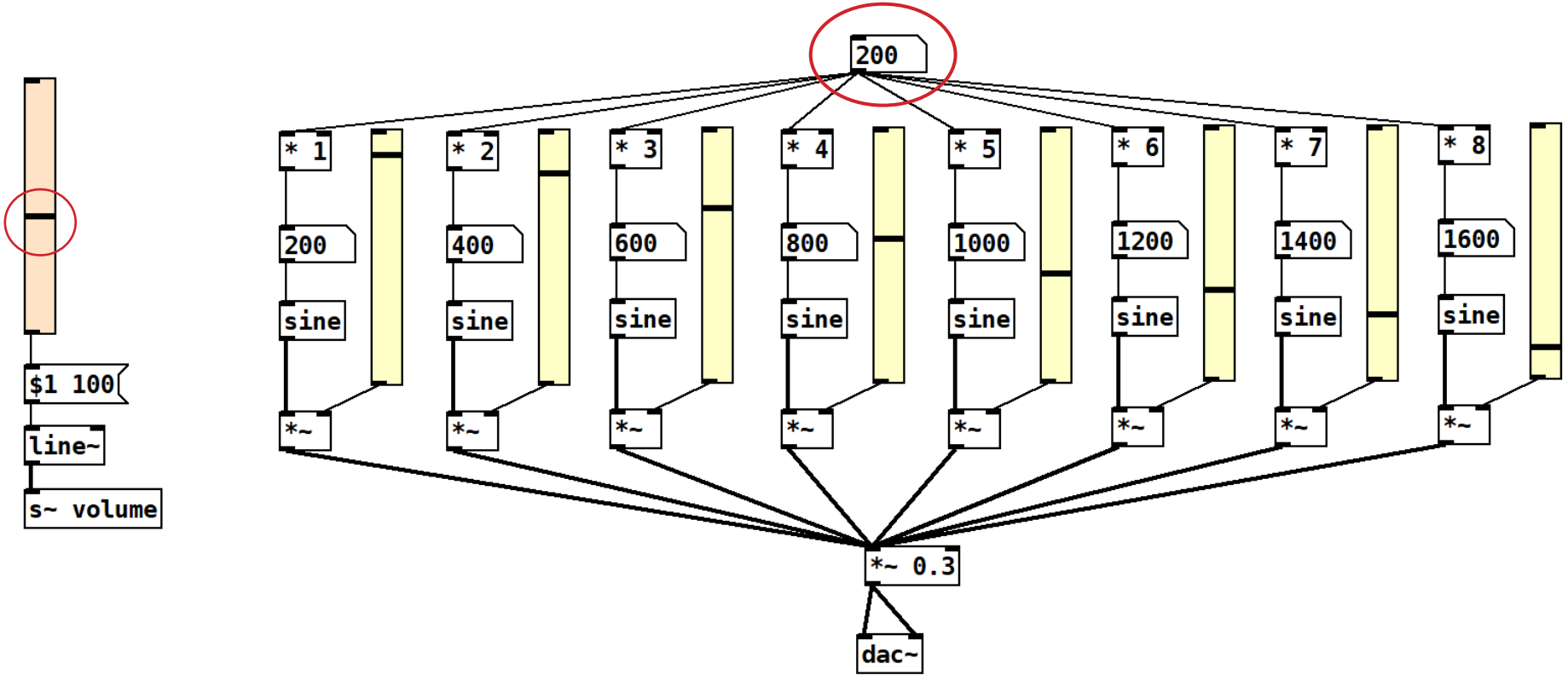
Additive synthesis

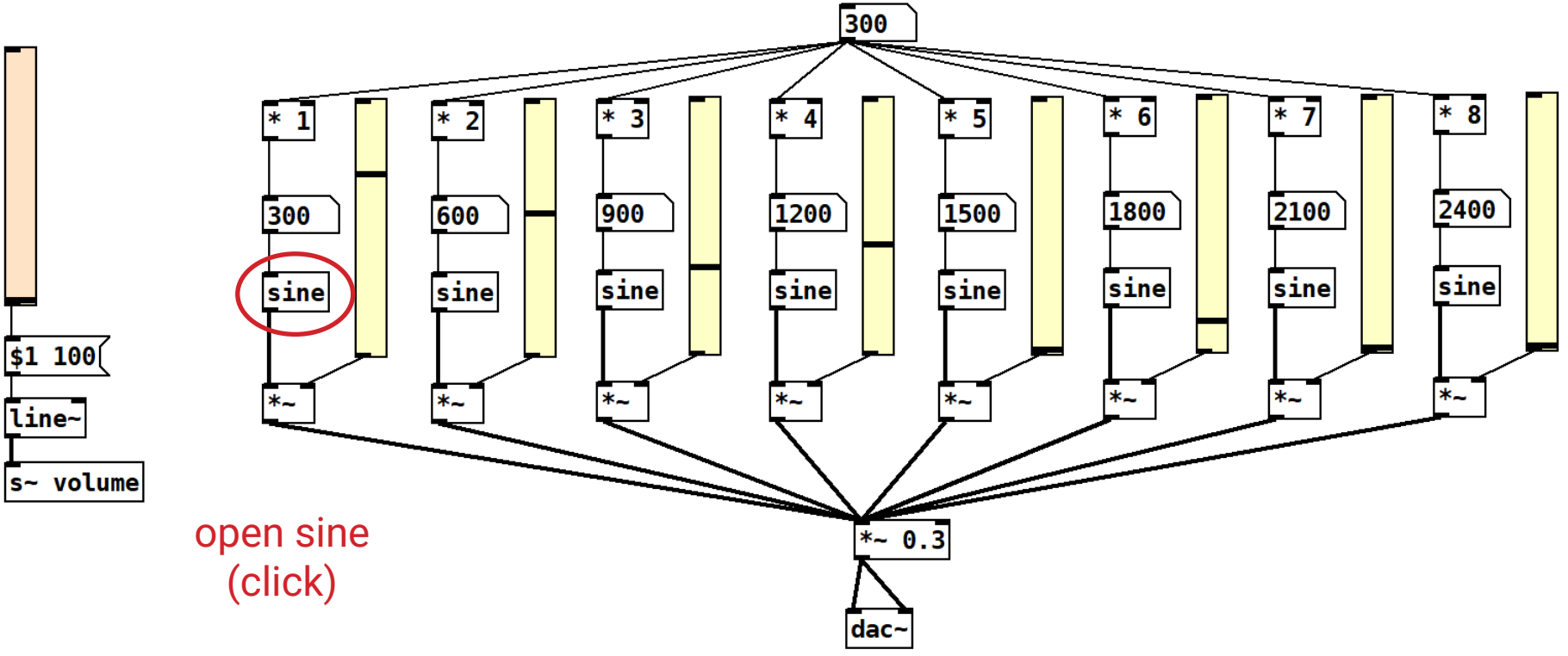

synth03.pd - D:/PROJEKTE/Tangible_Music_Lab/Digital_Sound_Synthesis/PUREDATA/Patches/synth_03
Datei Bearbeiten Einfügen Finde Medien Fenster Hilfe
Open synth.pd
(TAM_synth_01.pd)
$1 100
line~
s~ volume
0
0
0
0
sine
sawtooth
triangle
square
*~
*~
*~
*~
dac~

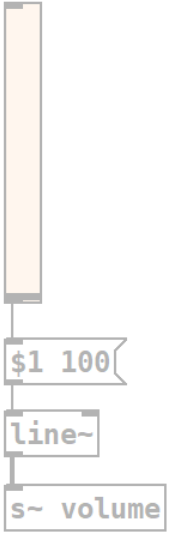

synth03.pd* [edit] - D:/PROJEKTE/Tangible_Music_Lab/Digital_Sound_Synthesis/PUREDATA/Patches/synth_03
Datei Bearbeiten Einfügen Finde Medien Fenster Hilfe
$1 100
line~
s~ volume
0
sine
*~
dac~
We only use the
sine-oscillator

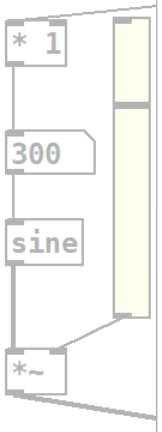

synth03.pd* [edit] - D:/PROJEKTE/Tangible_Music_Lab/Digital_Sound_Synthesis/PUREDATA/Patches/synth_03
Datei Bearbeiten Einfügen Finde Medien Fenster Hilfe
$1 100
line~
s~ volume
0
sine
*~
dac~
Put a slider (0 – 1)
instead of the toogle


synth03.pd* [edit] - D:/PROJEKTE/Tangible_Music_Lab/Digital_Sound_Synthesis/PUREDATA/Patches/synth_03
Datei Bearbeiten Einfügen Finde Medien Fenster Hilfe
0
fundamental
frequency
* 1
0
sine
$1 100
line~
s~ volume
*~
*~ 0.3
dac~


$1 100
line~
s~ volume
200
* 1
200
sine
*~
* 2
400
sine
*~
* 3
600
sine
*~
* 4
800
sine
*~
* 5
1000
sine
*~
* 6
1200
sine
*~
* 7
1400
sine
*~
* 8
1600
sine
*~
*~ 0.3
dac~


$1 100
line~
s~ volume
300
* 1
* 2
* 3
* 4
* 5
* 6
* 7
* 8
300
600
900
1200
1500
1800
2100
2400
sine
sine
sine
sine
sine
sine
sine
sine
*~
*~
*~
*~
*~
*~
*~
*~
*~ 0.3
dac~
open sine
(click)





sine.pd* [edit] - D:/PROJEKTE/Tangible_Music_Lab/Digital_Sound_Synthesis/PUREDATA/Patches/synth_04

Datei Bearbeiten Einfügen Finde Medien Fenster Hilfe

inlet

random 100

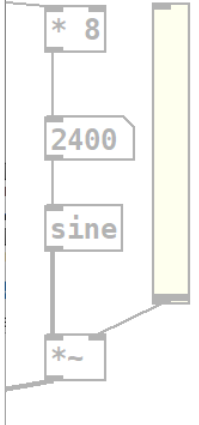
osc~ 3

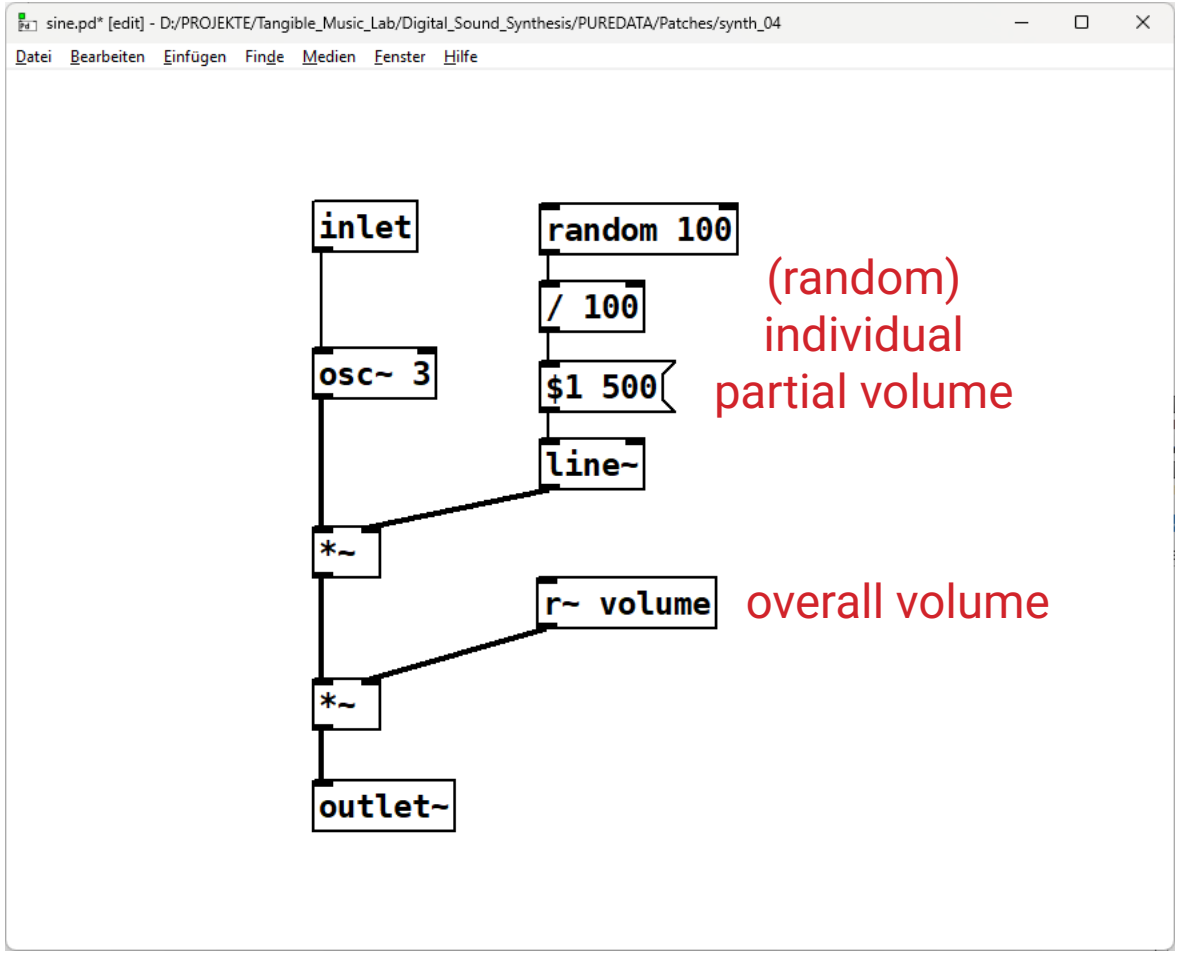
r~ volume

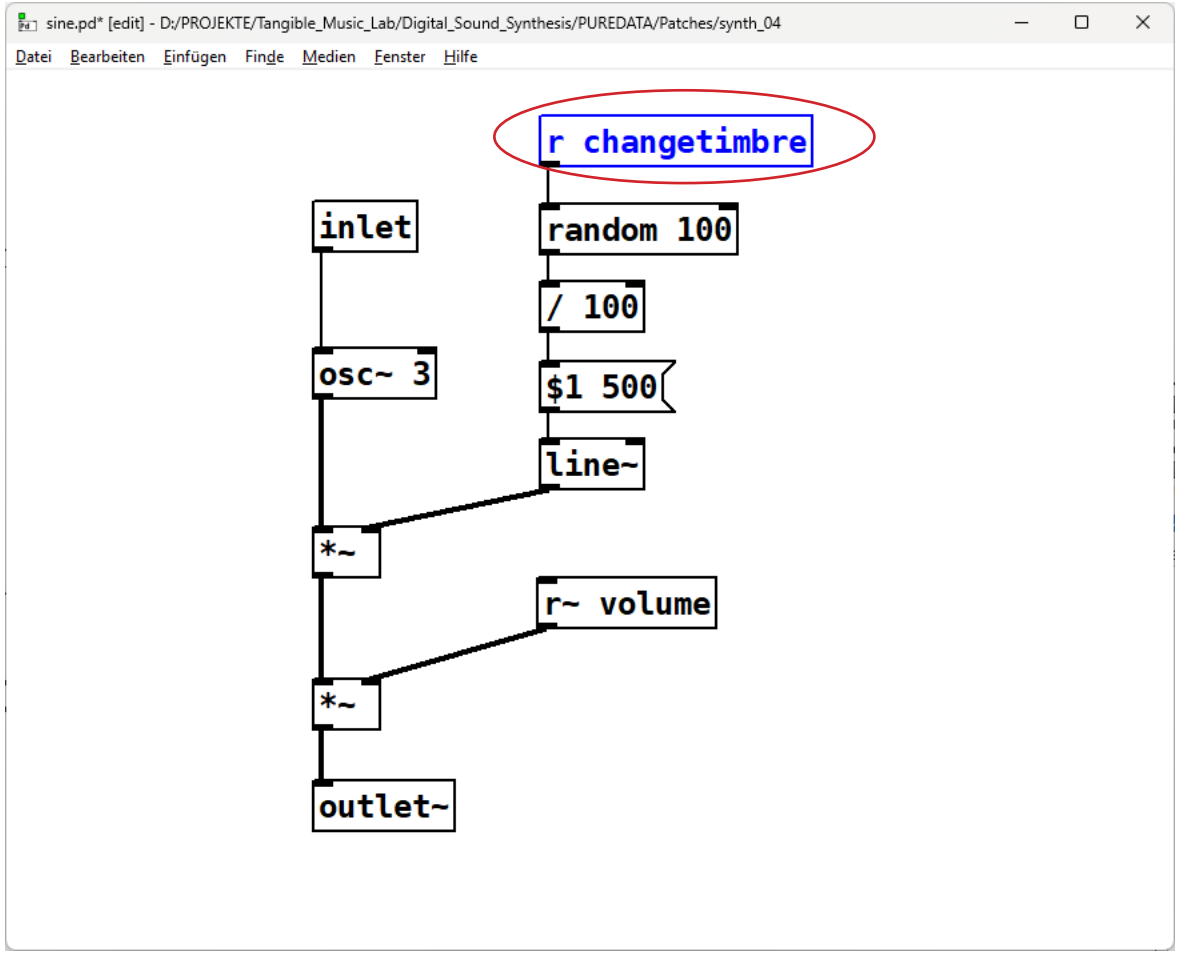
*~

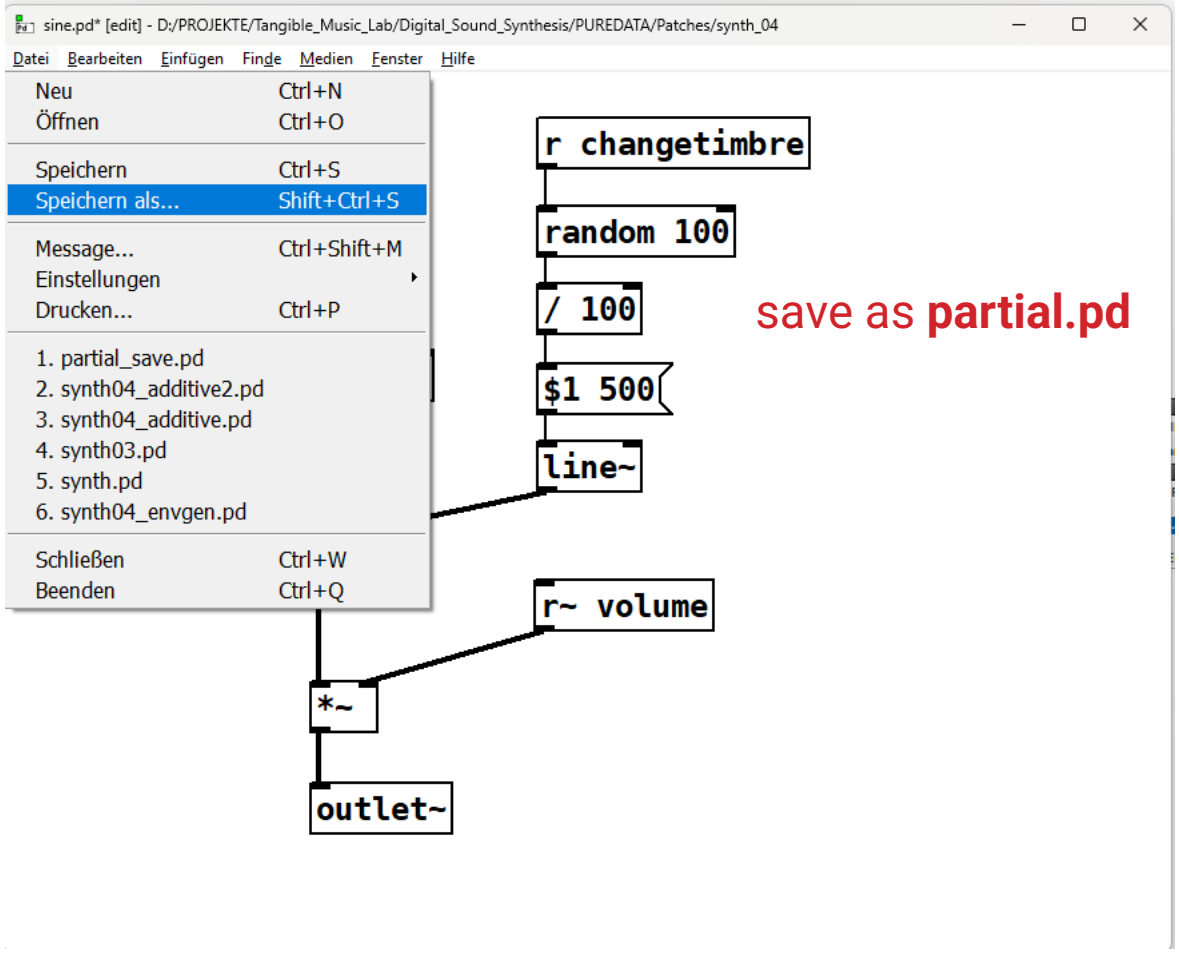
outlet~

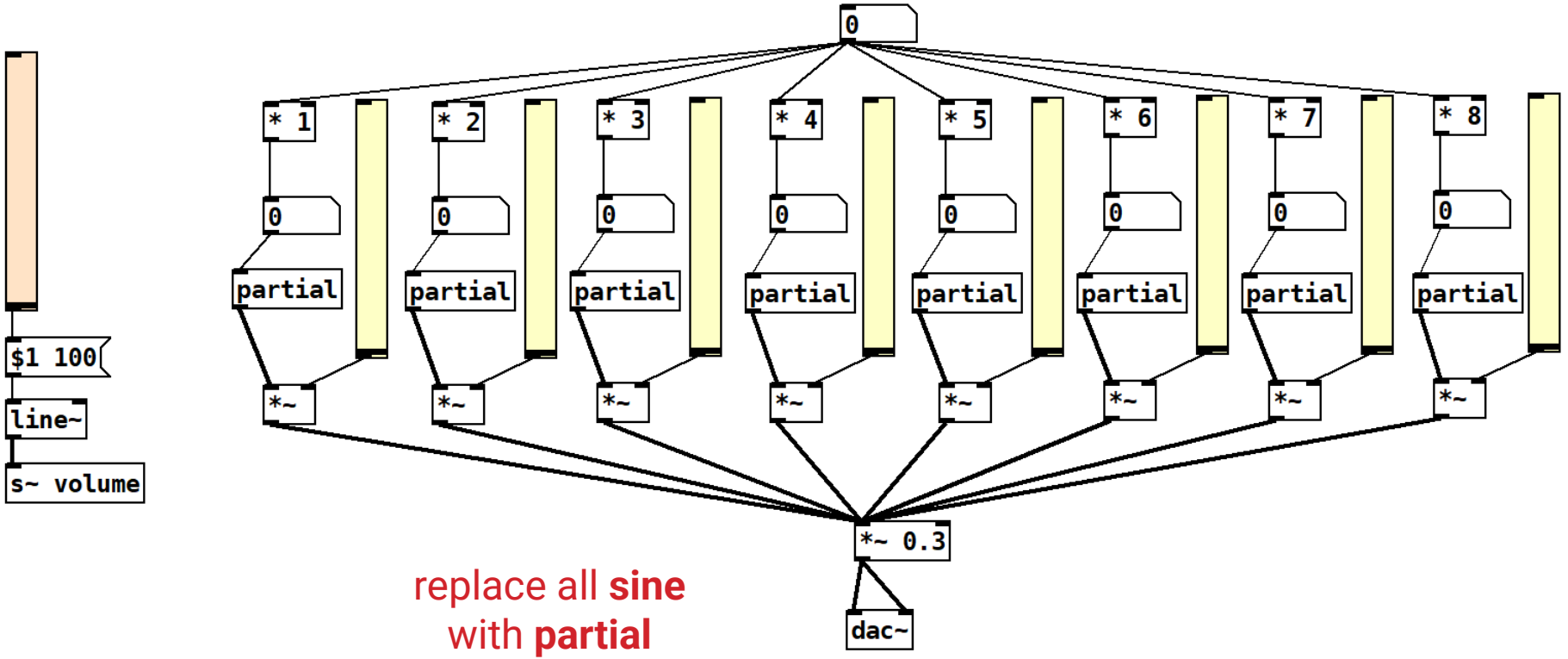
outputs random numbers between 0 – 99



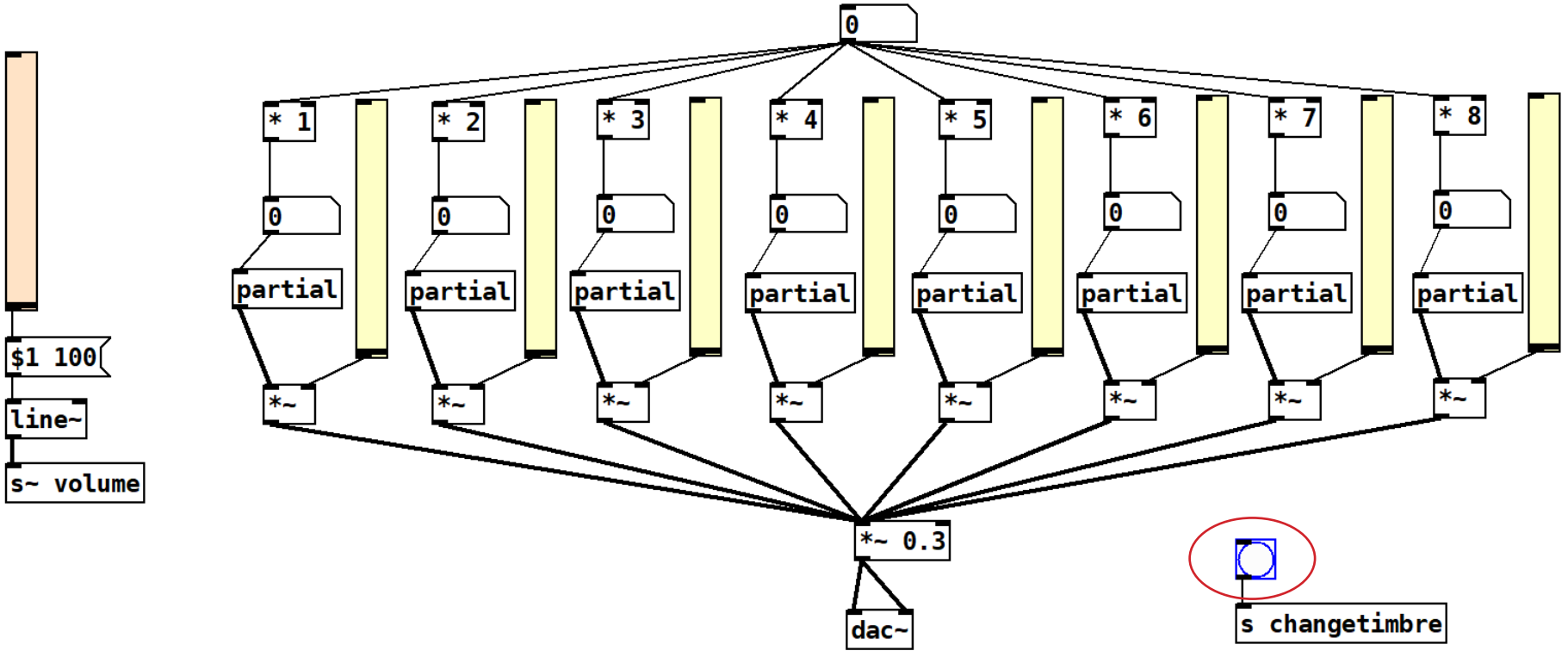

sine.pd* [edit] - D:/PROJEKTE/Tangible_Music_Lab/Digital_Sound_Synthesis/PUREDATA/Patches/synth_04
Datei Bearbeiten Einfügen Finde Medien Fenster Hilfe
inlet
random 100
/ 100
osc~ 3
$1 500
line~
*~
r~ volume
*~
outlet~
(random)
individual
partial volume
overall volume

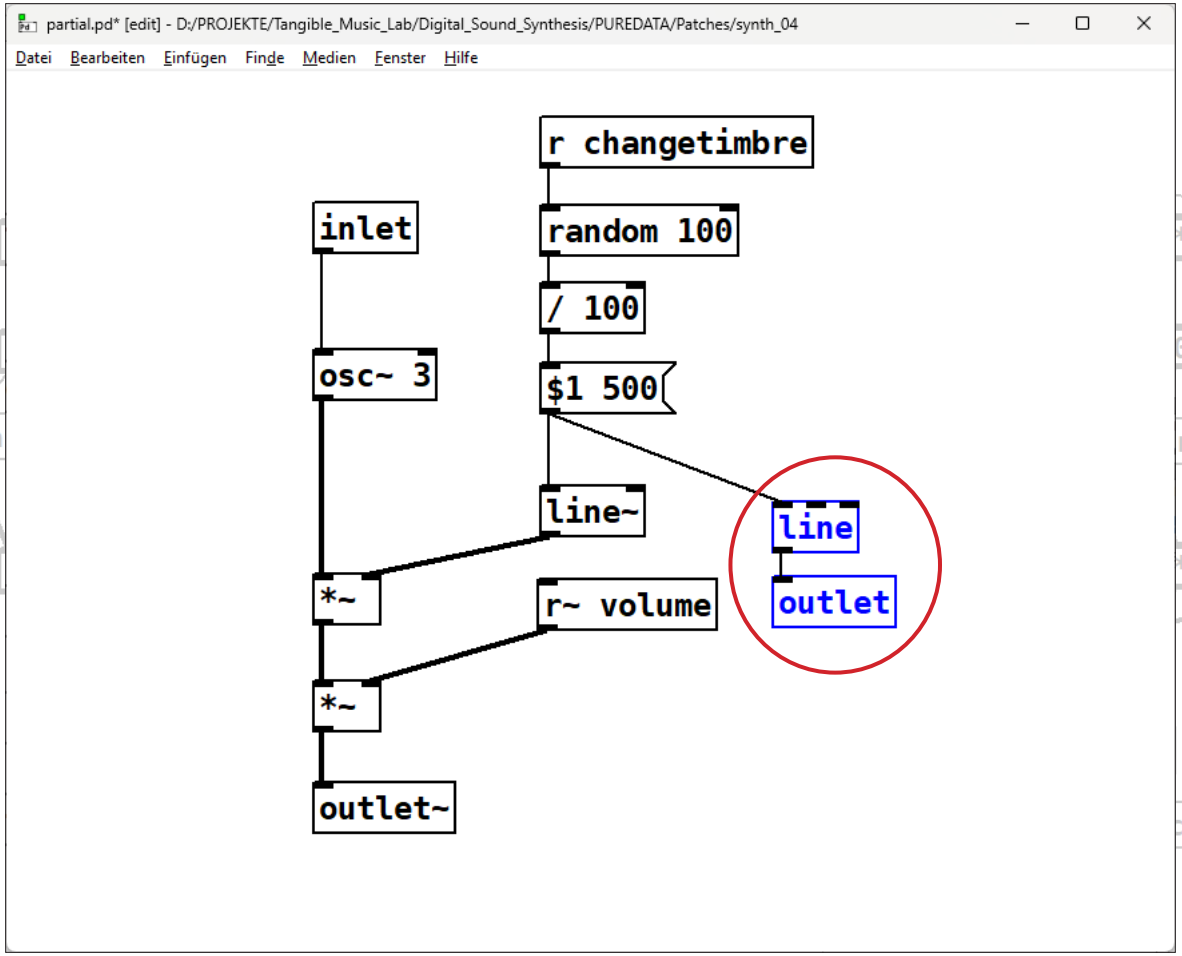

sine.pd* [edit] - D:/PROJEKTE/Tangible_Music_Lab/Digital_Sound_Synthesis/PUREDATA/Patches/synth_04
Datei Bearbeiten Einfügen Finde Medien Fenster Hilfe
r changetimbre
inlet
random 100
/ 100
osc~ 3
$1 500
line~
*~
r~ volume
*~
outlet~

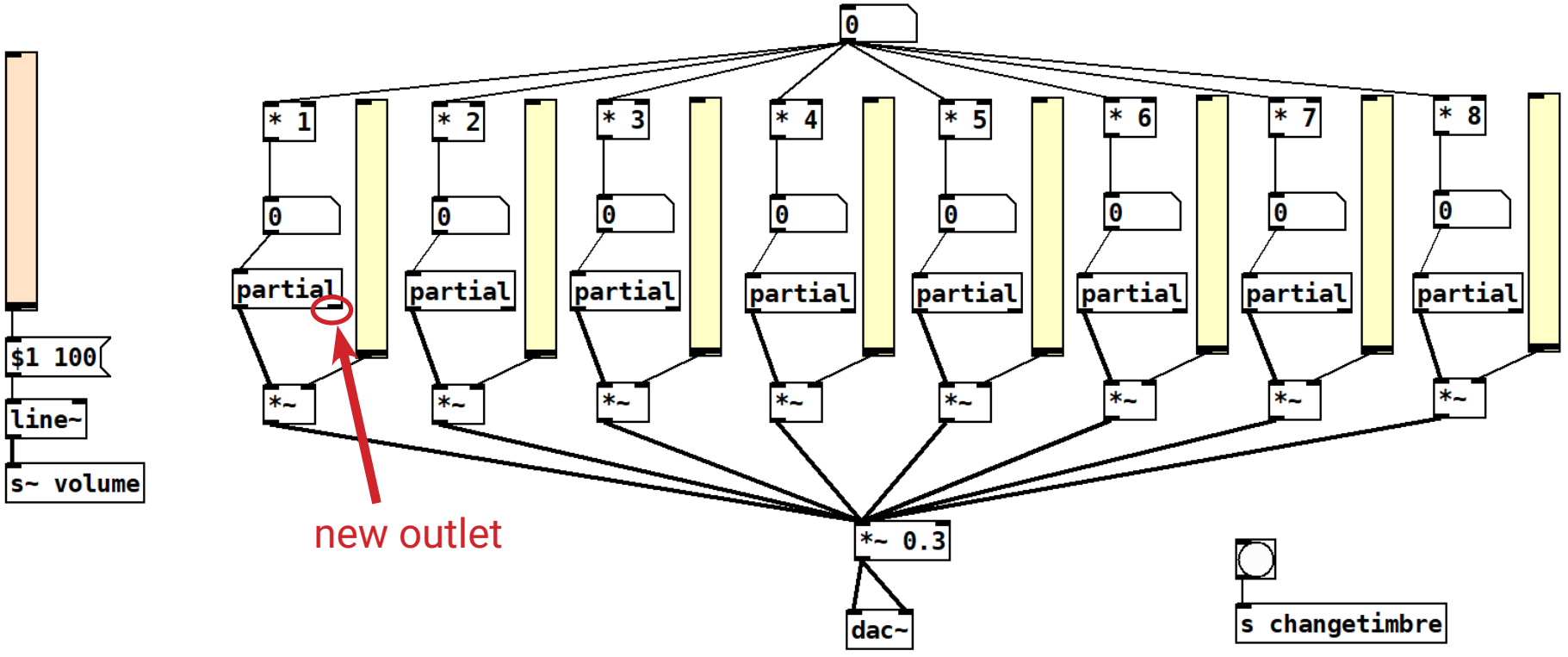

sine.pd* [edit] - D:/PROJEKTE/Tangible_Music_Lab/Digital_Sound_Synthesis/PUREDATA/Patches/synth_04
Datei Bearbeiten Einfügen Finde Medien Fenster Hilfe
Neu Ctrl+N
Öffnen Ctrl+O
Speichern Ctrl+S
Speichern als... Shift+Ctrl+S
Message... Ctrl+Shift+M
Einstellungen
Drucken... Ctrl+P
1. partial_save.pd
2. synth04_additive2.pd
3. synth04_additive.pd
4. synth03.pd
5. synth.pd
6. synth04_envgen.pd
Schließen Ctrl+W
Beenden Ctrl+Q
r changetimbre
random 100
/ 100
$1 500
line~
r~ volume
*~
outlet~
save as partial.pd

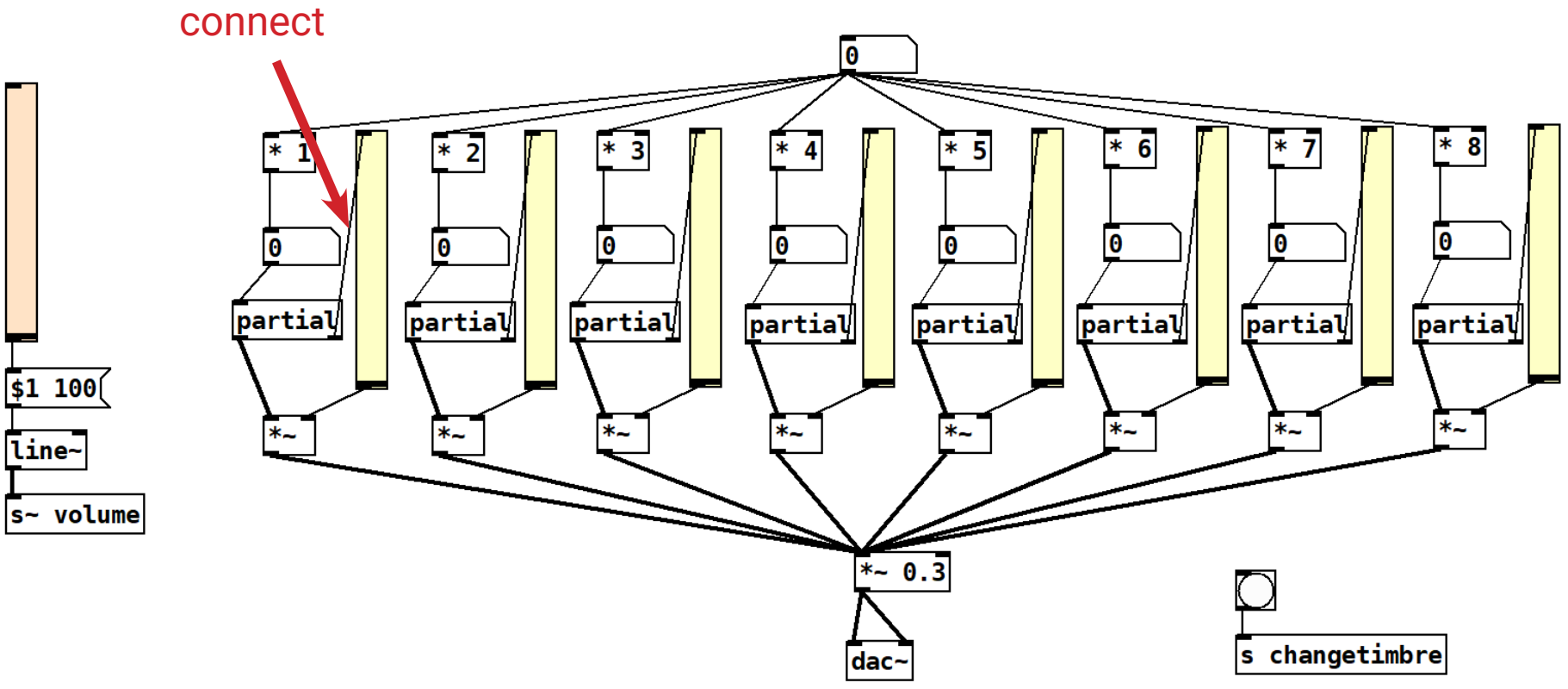


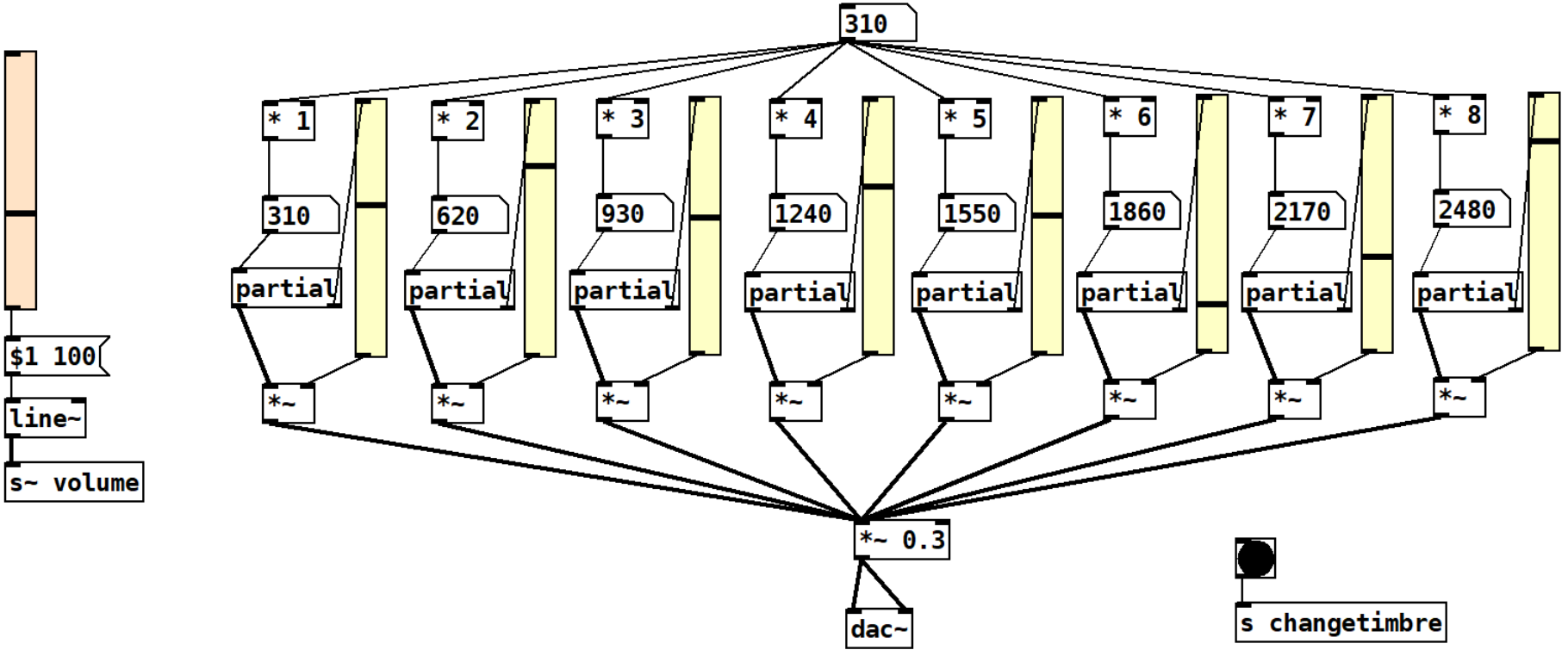
replace all **sine**
with **partial**

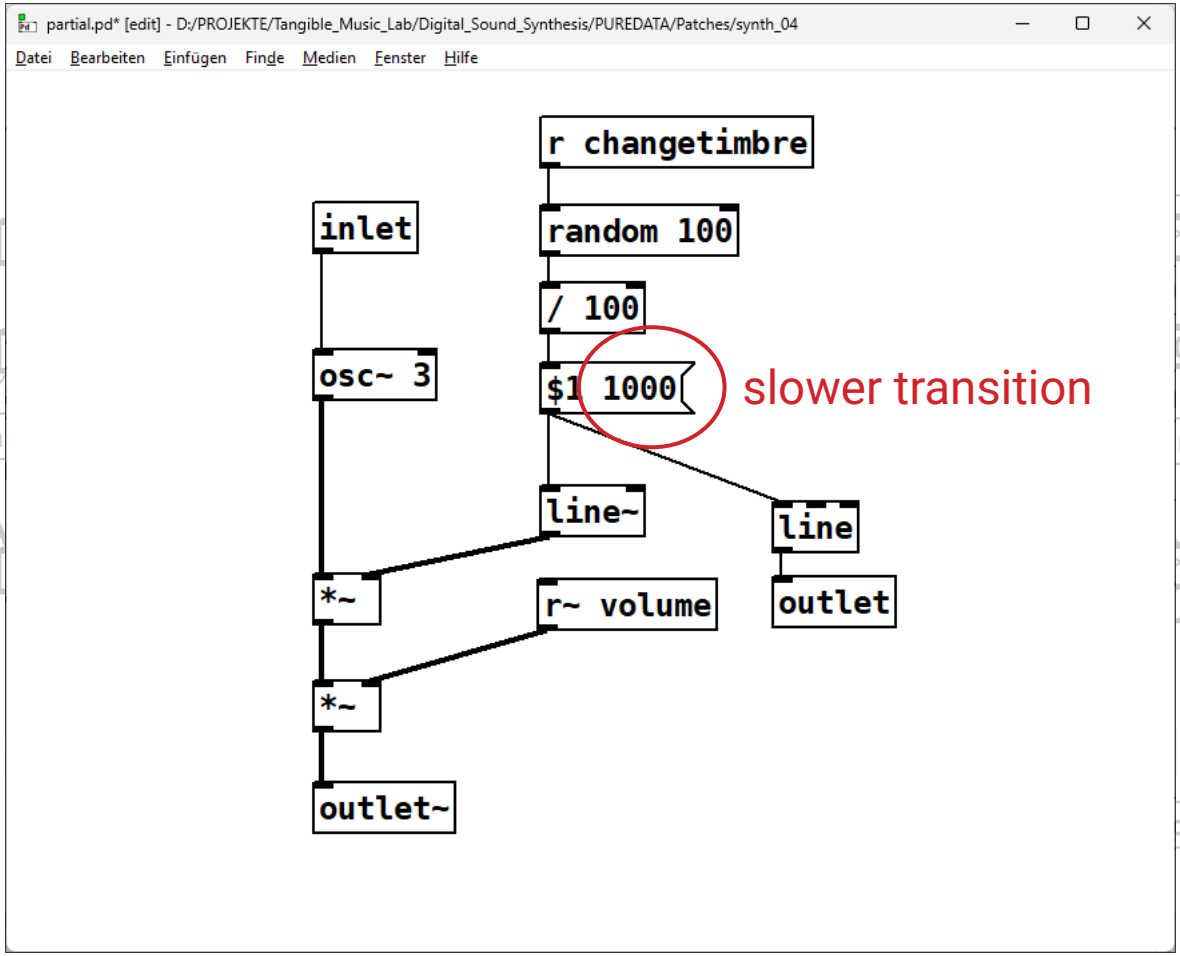

$1 100
line~
s~ volume
0
* 1
* 2
* 3
* 4
* 5
* 6
* 7
* 8
0
partial
*~
*~ 0.3
dac~
s changetimbre

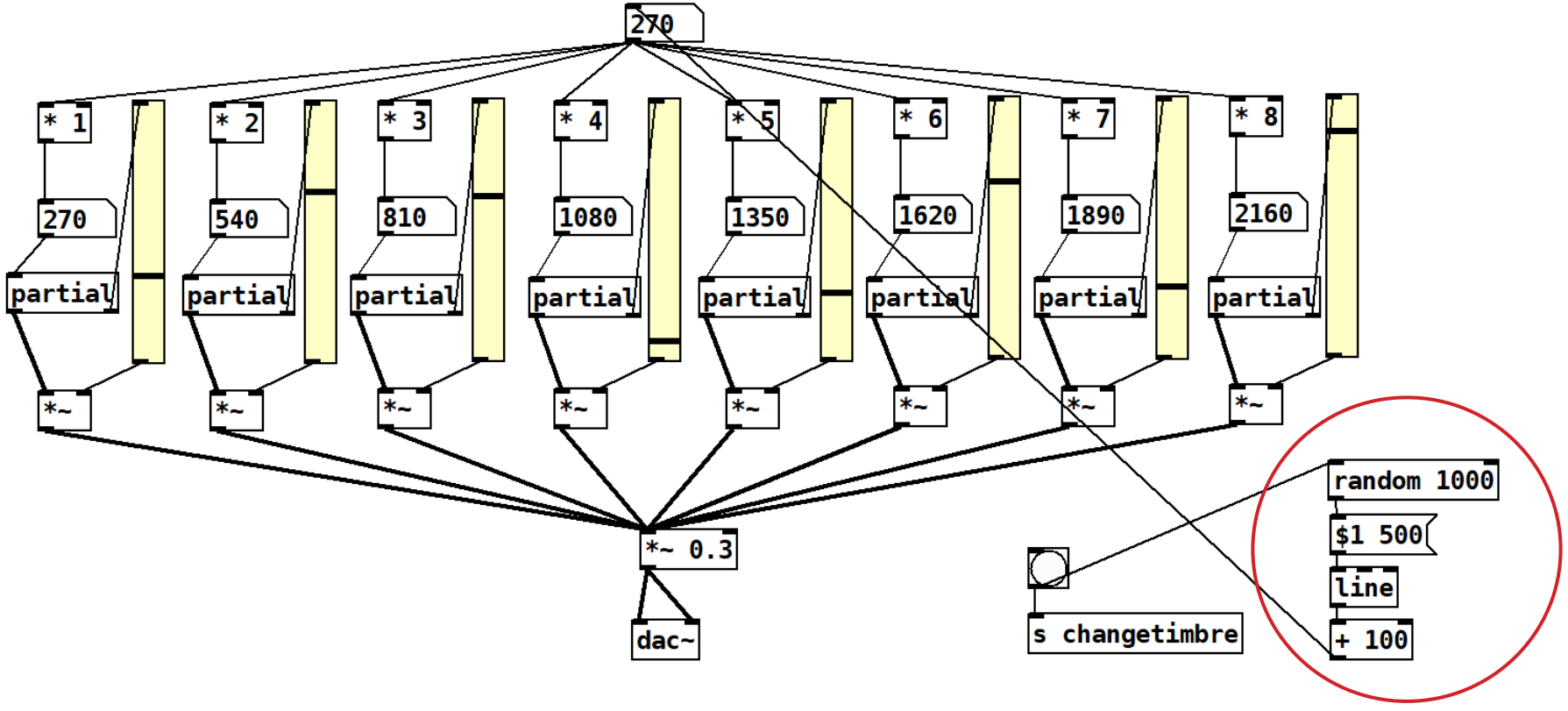

partial.pd* [edit] - D:/PROJEKTE/Tangible_Music_Lab/Digital_Sound_Synthesis/PUREDATA/Patches/synth_04
Datei Bearbeiten Einfügen Finde Medien Fenster Hilfe
r changetimbre
inlet
random 100
/ 100
osc~ 3
$1 500
line~
line
*~
r~ volume
outlet
*~
outlet~


$1 100
line~
s~ volume
0
* 1
* 2
* 3
* 4
* 5
* 6
* 7
* 8
0
partial
*~
new outlet
*~ 0.3
dac~
s changetimbre

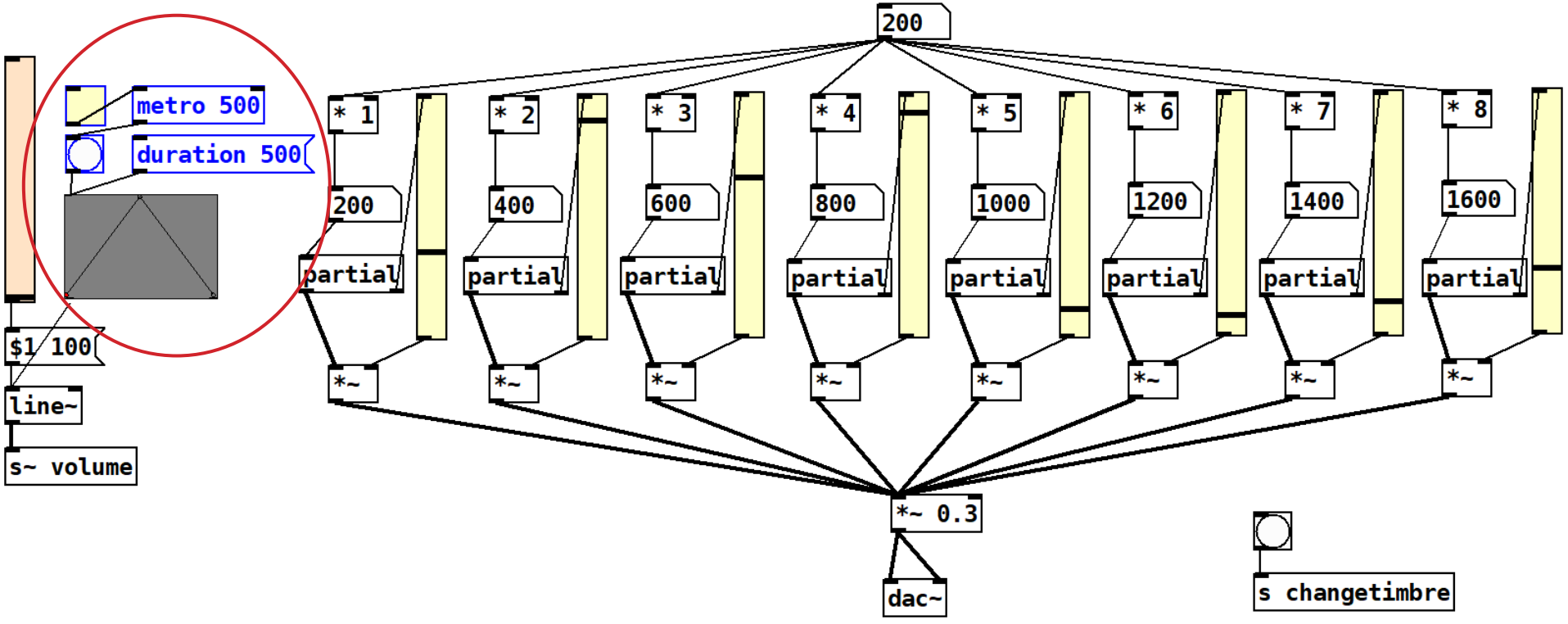

connect
$1 100
line~
s~ volume
0
* 1
* 2
* 3
* 4
* 5
* 6
* 7
* 8
0
0
0
0
0
0
0
0
partial
partial
partial
partial
partial
partial
partial
partial
*~
*~
*~
*~
*~
*~
*~
*~
*~ 0.3
dac~
s changetimbre

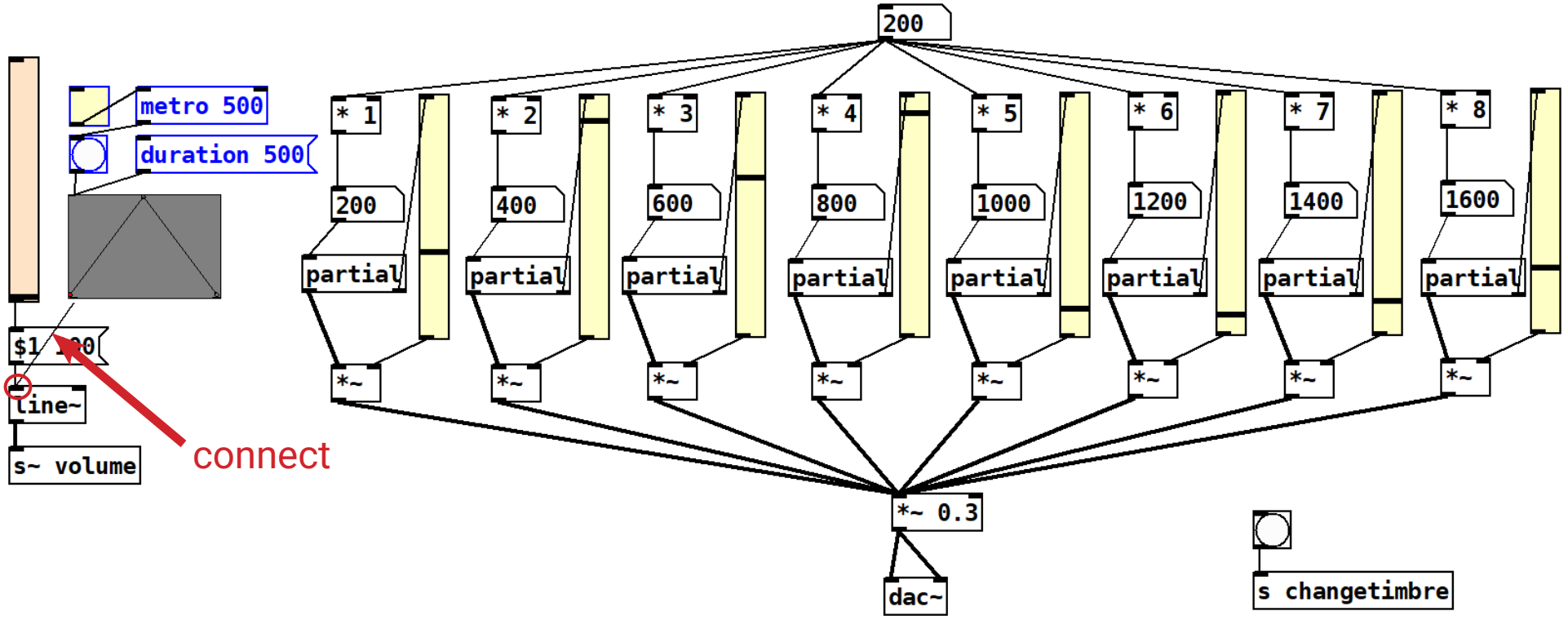

$1 100
line~
s~ volume
310
* 1
* 2
* 3
* 4
* 5
* 6
* 7
* 8
310
620
930
1240
1550
1860
2170
2480
partial
partial
partial
partial
partial
partial
partial
partial
*~
*~
*~
*~
*~
*~
*~
*~
*~ 0.3
dac~
s changetimbre

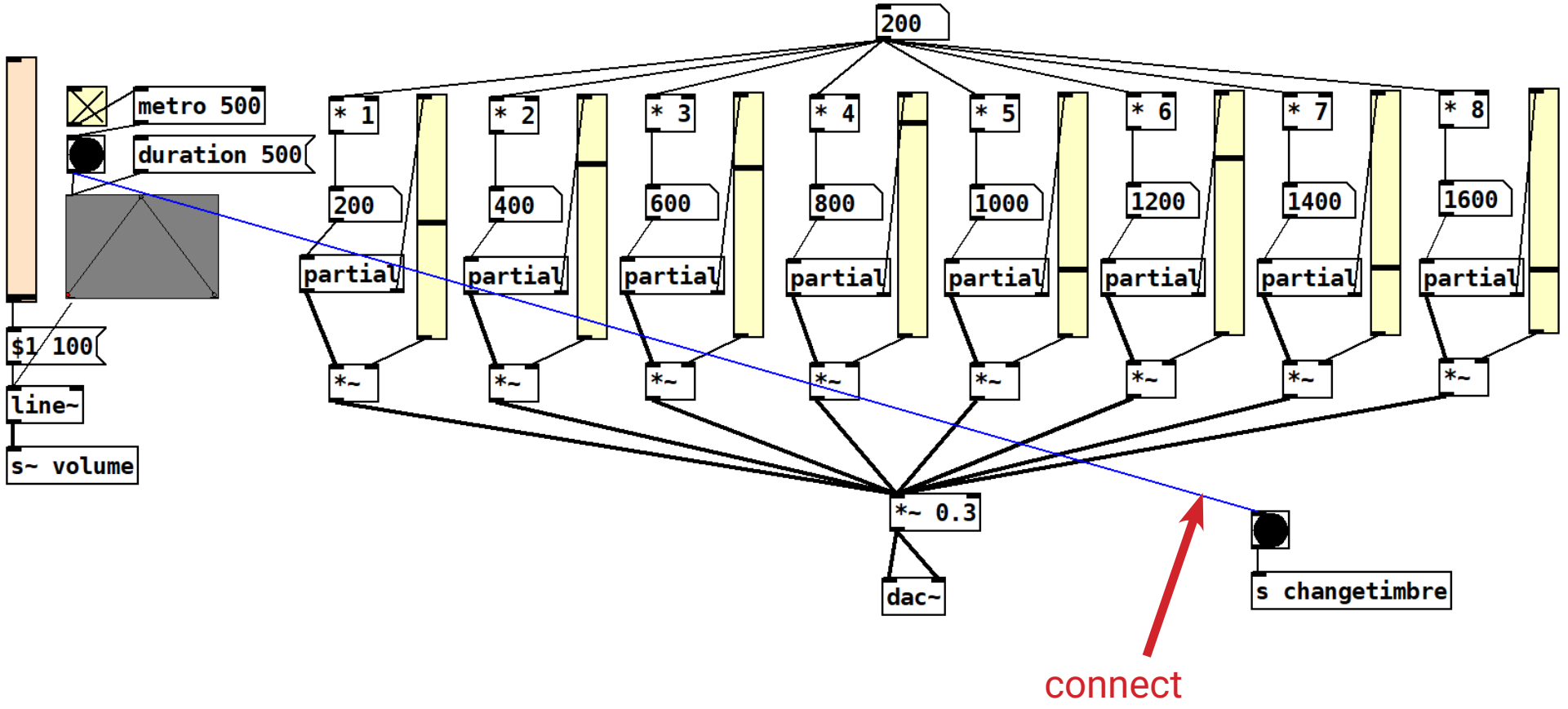

partial.pd* [edit] - D:/PROJEKTE/Tangible_Music_Lab/Digital_Sound_Synthesis/PUREDATA/Patches/synth_04
Datei Bearbeiten Einfügen Finde Medien Fenster Hilfe
r changetimbre
inlet
random 100
/ 100
osc~ 3
$1 1000
slower transition
line~
line
*~
r~ volume
outlet
*~
outlet~


270
* 1
* 2
* 3
* 4
* 5
* 6
* 7
* 8
270
540
810
1080
1350
1620
1890
2160
partial
partial
partial
partial
partial
partial
partial
partial
*~
*~
*~
*~
*~
*~
*~
*~
*~ 0.3
dac~
s changetimbre
random 1000
$1 500
line
+ 100

copy & past from **envelope_synth.pd**

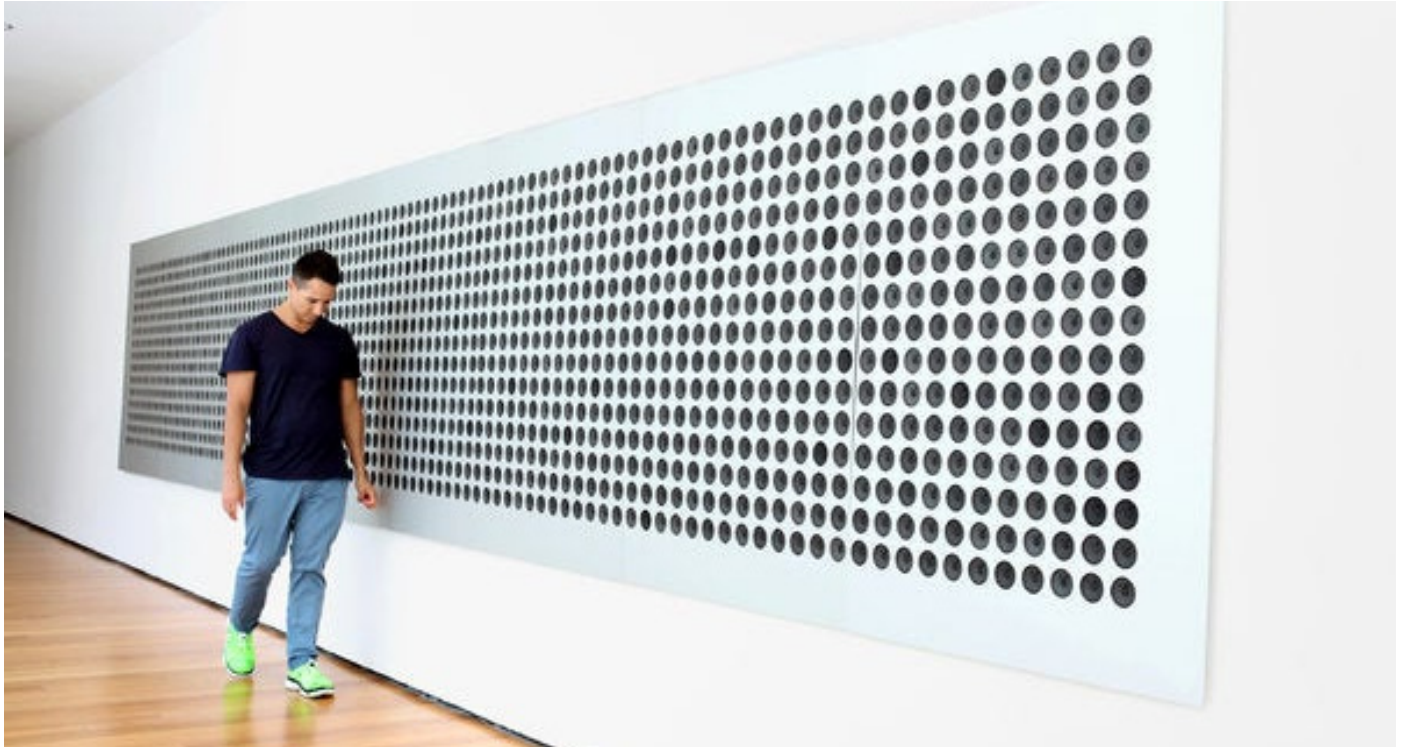



metro 500
duration 500
$1 200
line~
s~ volume
connect
200
* 1
200
partial
*~
* 2
400
partial
*~
* 3
600
partial
*~
* 4
800
partial
*~
* 5
1000
partial
*~
* 6
1200
partial
*~
* 7
1400
partial
*~
* 8
1600
partial
*~
*~ 0.3
dac~
s changetimbre


metro 500
duration 500
$1 100
line~
s~ volume
200
* 1
* 2
* 3
* 4
* 5
* 6
* 7
* 8
200
400
600
800
1000
1200
1400
1600
partial
*~
*~ 0.3
dac~
s changetimbre
connect

MICROTONAL WALL

Tristan Perich



https://www.moma.org/multimedia/embed/video/276/1331