

abc.lib- News from Multichannel Audio Processing in Mixed Music

A.Bonardi P.Goutmann



Outline

- Context of abc.lib
- Architecture of the lib
- Distributions
- Max Package (v.1.1.0)
- Example of MC processing and HOA2D

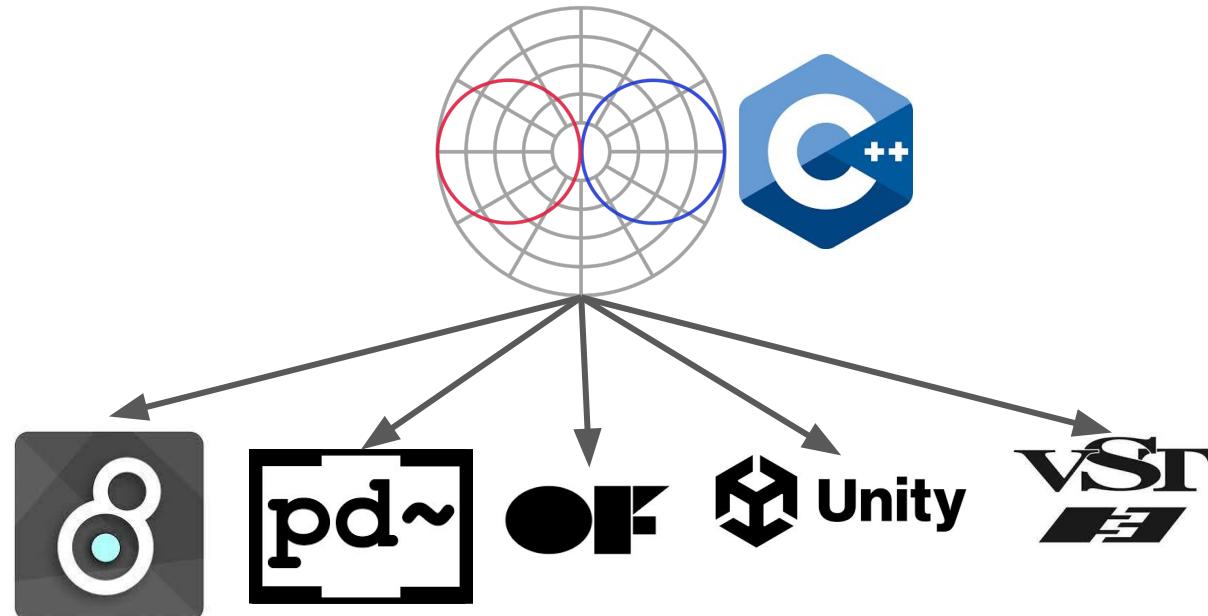
Development of HOA Library (High Order Ambisonics Library)



3 projects of the Labex Arts H2H:

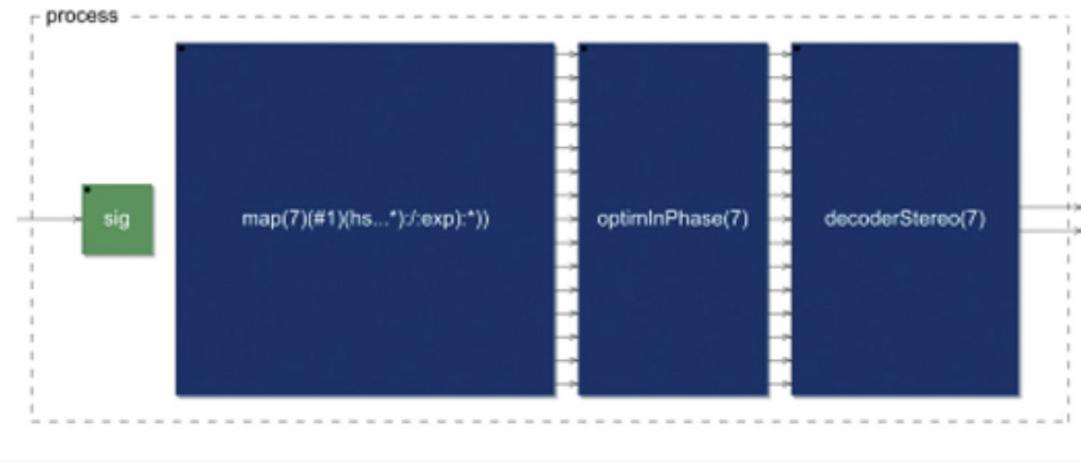
- Spatialisation by and for musicians - 2012-2013
- interfaces for spatialisation - 2013-2014
- HOA 3D - 2014-2015

HoaLibrary
<http://hoalibrary.mshparisnord.fr/>



Elementary functions of HOA in Faust (ho.lib)

FAUST



```
import("filter.lib");
import("hoa.lib") ;

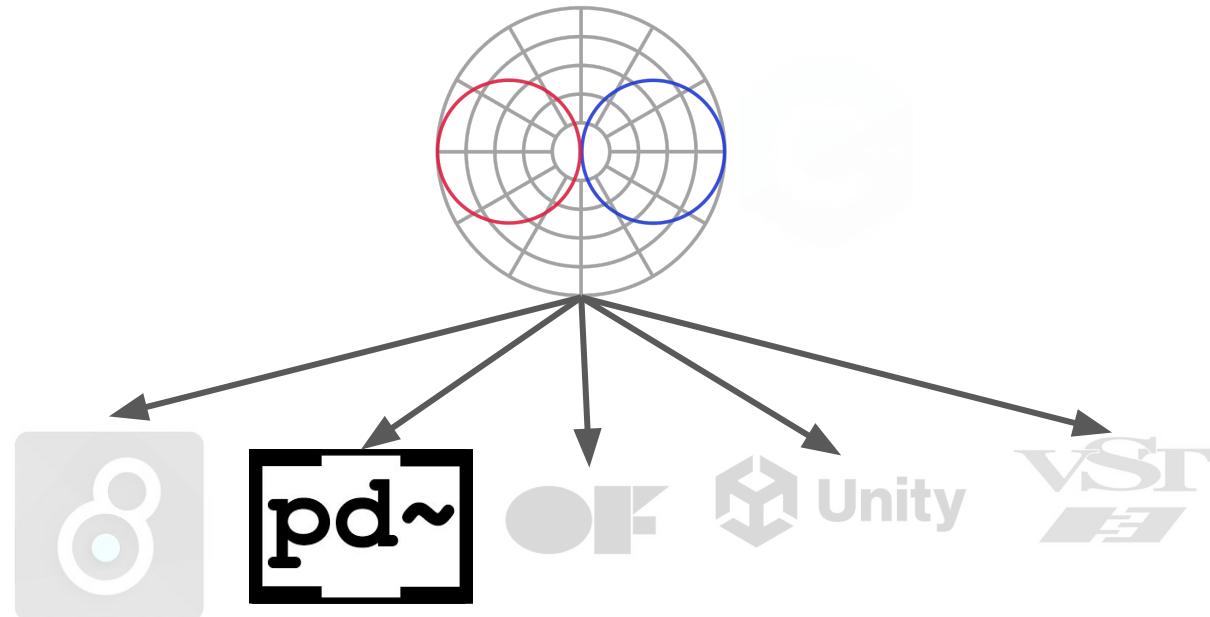
radius = hslider("Source Radius", 1., 0, 10, 0.001) : smooth(tau2pole(0.02));
angle = hslider("Source Angle", 0., -2*PI, 2*PI, 0.001) : smooth(tau2pole(0.02));

process(sig) = map(7, sig, x1, y1) : optimInPhase(7) : decoderStereo(7);
```

Obsolescence of Pd version

HoaLibrary

<http://hoalibrary.mshparisnord.fr/>



abc in Paris 8 University education

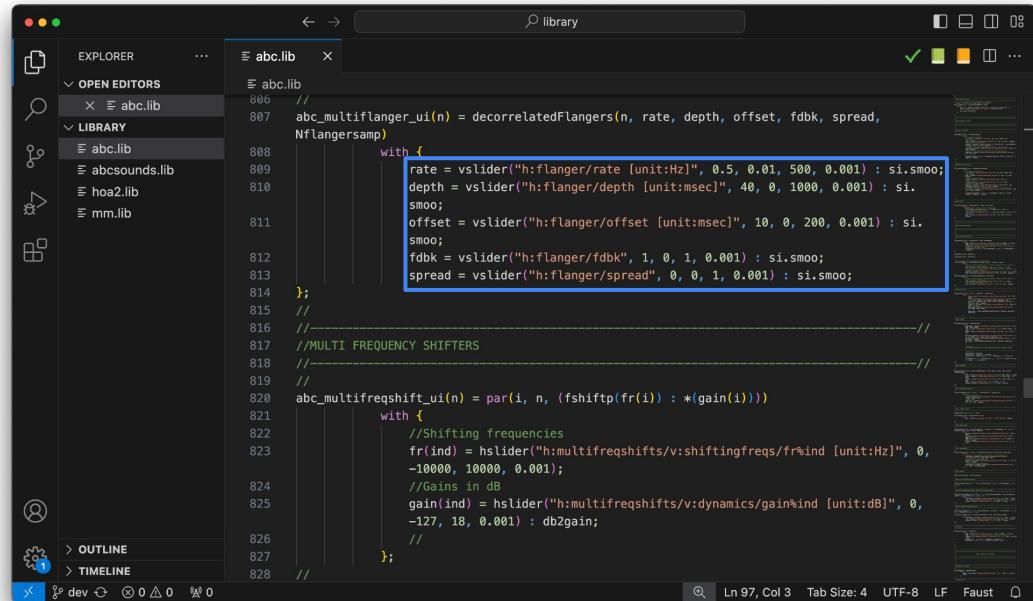


- *Max & Pd programming lvl2 (L3)*
- *Programming Languages (L3)*
- *Music and Computerized Tools (M1/M2)*
- *Compositions in “J.Combier’s workshop”*
- *PhD students*

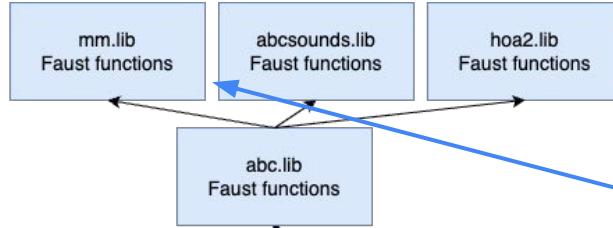
Music and Informatic Tools (2023-2024) - MIP of EUR ArTeC with CAIRN musicians

abc.lib
Faust functions

ex: line 807-828 abc.lib



```
// abc_multiflanger_ui(n) = decorrelatedFlangers(n, rate, depth, offset, fdbk, spread, Nflangersamp)
// with {
//   rate = vslider("h:flanger/rate [unit:Hz]", 0.5, 0.01, 500, 0.001) : si.smoo;
//   depth = vslider("h:flanger/depth [unit:msec]", 40, 0, 1000, 0.001) : si.smoo;
//   offset = vslider("h:flanger/offset [unit:msec]", 10, 0, 200, 0.001) : si.smoo;
//   fdbk = vslider("h:flanger/fdbk", 1, 0, 1, 0.001) : si.smoo;
//   spread = vslider("h:flanger/spread", 0, 0, 1, 0.001) : si.smoo;
// };
// -----
// /MULTI FREQUENCY SHIFTERS
// -----
abc_multifreqshift_ui(n) = par(i, n, (fshiftfp(fr(i)) : *(gain(i))))
with {
  //Shifting frequencies
  fr(ind) = hslider("h:multipfreqshifts/v:shiftingfreqs/fr%ind [unit:Hz]", 0, -10000, 10000, 0.001);
  //Gains in dB
  gain(ind) = hslider("h:multipfreqshifts/v:dynamics/gain%ind [unit:dB]", 0, -127, 18, 0.001) : db2gain;
}
```

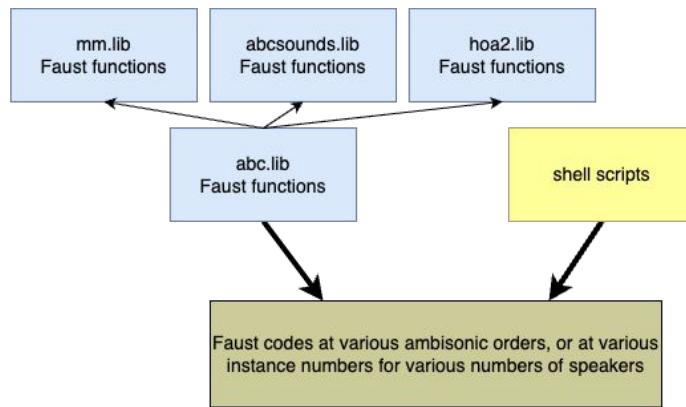


ex: call of “decorrelatedFlangers” from mm.lib

```

abc_multiflanger_i(n) = decorrelatedFlangers[n, rate, depth, offset, fdbk, spread,
Nflangersamp]
    with {
        rate = vslider("h:flanger/rate [unit:Hz]", 0.5, 0.01, 500, 0.001) : si.smoo;
        depth = vslider("h:flanger/depth [unit:msec]", 40, 0, 1000, 0.001) : si.smoo;
        smoo;
        offset = vslider("h:flanger/offset [unit:msec]", 10, 0, 200, 0.001) : si.smoo;
        smoo;
        fdbk = vslider("h:flanger/fdbk", 1, 0, 1, 0.001) : si.smoo;
        spread = vslider("h:flanger/spread", 0, 0, 1, 0.001) : si.smoo;
    };
    // -----
    //-----//MULTI FREQUENCY SHIFTERS
    //-----//
    abc_multifreqshift_i(n) = par(i, n, (fshiftfp(fr(i)) : *(gain(i))))
    with {
        //Shifting frequencies
        fr(ind) = hslider("h:multipfreqshifts/v:shiftingfreqs/fr%ind [unit:Hz]", 0,
-10000, 10000, 0.001);
        //Gains in dB
        gain(ind) = hslider("h:multipfreqshifts/v:dynamics/gain%ind [unit:dB]", 0,
-127, 18, 0.001) : db2gain;
    };

```



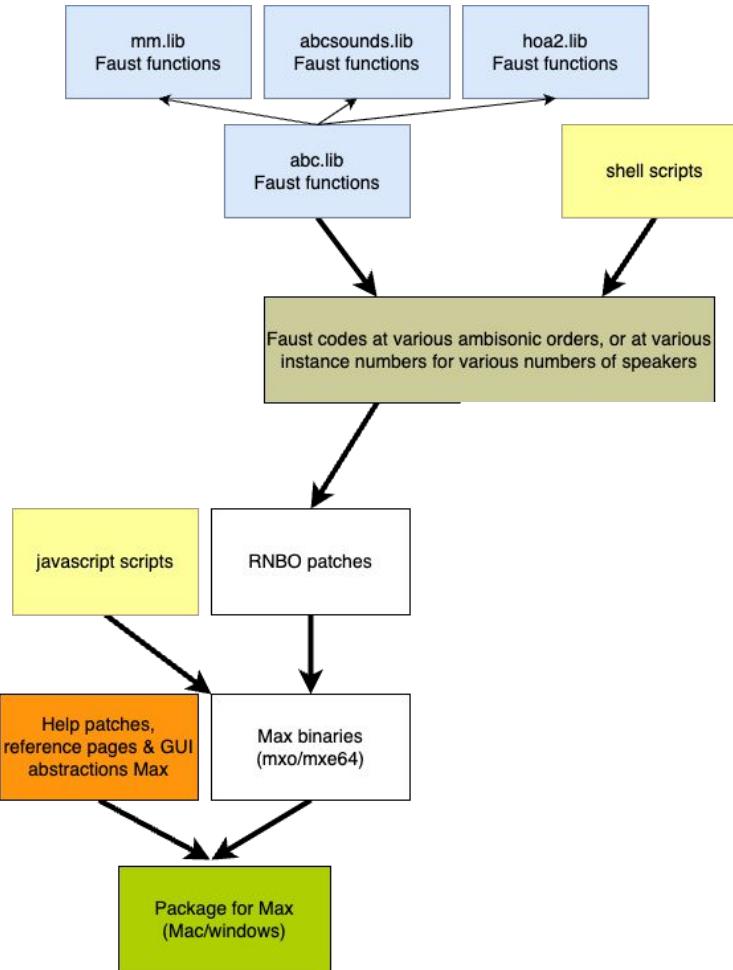
A screenshot of a GitHub repository page for `alainbonardi/abcLib`. The repository has 49 stars and 6 forks. The `bashFiles` directory is shown, containing numerous shell scripts related to `abc.lib` code generation. The commits listed show the history of these scripts, including additions for `abc_2d_vectors`, `abc_2d_man_decorrelat...`, and `busmultFaustCodeGeneration.sh`.

Name	Last commit message	Last commit date
..		
abcLibDSPPGeneration.sh	Added shell scripts to generate abc_2d_vectors, abc_2d_man_decorrelat...	ec3703c - 7 months ago
addsynthFaustCodeGeneration.sh		
busmultFaustCodeGeneration.sh	Minor changes in abc.lib with addSynth and subtractSynth	last year
busselectFaustCodeGeneration...		
busselectFaustCodeGeneratio...		
choosingMultiparaFaustCodeGe...		
decoder2dFaustCodeGeneratio...		
delayhansFaustCodeGeneratio...		
encoder2dFaustCodeGeneratio...		
faustCodeHeader.txt		

ex: shell scripts and faust codes on Github

A screenshot of a GitHub repository page for `alainbonardi/abcLib`. The repository has 49 stars and 6 forks. The `faustCodes/abc_flangers` directory is shown, containing shell scripts for generating `abc_2d_vectors` and `abc_2d_man_decorrelat...` for various flanger instances (1 through 16). The commits show the addition of these scripts over time.

Name	Last commit message	Last commit date
..		
abc_flanger1.ds	Added shell scripts to generate abc_2d_vectors, abc_2d_man_decorrelat...	7 months ago
abc_flanger10.ds	Added shell scripts to generate abc_2d_vectors, abc_2d_man_decorrelat...	7 months ago
abc_flanger11.ds	Added shell scripts to generate abc_2d_vectors, abc_2d_man_decorrelat...	7 months ago
abc_flanger12.ds	Added shell scripts to generate abc_2d_vectors, abc_2d_man_decorrelat...	7 months ago
abc_flanger13.ds	Added shell scripts to generate abc_2d_vectors, abc_2d_man_decorrelat...	7 months ago
abc_flanger14.ds	Added shell scripts to generate abc_2d_vectors, abc_2d_man_decorrelat...	7 months ago
abc_flanger15.ds	Added shell scripts to generate abc_2d_vectors, abc_2d_man_decorrelat...	7 months ago
abc_flanger16.ds	Added shell scripts to generate abc_2d_vectors, abc_2d_man_decorrelat...	7 months ago
abc_flanger2.ds	Added shell scripts to generate abc_2d_vectors, abc_2d_man_decorrelat...	7 months ago
abc_flanger3.ds	Added shell scripts to generate abc_2d_vectors, abc_2d_man_decorrelat...	7 months ago
abc_flanger4.ds	Added shell scripts to generate abc_2d_vectors, abc_2d_man_decorrelat...	7 months ago
abc_flanger5.ds	Added shell scripts to generate abc_2d_vectors, abc_2d_man_decorrelat...	7 months ago
abc_flanger6.ds	Added shell scripts to generate abc_2d_vectors, abc_2d_man_decorrelat...	7 months ago
abc_flanger7.ds	Added shell scripts to generate abc_2d_vectors, abc_2d_man_decorrelat...	7 months ago



A screenshot of a Mac OS X file browser window titled "abclib_rnbo". The left sidebar shows standard Mac categories like Favoris, Bureau, and Documents. The main pane lists 718 files, all named "abc_2d_decoder1_x.maxpat" where x is a number from 3 to 13. Each file is a zero-octet Max patcher. The list ends with "...".

Nom	Date de modification	Taille	Type
abc_2d_decoder1_3.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder1_4.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder1_5.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder1_6.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder1_7.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder1_8.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder1_9.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder1_10.maxpat	• 14 octobre 2024, 15:54	257 ko	Max patcher
abc_2d_decoder1_11.maxpat	• 14 octobre 2024, 15:54	293 ko	Max patcher
abc_2d_decoder1_12.maxpat	• 14 octobre 2024, 15:54	332 ko	Max patcher
abc_2d_decoder1_13.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder1_14.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder1_15.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder1_16.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder1.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder2_3.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder2_4.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder2_5.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder2_6.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder2_7.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder2_8.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder2_9.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder2_10.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder2_11.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder2_12.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher
abc_2d_decoder2_13.maxpat	• 14 octobre 2024, 15:54	Zéro octet	Max patcher

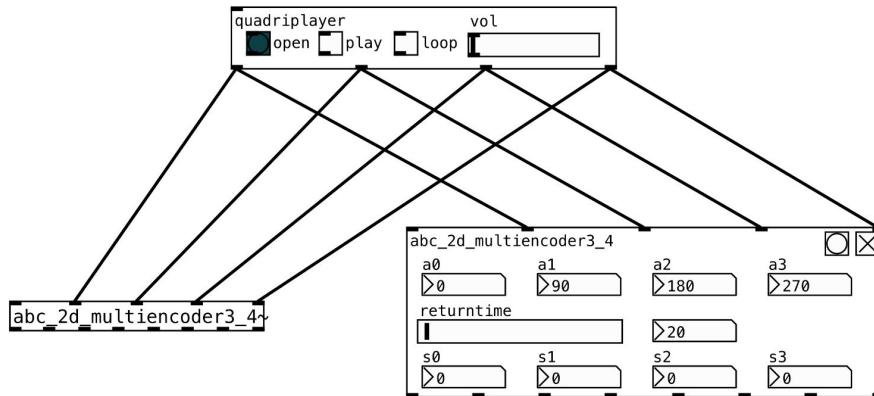
(718 RNBO patches)



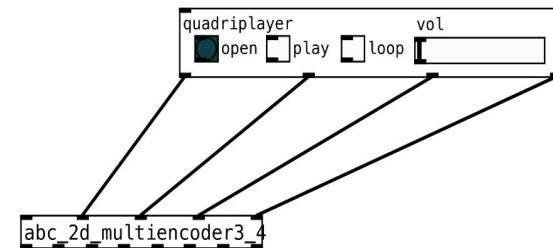
? faustgen2~ (A. Graef)
 for Mac OS / Windows / Linux
 or wrapper pd

'Classical' - non multichannel

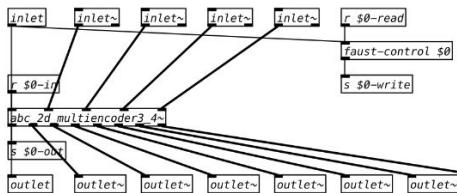
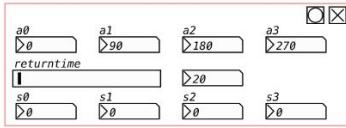
external compilation (online or local)



faustgen2 (inside the Pd patch)



ui generation by the online compiler

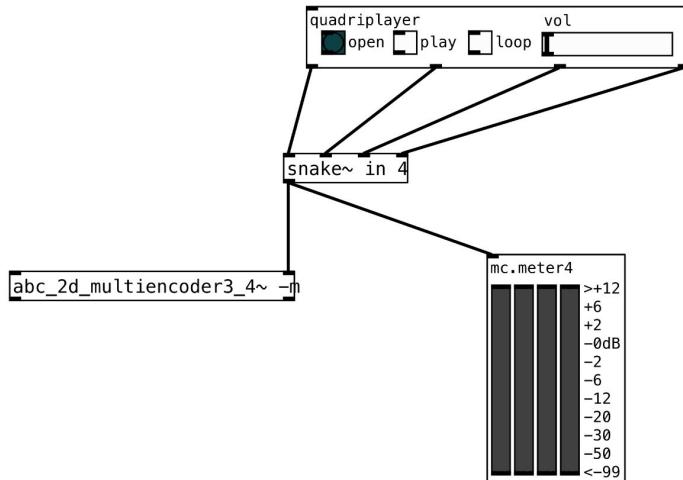


```
r $0-init
r $0-active
active $1(
$0 (
s $0-multiencoder/angles/a0
\multiencoder/angles/a0 $1(
r $0-multienncoder/angles/a1
\multiencoder/angles/a1 $1(
r $0-multienncoder/angles/a2
\multiencoder/angles/a2 $1(
r $0-multienncoder/angles/a3
\multiencoder/angles/a3 $1(
r $0-multienncoder/returntime
\multiencoder/returntime $1(
r $0-multienncoder/speeds/s0
\multiencoder/speeds/s0 $1(
r $0-multienncoder/speeds/s1
\multiencoder/speeds/s1 $1(
r $0-multienncoder/speeds/s2
\multiencoder/speeds/s2 $1(
r $0-multienncoder/speeds/s3
\multiencoder/speeds/s3 $1(
s $0-multienncoder/speeds/s3
```

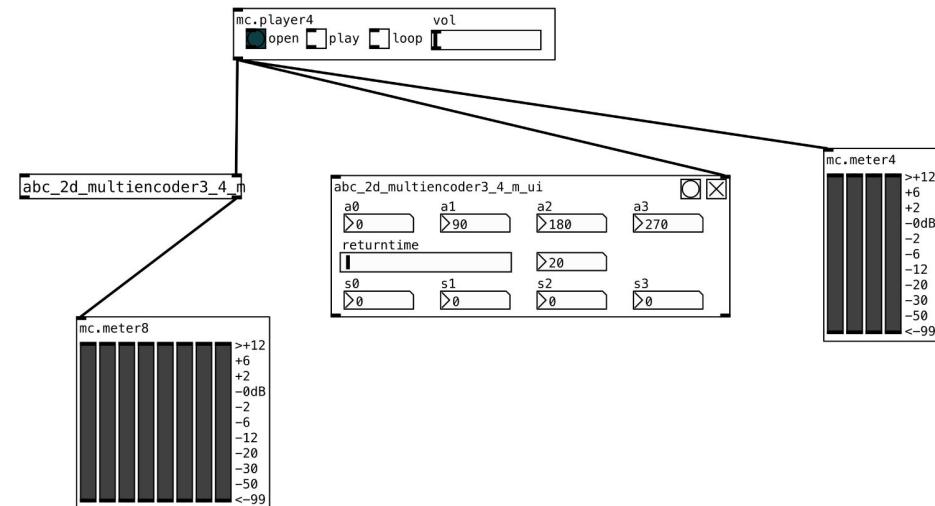
```
s $0-in
s $0-read
r $0-write
route active
s $0-active
route /multiencoder/angles/a0
s $0-multiencoder/angles/a0
route /multiencoder/angles/a1
s $0-multienncoder/angles/a1
route /multiencoder/angles/a2
s $0-multienncoder/angles/a2
route /multiencoder/angles/a3
s $0-multienncoder/angles/a3
route /multienencoder/returntime
s $0-multienncoder/returntime
route /multiencoder/speeds/s0
s $0-multienncoder/speeds/s0
route /multienencoder/speeds/s1
s $0-multienncoder/speeds/s1
route /multienencoder/speeds/s2
s $0-multienncoder/speeds/s2
route /multienencoder/speeds/s3
s $0-multienncoder/speeds/s3
```

Multichannel

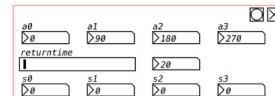
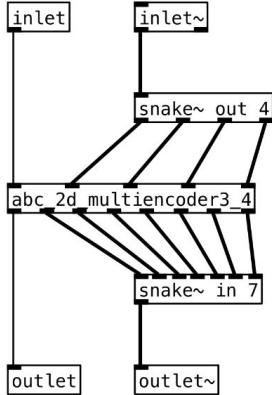
external compilation (since Faust v.2.75.7, sept. 2024)



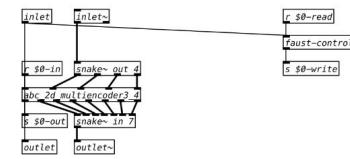
faustgen2



inside the abstractions using faustgen2 (generated by a Python program)



Generated Tue Nov 19 22:29:42 2024 by faust2pd v2.16. See
<http://faust.grame.fr> and <http://purelang.bitbucket.org/>.



```

r $0-init
i [
s $0-active
k [
s $0-multiencoder/angles/a0
f [
r $0-multiencoder/angles/a0 $0
r $0-multiencoder/angles/a1
multiencoder/angles/a1 $1
r $0-multiencoder/angles/a2
multiencoder/angles/a2 $2
r $0-multiencoder/angles/a3
multiencoder/angles/a3 $3
f [
r $0-multiencoder/returntime
multiencoder/returntime $0
r $0-multiencoder/returntime $1
r $0-multiencoder/speeds/s0
multiencoder/speeds/s0 $0
r $0-multiencoder/speeds/s1
multiencoder/speeds/s1 $1
r $0-multiencoder/speeds/s2
multiencoder/speeds/s2 $2
r $0-multiencoder/speeds/s3
multiencoder/speeds/s3 $3
  
```

```

s $0-read
route active
active si[
s $0-multiencoder/angles/a0
route /multiencoder/angles/a0
s $0-multiencoder/angles/a1
route /multiencoder/angles/a1
s $0-multiencoder/angles/a2
route /multiencoder/angles/a2
s $0-multiencoder/angles/a3
route /multiencoder/angles/a3
s $0-multiencoder/returntime
route /multiencoder/returntime
s $0-multiencoder/returntime $0
route /multiencoder/speeds/s0
s $0-multiencoder/speeds/s1
route /multiencoder/speeds/s1
s $0-multiencoder/speeds/s2
route /multiencoder/speeds/s2
s $0-multiencoder/speeds/s3
route /multiencoder/speeds/s3
  
```

generated by pdCanvasToMC.py / abclib - CICM



Max 8

- Wrapper (D.Fierro)
- GUI Abstractions
- Documentation with reference pages

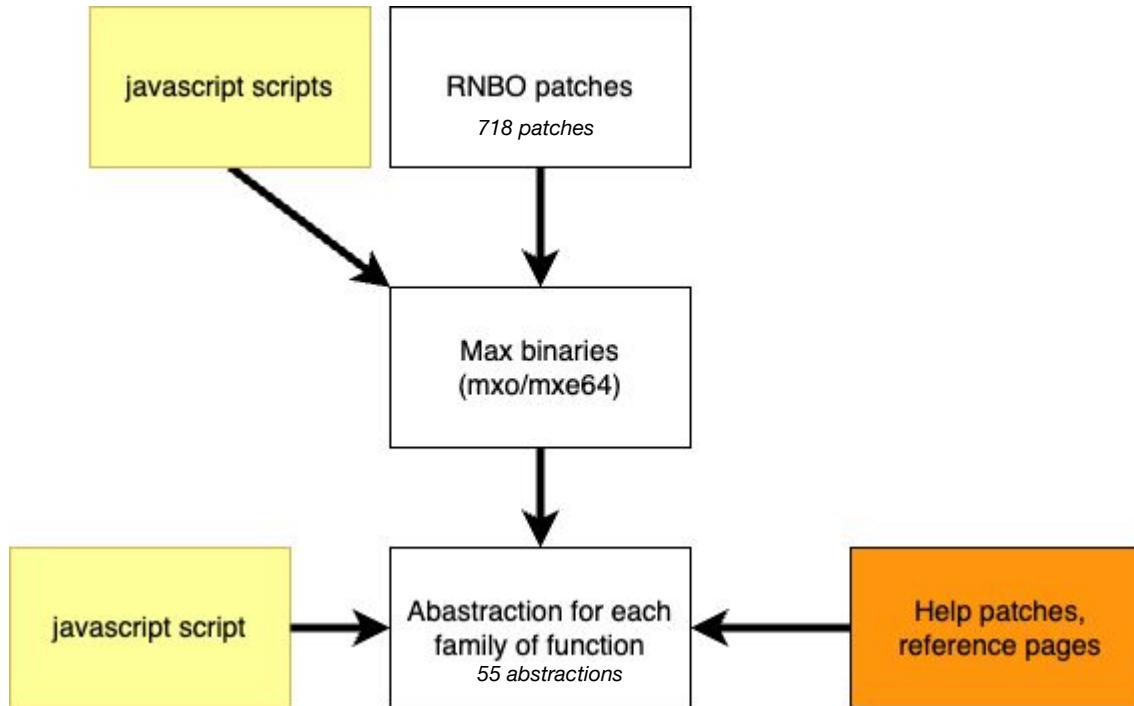


Max 8

- Wrapper (D.Fierro) **718 externals => 55 abstractions**
- GUI Abstractions
- Documentation with reference pages

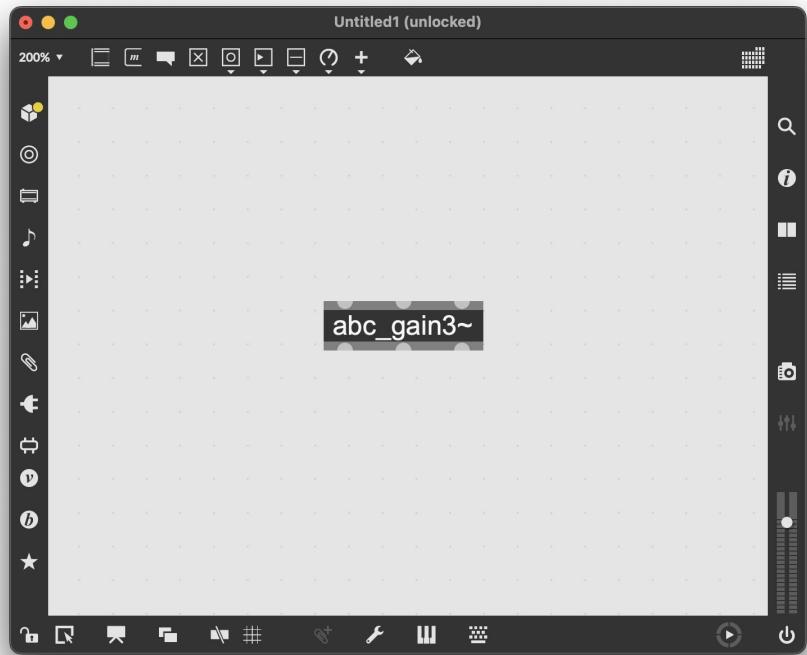


Max 8



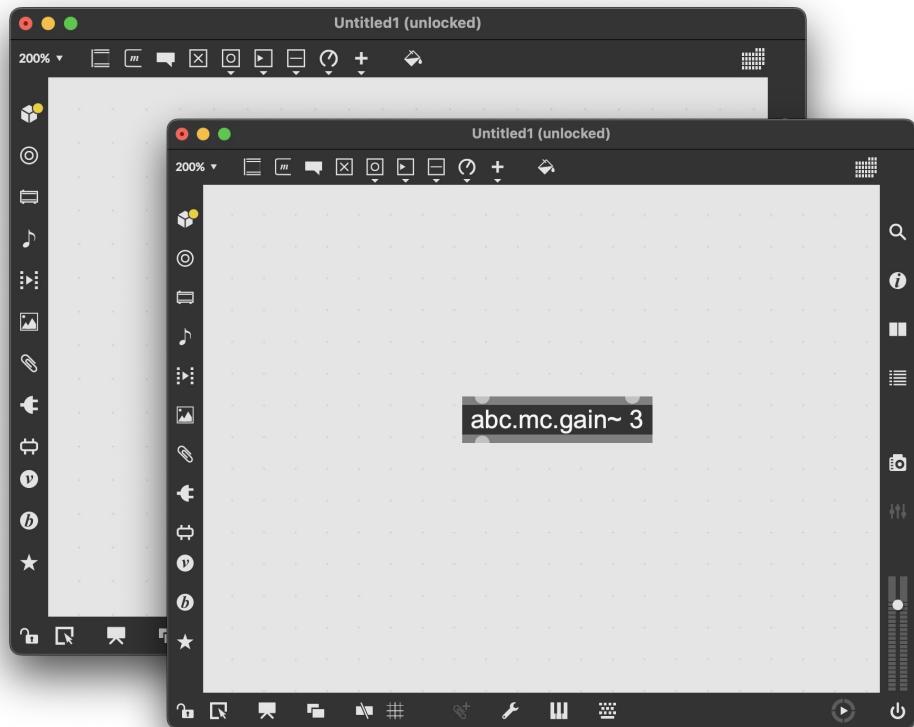


Max 8





Max 8





Max 8

The screenshot displays three Max 8 windows:

- The top window is titled "Untitled1 (unlocked)" with a zoom level of 200%. It contains a single object labeled "abc.mc.gain~ 3".
- The middle window is also titled "Untitled1 (unlocked)" with a zoom level of 200%. It is empty.
- The bottom-right window is titled "[abc.mc.gain~]" with a zoom level of 100%. It shows the internal JS abstraction structure:

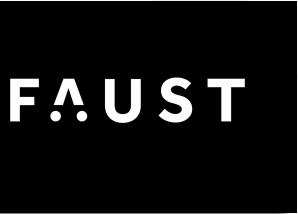
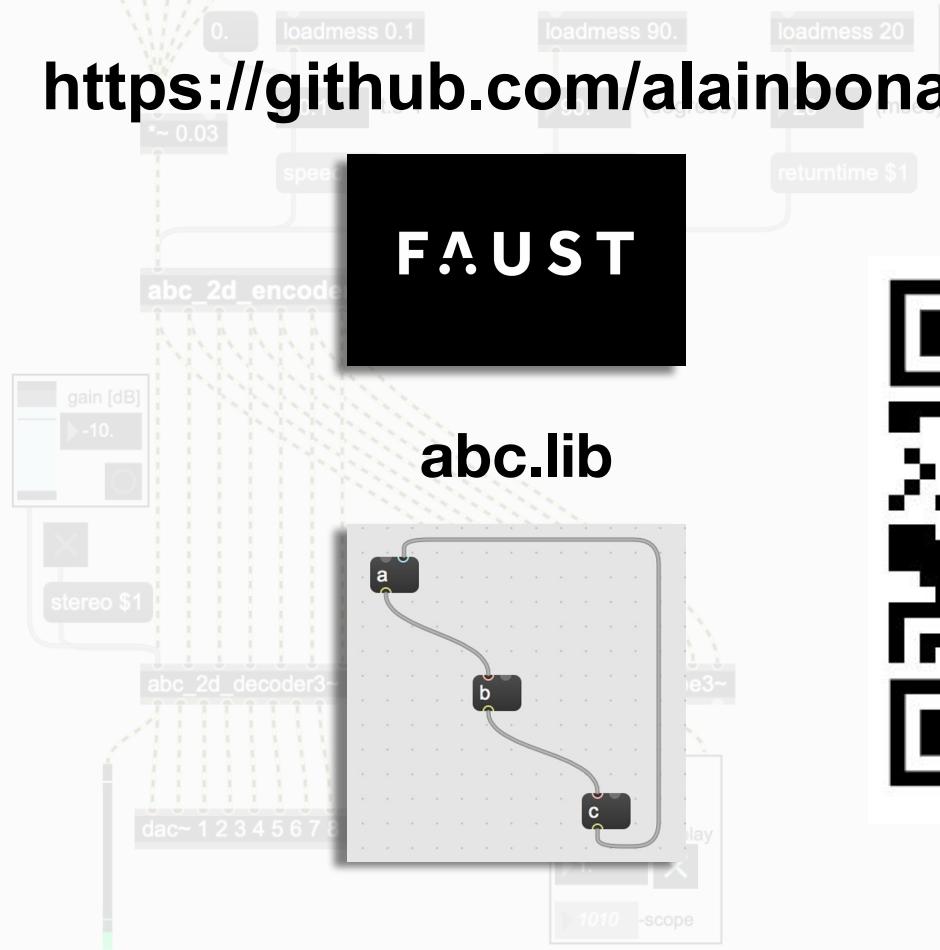
```
js abc_wrp.js 3 0 0 0 0 0 0 0 0
```

```
graph TD; 1[1] --> mc_unpack[mc.unpack~ 3]; 2[2] --> mc_unpack; mc_unpack --> abc_gain[abc_gain3~]; abc_gain --> mc_pack[mc.pack~ 3]; mc_pack --> 1[1]
```

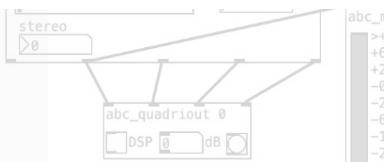
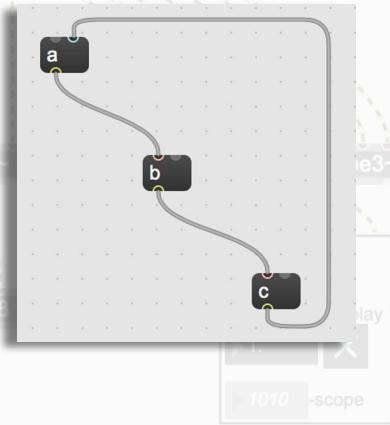
A large warning message is displayed on the right side of this window:

DO NOT MODIFY THIS ABSTRACTION.
This abstraction serves as a wrapper for the objects of the 'abc' library. It automatically selects the correct object and sets the appropriate inputs and outputs.
Any modification will cause it to malfunction.

<https://github.com/alainbonardi/abclib/releases/tag/v1.1.0>



abc.lib



abclibrary|Alain_Bonardi_&_Paul_Goutman_2019-2021_CICM|University_Paris

g/v1.1.0

