

FAUST BY & FOR MUSICIANS: RESEARCH, CREATION, TEACHING

Alain Bonardi and Paul Goutmann
University of Paris 8 / CICM-MUSIDANSE / ERC G3S Project

Music at the University of Paris 8

Music at the University of Paris 8

→ University of Paris 8: 23.000 students



University of Paris 8



Maison des Sciences Humaines et Sociales Paris Nord

Music at the University of Paris 8

→ University of Paris 8: 23.000 students

→ Music Department: 600 students



University of Paris 8



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- 6 majors in the Licence/Bachelor's program



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- Music Department: 600 students
- 6 majors in the Licence/Bachelor's program
- 2 majors in the Master's program
- MUSIDANSE laboratory with 4 teams
- Computer Science and Music Creation Center (CICM) hosted at MSH Paris Nord



University of Paris 8



Maison des Sciences Humaines et Sociales Paris Nord

Our Positioning

Computer Music Courses (Licence/Bachelor and Master)



3D Ambisonics studio of the CICM



Auditorium of the MSH PN

Our Positioning

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→ A large range of knowledge and methodologies.



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→ Interaction between composition and research, based on project-oriented research-creation

→ Main areas of research: spatial audio, as well as mixed, electroacoustic, and experimental music



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Faust for Our Pedagogy

Mixed Music as a Pedagogical Framework for Creators

→ Computer Music courses are strongly connected with the Composition Workshop.

Mixed Music as a Pedagogical Framework for Creators

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The design of live electronics is music and sound oriented, for composition.

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→ **A synthetic approach of composition: towards a whole interaction of acoustic instruments with live electronic processes.**

Mixed Music as a Pedagogical Framework for Creators

Computer Music courses are strongly connected with the Composition Workshop.

The design of live electronics is music and sound oriented, for composition.

A synthetic approach of composition: towards a whole interaction of acoustic instruments with live electronic processes.

→ **Live processing enables immediate perceptual evaluation.**

Faust in the 3rd Year of the Bachelor

→ Introduction to functional programming in analogy
with patching

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Introduction to functional programming in analogy
with patching

→ **6 × 3 hours = 18 hours of Faust teaching**

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→ Starting from the basic modules and processes
known in computer music

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Starting from the basic modules and processes
known in computer music

→ **Intensively using the Faust libraries to implement
ready-to-use modules and combining them simply.**

Faust in the 3rd Year of the Bachelor

Introduction to functional programming in analogy
with patching

6 × 3 hours = 18 hours of Faust teaching

Starting from the basic modules and processes
known in computer music

Intensively using the Faust libraries to implement
ready-to-use modules and combining them simply.

→ **Running the modules on phones thanks to PWA
architectures.**

Presence of Faust in our Project-Oriented Master Degree

→ A research-creation framework: being able to formulate an hypothesis and assess it

Presence of Faust in our Project-Oriented Master Degree

A research-creation framework: being able to
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Faust code for exploration

Presence of Faust in our Project-Oriented Master Degree

A research-creation framework: being able to formulate an hypothesis and assess it

Faust code for exploration

→ **abclib for patch sketching in multichannel and spatial environments**

Faust for Research at CICM

Faust for Research at CICM



ACI Jeunes Chercheurs

“Espaces Sonores”

2000–2004

ACI Jeunes Chercheurs

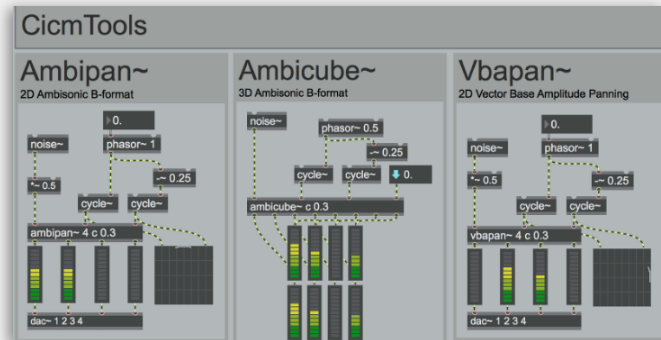
“Espaces Sonores” (2000–2004)

→ Benoît Courribet & Rémi Mignot

→ Ambipan, ambicube, vbapan, B-Format

→ Punctual sources and trajectories

→ Book: “Espaces sonores” Actes de Recherches



Faust for Research at CICM



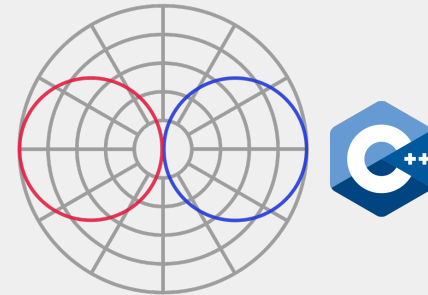
ACI Jeunes Chercheurs
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Labex Arts H2H
HOALibrary
2012–2019

LabEx Arts H2H

- Spatialisation by and for musicians – 2012–2013
- Interfaces for spatialisation – 2013–2014
- HOA 3D – 2014–2015
- Development of the HOALibrary

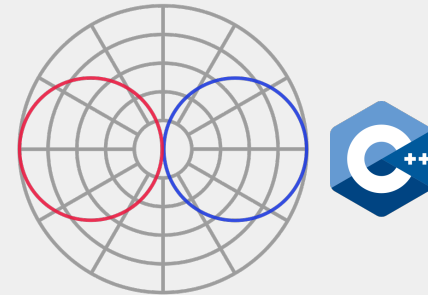


HoaLibrary



LabEx Arts H2H

- Spatialisation by and for musicians – 2012–2013
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- Development of the HOALibrary
- Elementary functions of HOA in Faust – since 2012



HoaLibrary

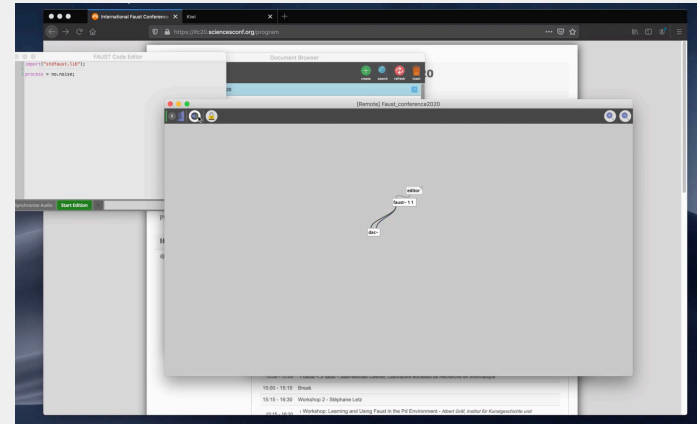


Faust for Research at CICM



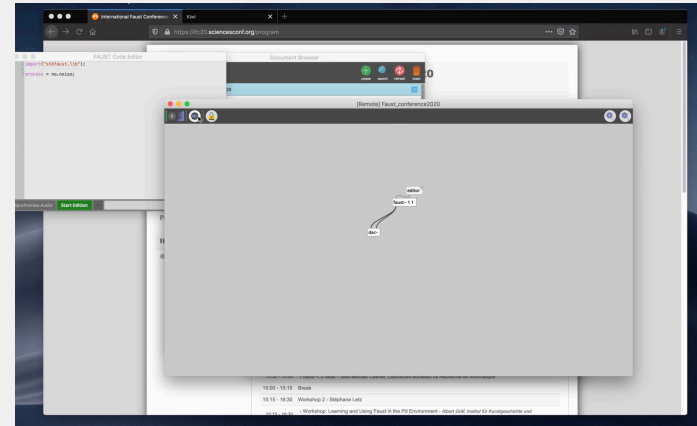
ANR MUSICOLL

→ Collaborative real-time patching and music with Kiwi software



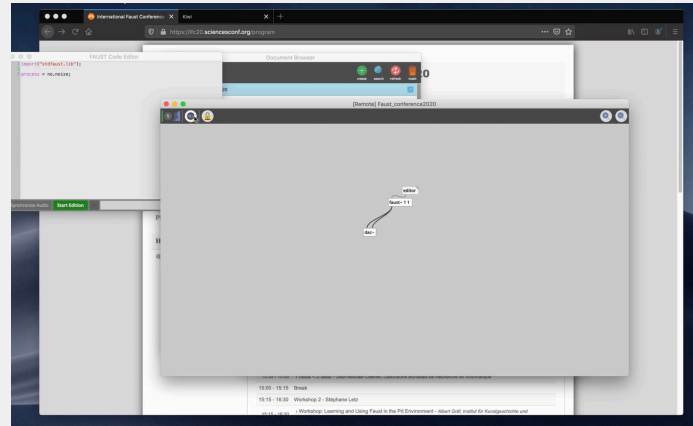
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- Embedded Faust compiler in Kiwi



ANR MUSICOLL

- Collaborative real-time patching and music with Kiwi software
- Embedded Faust compiler in Kiwi
- HandsOn Workshop at IFC20: Kiwi and Faust



Faust for Research at CICM



Faust for Research at CICM



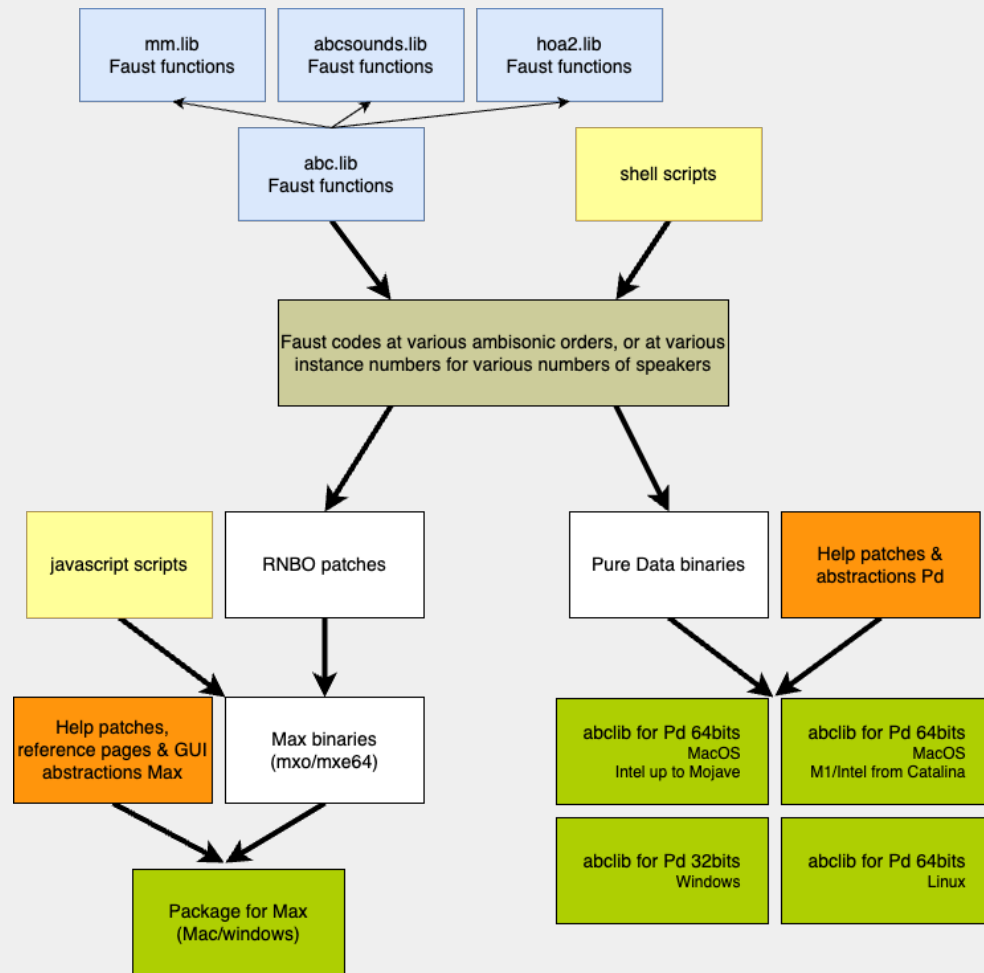
(2019) Pd version of
Hoalibrary was obsolete

Faust for Research at CICM



Abc Library Max Package & Pd Coll.

- Focus on spatial audio & MC processing
- Making it accessible for musicians
- Multiple target: Max, pd, (vst/SuperCollider)
- More than 1700 dl on Max Package Manager
- Compilation workflow

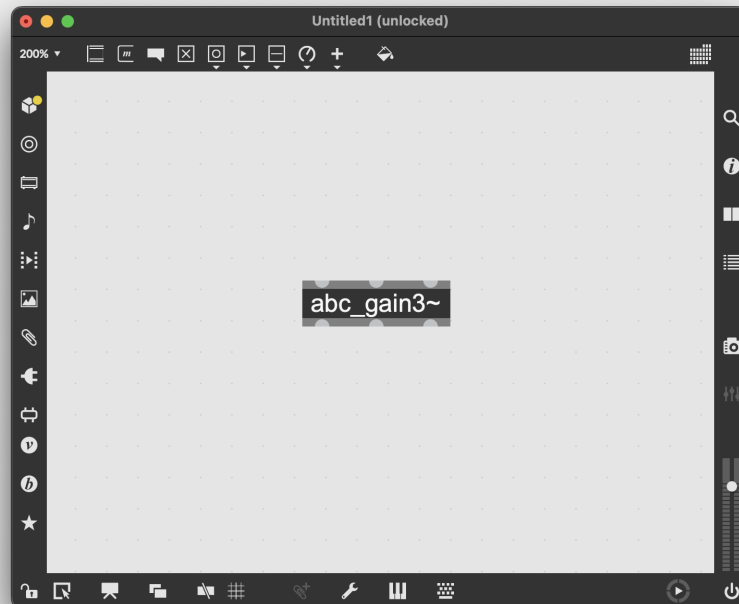


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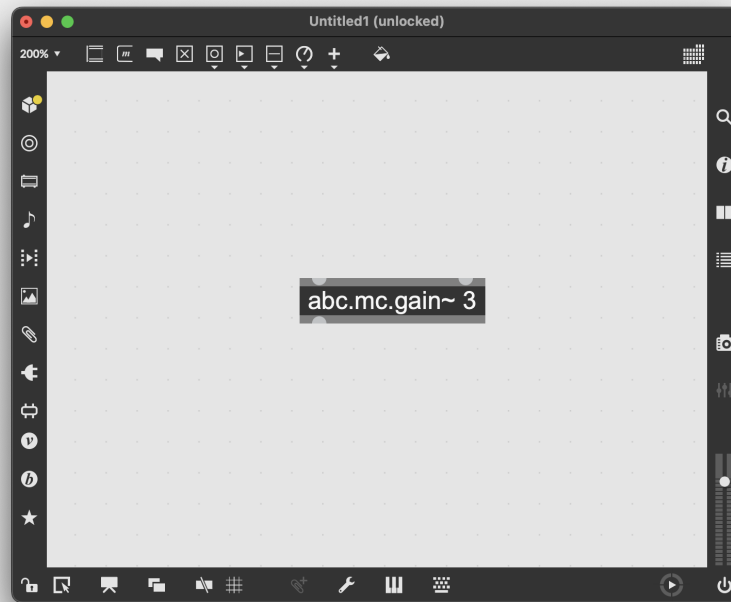
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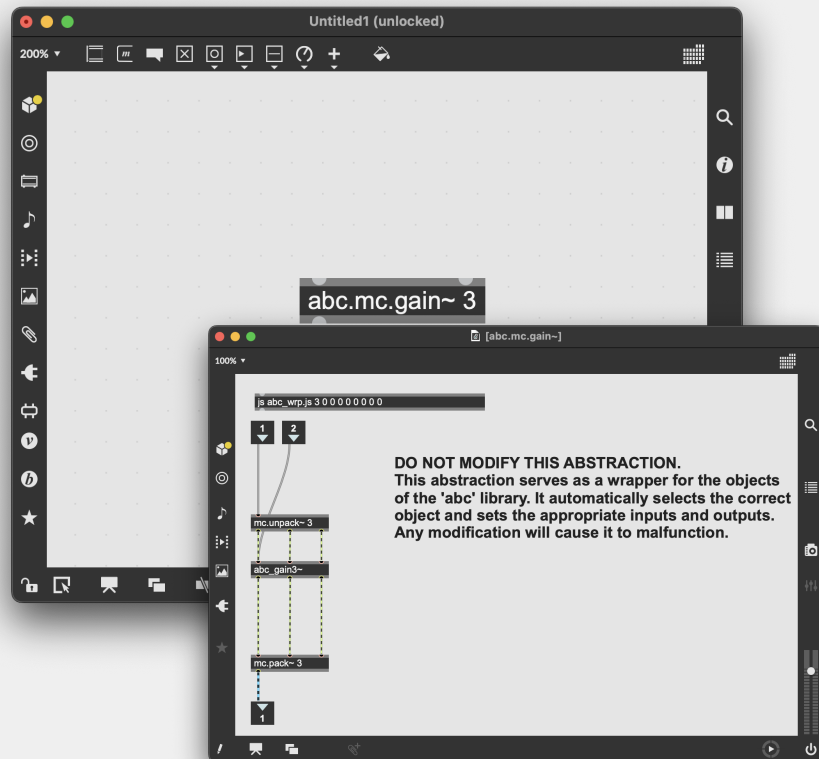
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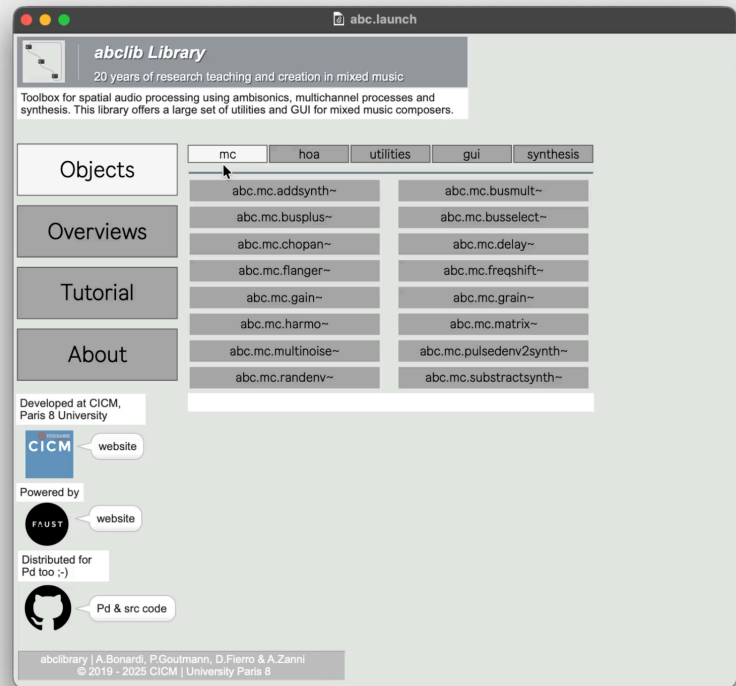
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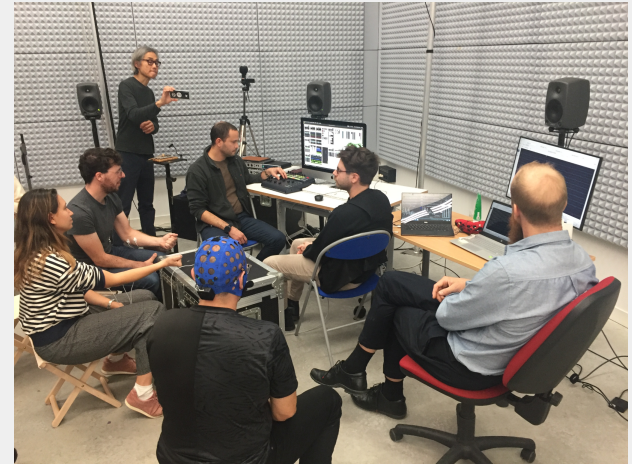


Faust for Research at CICM



ANR BBDMI

→ Body Brain Digital Music Instruments



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→ Body Brain Digital Music Instruments

→ Producing instrumental prototypes in an open way (open software and open hardware) and to document them in the framework of open science (FAIR).

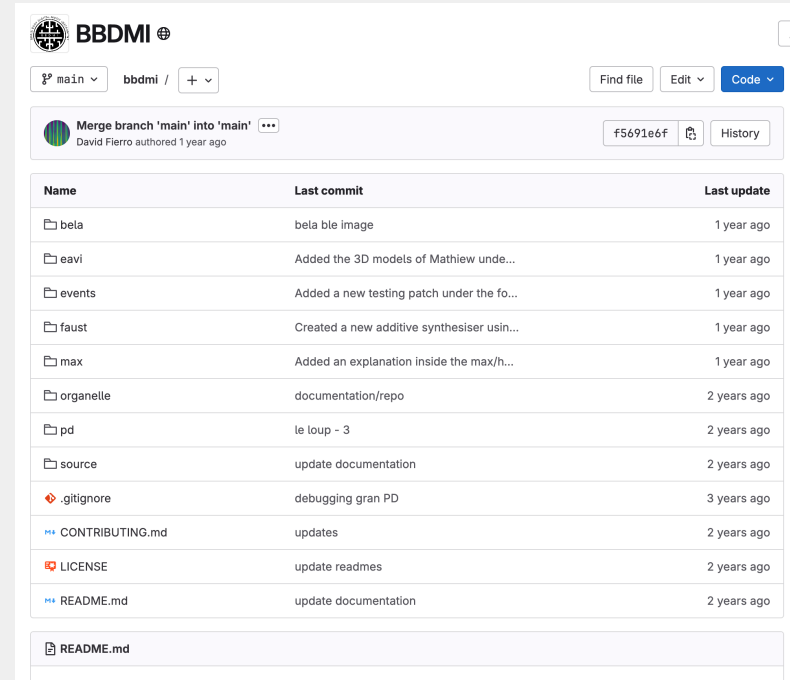


ANR BBDMI

→ Body Brain Digital Music Instruments
 → Producing instrumental prototypes in an open way (open software and open hardware) and to document them in the framework of open science (FAIR).

→ A Faust and Max Gitlab:

<https://gitlab.huma-num.fr/bbdmi/bbdmi>



The screenshot shows the GitLab interface for the BBDMI repository. At the top, there is a navigation bar with the repository name 'BBDMI' and a globe icon. Below this, there are buttons for 'Find file', 'Edit', and 'Code'. The main content area displays a merge branch 'main' into 'main' by David Fierro, authored 1 year ago, with a commit hash 'f5691e6f' and a 'History' button. Below this is a table listing the repository's files and their last commit details.

Name	Last commit	Last update
📁 bela	bela ble image	1 year ago
📁 eavi	Added the 3D models of Mathieu unde...	1 year ago
📁 events	Added a new testing patch under the fo...	1 year ago
📁 faust	Created a new additive synthesiser usin...	1 year ago
📁 max	Added an explanation inside the max/h...	1 year ago
📁 organelle	documentation/repo	2 years ago
📁 pd	le loup - 3	2 years ago
📁 source	update documentation	2 years ago
🔥 .gitignore	debugging gran PD	3 years ago
📄 CONTRIBUTING.md	updates	2 years ago
📄 LICENSE	update readmes	2 years ago
📄 README.md	update documentation	2 years ago

Below the table, there is a section for 'README.md' with a document icon.

Faust for Research at CICM





**Generative
Spatial Synthesis
of Sound & Music**

Design generic operative models
integrating existing 3D audio approaches

1

Design **human-machine interfaces**
for the generative exploration
of sound spaces

4

G3S

2

Build a **customized ML model**
to generate new sound spaces

3

Bring out **qualitative and quantitative**
descriptions of spatiality

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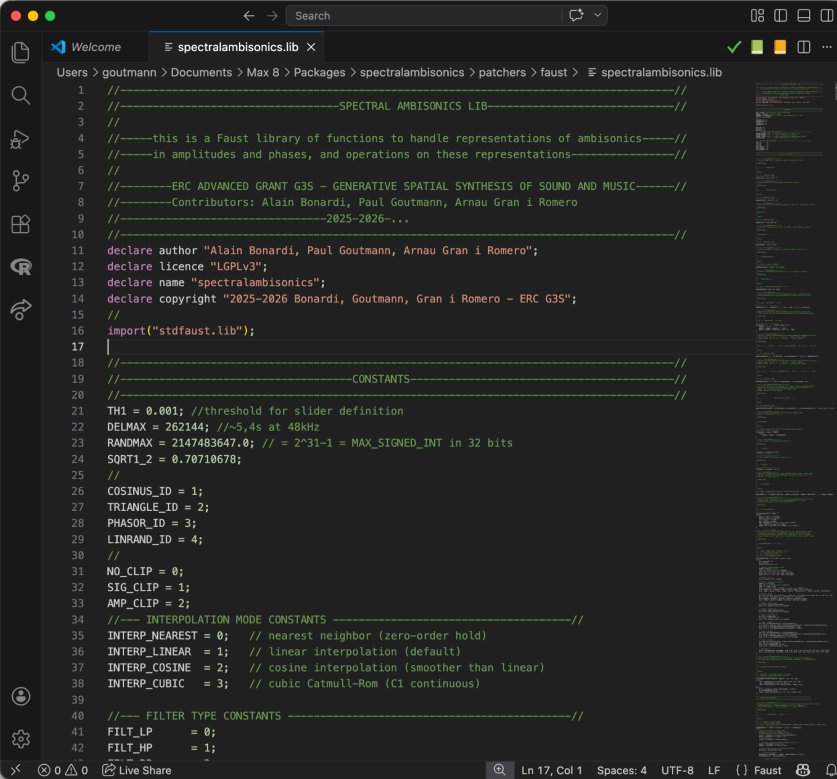
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Bring out **qualitative and quantitative**
descriptions of spatiality

spectralambisonics.lib

→ Focus on Fourier-like approach of 2D ambisonics

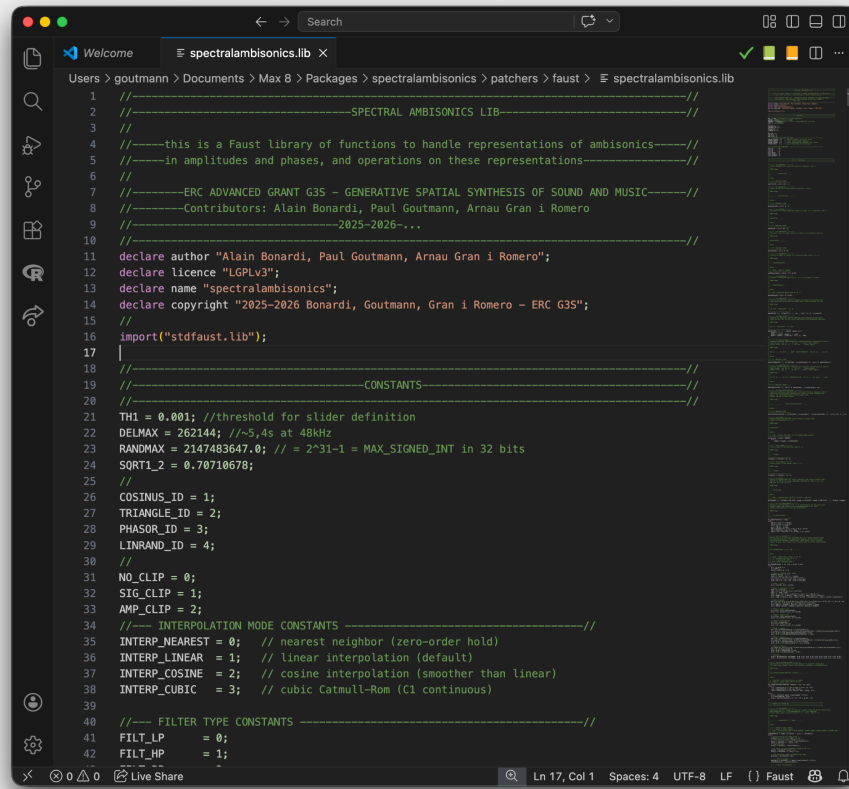


```
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4 //-----this is a Faust library of functions to handle representations of ambisonics-----//
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7 //-----ERC ADVANCED GRANT G3S - GENERATIVE SPATIAL SYNTHESIS OF SOUND AND MUSIC-----//
8 //-----Contributors: Alain Bonardi, Paul Goutmann, Arnau Gran i Romero-----//
9 //-----2025-2026-...-----//
10
11 declare author "Alain Bonardi, Paul Goutmann, Arnau Gran i Romero";
12 declare licence "LGPLv3";
13 declare name "spectralambisonics";
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15 //
16 import("stdfaust.lib");
17
18 //-----CONSTANTS-----//
19 //-----//
20
21 TH1 = 0.001; //threshold for slider definition
22 DELMAX = 262144; //5.4s at 48kHz
23 RANDMAX = 2147483647.0; // = 2^31-1 = MAX_SIGNED_INT in 32 bits
24 SQRT1_2 = 0.70710678;
25 //
26 COSINUS_ID = 1;
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28 PHASOR_ID = 3;
29 LINRAND_ID = 4;
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36 INTERP_LINEAR = 1; // linear interpolation (default)
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40 //--- FILTER TYPE CONSTANTS ---//
41 FILT_LP = 0;
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spectralambisonics.lib

→ Focus on Fourier-like approach of 2D ambisonics

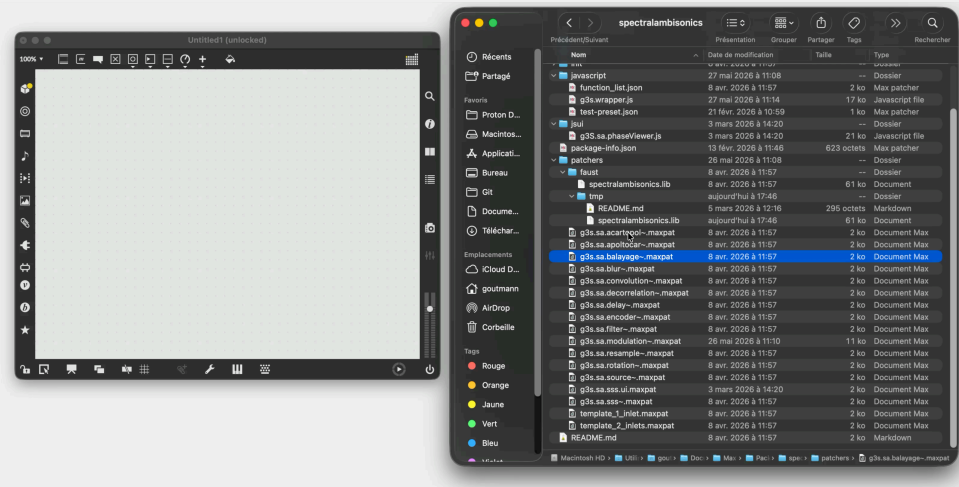
→ New musical processes operating at the spectral representational level



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spectralambisonics.lib

- Focus on Fourier-like approach of 2D ambisonics
- New musical processes operating at the spectral representational level
- Based on faustgen~ and a new wrapper



spectralambisonics.lib

- Focus on Fourier-like approach of 2D ambisonics
- New musical processes operating at the spectral representational level
- Based on faustgen~ and a new wrapper
- Max documentation generated from Faustlib

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Faust for Creation

Fil de Soi 2 for acoustic guitar and live electronics

→ Timbre modification based on Matrix Organization of Realtime Sound Processing in Faust

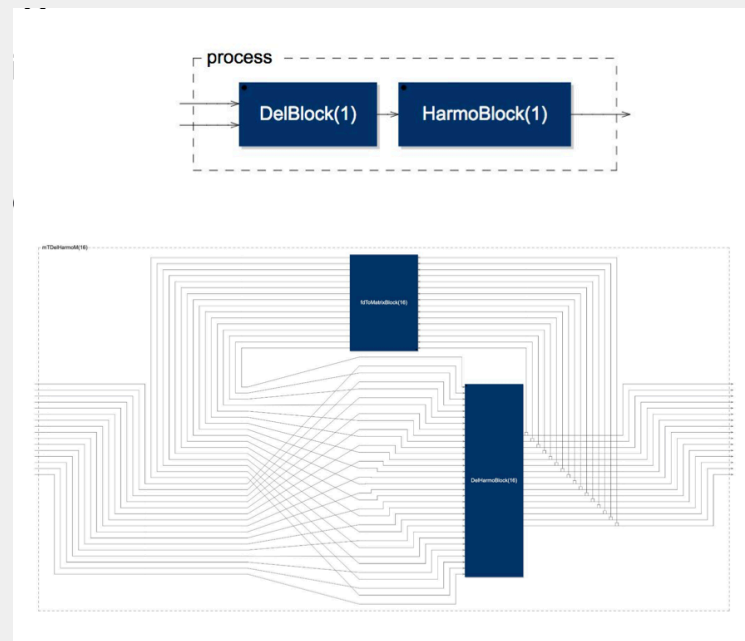
→ No pre-recorded sound, everything in live based on the guitar input

→ The whole DSP is written in Faust: A very simple elementary process (delay line => harmonizer), implemented 16 times

→ With a 16×16 reinjection matrix

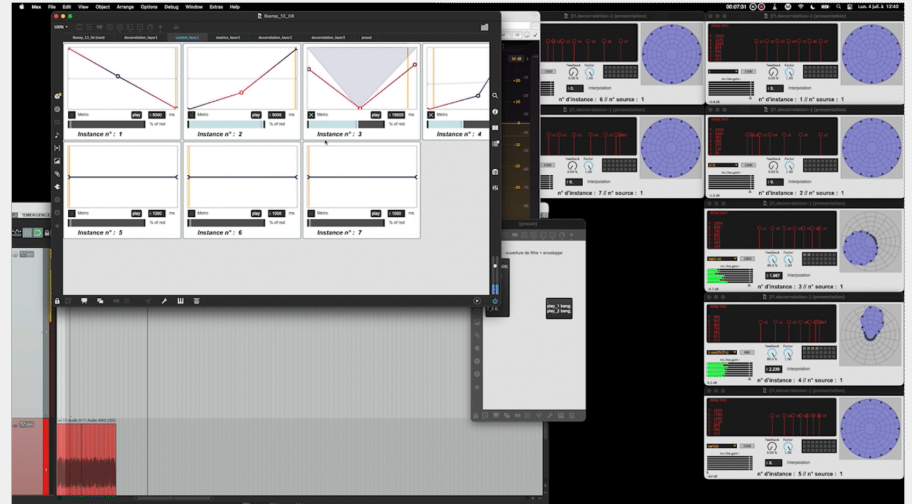
→ Spatial processing of sound: dispatching of some of the 16 outputs to ambisonic components (short delays), guitar granulation (spatial vibrato)

<https://soundcloud.com/alain-bonardi/fil-de-soi-2>



Émergences

- 3D Electroacoustic work as a part of PhD thesis
- 3 types of spatial morphologies are composed: spatial texture, spatial envelope and stratification
- Each spatial morphology is linked to a set of DSP processes written in Faust and GUI
- Those developments integrated abc.lib and hoa.lib



References

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