SKETCHSYNTH

A visual interactive web synthesizer

Advanced Coding Tools and Methodologies
2025/2026

PROJECT INTRODUCTION

- **Project goal**: explores the relationship between visual shapes and audio timbre.
- Combination of **visual art** and **sound synthesis**.
- Starting point: **wavetable look-up synthesis**.
- Web app: **SketchSynth**

SKETCHSYNTH: a visual interactive web synthesizer

IMPLEMENTATION INTRODUCTION

- **Starting point**: hand-drawn waveform on HTML canvas.
- **DSP & wavetable look-up synthesis**: Web Audio API.
- **Interactive GUI**: CSS & JavaScript.

WEB APP STRUCTURE

- **Four main modules:**
    1. Waveform setup
    2. Envelope designer
    3. Filter designer
    4. Performance & Output

WAVEFORM SETUP

- Core of the **timbre generation**.
- **HTML canvas**
- **Clear** & **export**/**load** waveforms.
- Load a **preset**: sine, square, sawtooth and triangular waves.

ENVELOPE DESIGNER

- **ADSR** envelope amplitude controller.
- Parameters
  - Attack time [s]
  - Decay time [s]
  - Sustain time [s]
  - Release [s]
- Routing: ON / OFF selector to bypass the amplitude controller.

FILTER DESIGNER

- **Dual-stage filter section** for spectral shaping.
- **Low pass** filter: cutoff frequency, resonance, slope.
- **High pass** filter: cutoff frequency, resonance, slope.
- Implementation: Web Audio API **biquad filters chain** (to implement different slopes).

PERFORMANCE & OUTPUT

- Interface for **musical performance**.
- **Virtual keyboard**: on-screen 2 octaves piano keyboard.
- **Octave control**: selector among octaves (from 1st to 6th piano octaves).
- **MIDI integration**: support for an external MIDI keyboard (not available on every browser).
- **Output level**: master volume slider for final gain staging.

HOW TO USE?

- Draw a waveform in the canvas or select a preset.
- Adjust the ADSR time values for the amplitude envelope (optional).
- Adjust the low pass and high pass filter for spectral shaping (optional).
- Play the on-screen keyboard selecting the desired octaves or connect an external MIDI keyboard.

UNIMPLEMENTED FEATURES & FUTURE DEVELOPMENT

- SketchSynth is a **monophonic** synth: could be developed as a **polyphonic** synthesizer.
- **Responsiveness** not fully developed and implemented.
- **Modulation & effects** implementation for a wider spectral shaping.