Teaching Faust Language @ Shanghai Conservatory of Music

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Shanghai Conservatory of Music

- Founded 1927 in Shanghai
- China’s first independent national higher music institution
- 14 schools/departments (incl. Composition/Conducting, Musicology, Performance, Music Engineering, Digital Media, etc.)
- Primary, secondary, undergraduate, master, PhD, postdoctoral programs
- 3335 full-time students; 638 staff; 372 full-time faculty; 68 international students; 649 affiliated school students

Music Engineering Department – Brief History

- Origins (late 1990s) – the “computer music” wave
- Early foundation (pre-2003)
- Establishment & start-up (2003–2010)
- Growth & internationalization (2010–2019)
- Reform & upgrading (2019–present)

Systematic Discipline Development

- Undergraduate tracks (BA/BMus)
  - Music Technology & Arts
  - Music Design & Production
  - Recording Arts (new in 2025)
- Master's programs (MA/MMus)
  - Music Technology
  - Music Artificial Intelligence (new in 2026)
  - Electronic Music Design
  - Film Music Production
  - Music Recording
- Doctoral research directions (PhD)
  - Music Artificial Intelligence (new in 2021)
  - AI Music Therapy (new in 2024)
- Current scale: ~300 students in total

Graduate Outcomes

- Game audio / interactive audio
- Music & internet audio platforms (streaming, short video, content ecosystems)
- Recording / live sound / broadcast & post-production
- Audio technology & smart hardware (e.g., headphones, spatial audio, voice)
- Intelligent manufacturing & automotive
- Semiconductors / chips
- Internet & AI companies
- Entrepreneurship (start-ups and studios)

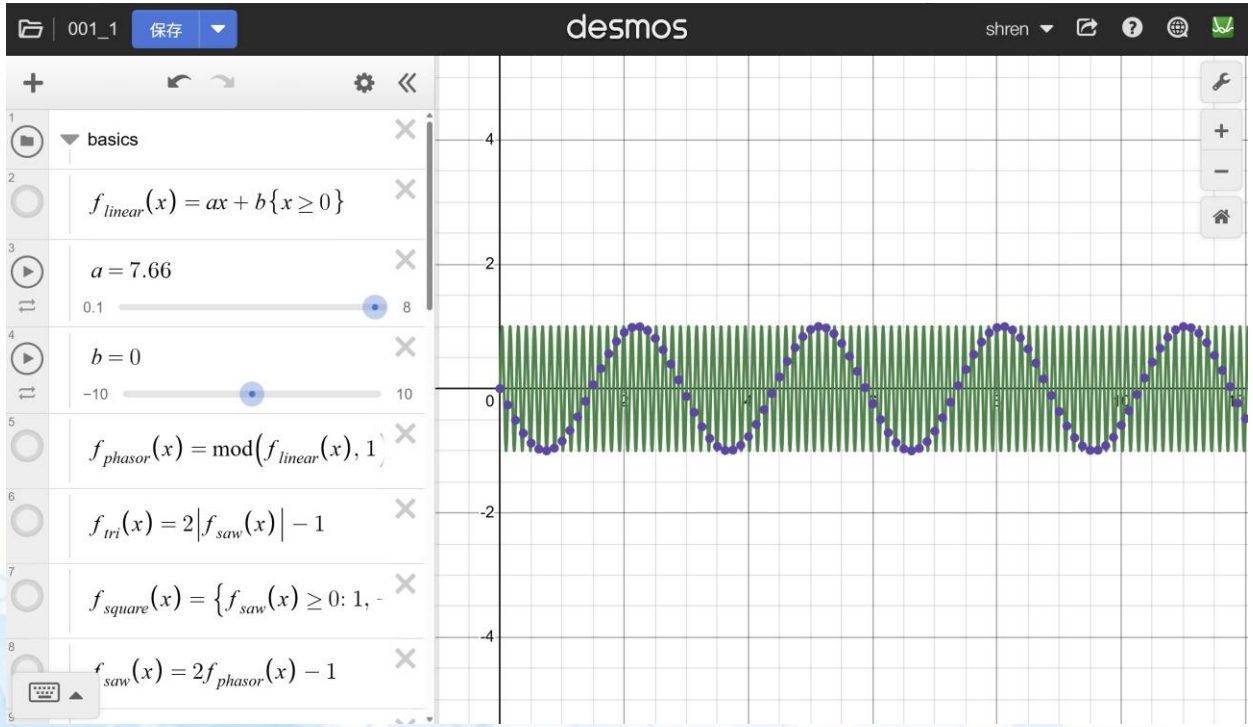
- 6 university-industry cooperation agreements signed
- Graduate talent supplied to 16 companies
- 10 teaching/practice internship bases established with companies
- Alumni entrepreneurship: 9 companies founded by graduates

Digital Audio Course (for L2 undergraduates)

- 32 weeks
- > 50 students / year
- For Music & Technology / Music Design & Production directions
- Learned:
  - making sound in Max/MSP
  - simple Python
- Learn from Faust
  - Building DSPs (synth/effects) from scratch
- Based on Faust course @ UJM

Part 1

- Basic Concepts of Digital Audio
  - Sampling rate, bit depth, Nyquist frequency, buffer size…
  - Using Desmos Visualization
- Faust Basics
  - Introduction to the language
  - Faust IDE
  - Syntax
  - Operators and built-in functions

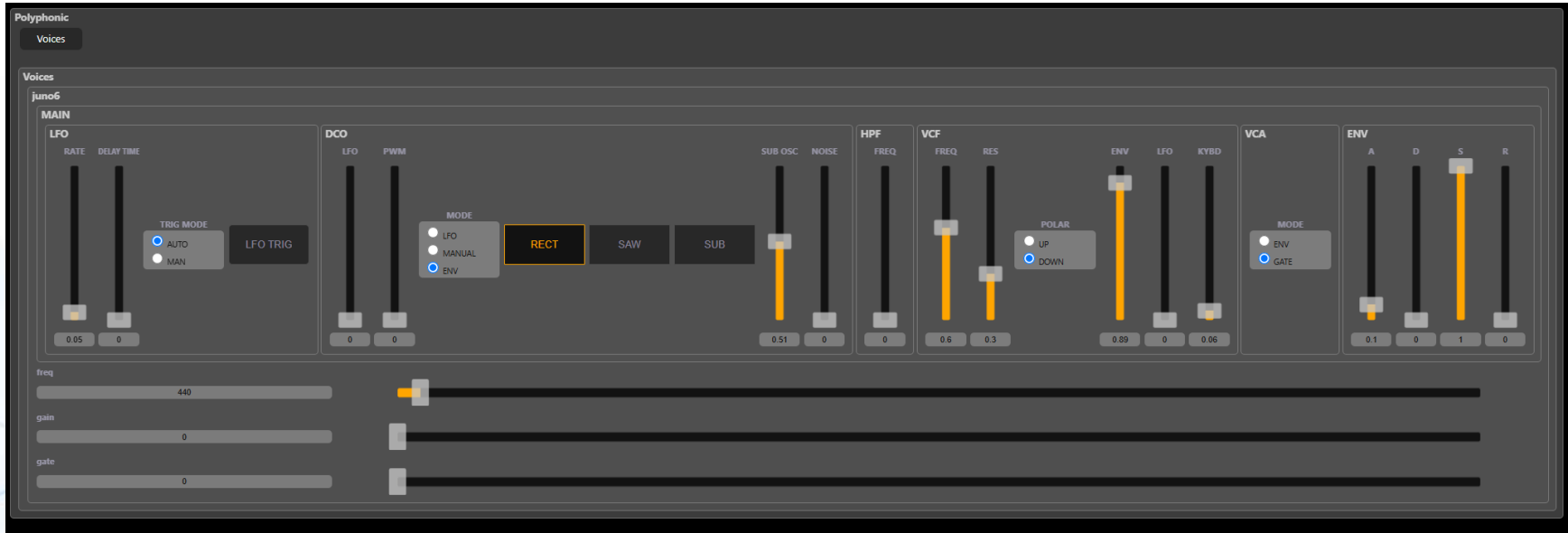


Part 2

- Synthesizers
  - Phasor (Faust recursion)
  - AM / RM / FM
  - Additive Synthesis (iterators)
  - Noise
  - DTMF (exercise)
  - Noises and RNG
- Echo and Feedback
- RMS Analyzer

Part 3

- Digital Filters
  - Using Julius Smith's online book. ❤
  - Avoiding too many maths.
  - Diagram → Code → Diagram → Spectrogram
- Karplus-Strong
- Distortions
- JUNO-6 (exercise)



Part 4

- Comb Filters and Allpass Filters
- Phaser / Flanger / Chorus
- Pitch-shifter
- Reverbs
  - JCREV
  - Freeverb
- Granular Synthesis (Real-time and non-real-time)

Part 5

- Short-Time Fourier Transform / FFT
  - With Max's pfft~ implementation
- Waveguide Synthesis and Physical Modelling
  - Romain Michon's Tutorial ❤
  - With Faust's Physical Modelling Library
  - Final Exercise

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Faust DSP Course - Digital Audio Tutorial Series

A comprehensive collection of Digital Audio Processing tutorials using the Faust programming language. This is an educational resource for the 32-week Digital Audio course in the Music Engineering Department at Shanghai Conservatory of Music.

Overview

This repository contains 38 progressive lessons covering fundamental to advanced concepts in digital signal processing (DSP) and audio synthesis. Each lesson is a self-contained Faust program that demonstrates specific DSP concepts and techniques used in music technology and audio engineering.

About Faust

Faust (Functional Audio Stream) is a functional programming language specifically designed for digital signal processing and audio applications. Faust enables rapid development of audio processing algorithms with a focus on both performance and readability.

Key Features of Faust:

- Functional programming paradigm ideal for signal processing
- Cross-platform compilation (C++, LLVM, JavaScript, etc.)
- Real-time performance
- Visual signal flow diagrams
- Easy prototyping and experimentation

- All 38 examples uploaded to https://github.com/Fr0stbyteR/dsp-course-faust

Music AI – Cross-discipline

- New Course: “Music Artificial Intelligence”
- Spring 2024–2025 (Semester 2): elective, open to all SHCM undergraduates
- From AY 2025: adds required version for students in Composition & Conducting / School of Digital Media / Arts Management
- Key topics: music generation, music analysis, machine listening, affective computing

Industry-Academia-Research with Vivo

- Research on earphone harmonic distortions
- > 60 blind listening tests
- Vivo TWS Earphones

Feedbacks

- Good way to learn DSPs
  - Easy to start (Faust IDE)
  - Instant feedback (diagrams, visualization, listening and testing)
  - Rich library and examples
- Suggestions
  - More tutorials and real-world usage examples
  - Richer documentation for AI
  - Vibe coding

Thank you!

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