

## Analog Visual Synthesizer project for summer 2025

The purpose of this project would be to create an instrument to be able to jam with hand-made animations. As a visual artist, I see so many different possibilities to animate images and I would like to make this come true. Being able to explore the many different possibilities is making our work interactive with the public. The visual aspect is extremely important to me because of how effective it is to communicate. I grew up not understanding the most simple academic concepts because it was all just numbers or letters. When I met people who vulgarized all sorts of concepts to me, I realized how there are so many ways to express concepts and how we receive them. Whether it's laws, scientific concepts, emotions, algebra formula, sociological concepts, etc. I'd like to create a tool that is accessible for artists to play with and understand their art in a different perspective, or to push it further, make the public understand it differently as well.

The diversity of animation techniques offers endless possibilities for expression, and each version of an animation holds its own unique energy and message. With this visual synthesizer, artists will have the freedom to explore multiple versions of their animations, mixing and layering them in real-time. By integrating an analog setup, the tool allows for a tactile and immersive experience, where digital and analog worlds come together. This hybrid approach offers artists a chance to break free from the traditional, linear way of presenting their work, enabling them to push boundaries and experiment with different visual narratives.

Furthermore, this synthesizer will not only empower artists but also engage the public in a hands-on experience. Anyone, regardless of their technical background, will be able to interact with the animations, mixing them with the analog effects, and seeing how different versions can evolve. This openness creates an inclusive space for people to engage with the art of animation in a playful and exploratory way, turning the act of viewing into an active and participatory experience.

By offering a variety of animation versions and providing the opportunity for anyone to interact with them through an analog-digital interface, the tool aims to democratize the process of artistic creation and expand the possibilities of visual storytelling.

### How it works :

- Generates and modifies visual signals
- Produces abstract shapes, modulates images, can be audio reactive
- Analog format implies the use of composited signals (PAL/NTSC) or specific tensions for CRT screens or projectors

### System specifications :

I am hesitating between 3 options:

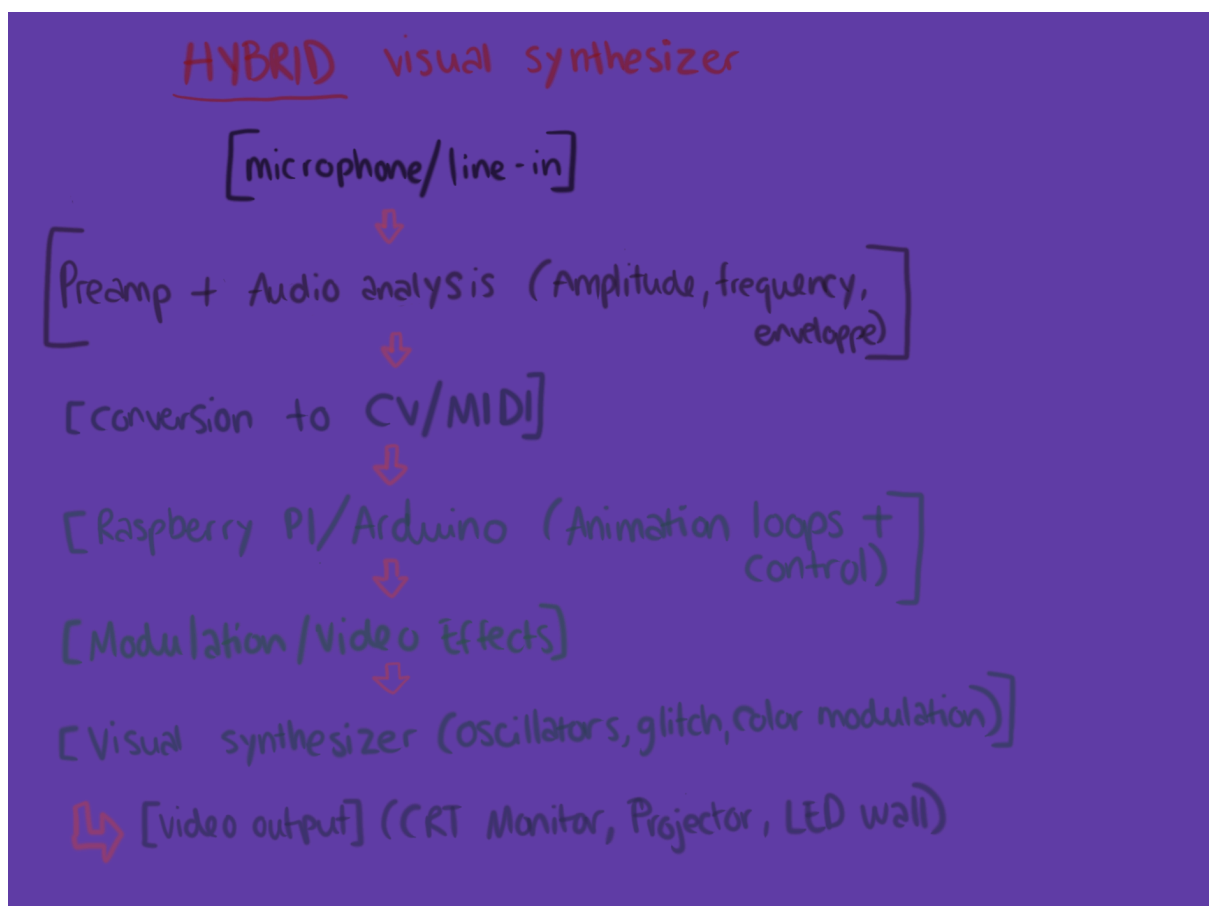
- LZX Industries - Compatible modules with Eurorack, perfect for modular video analog work
- DIY - Build with electronic components like VCOs (oscillators), filters and modulators
- DIY Video Synth - Open-source and craftmade, forums like Video Circuits or projects like CHA/V could be a good base

### Experimentation and prototyping :

I would start with simple circuits with video signal generators (LM1881 for the synchronicity or amplis-op to modulate). An oscilloscope could be useful to visualize signals. Testing with a Raspberry Pi or Arduino to hybrid with digital could also be interesting.

I imagined a first version of the structure of it based on my personal knowledge.

Here is the sketch:



Here is the breakdown of each section:

#### 1. AUDIO INPUT:

**Purpose:** Captures sound and converts it into data that will influence the visuals.

### Components:

- **Microphone / Line-In:** Captures external audio (e.g., voice, instruments, music).
- **Preamp (Preamplifier):** Boosts the audio signal to a usable level.
- **Audio Analysis Module:** Extracts key features from the audio signal, such as:
  - **Amplitude (Volume level)** – Can control brightness or shape size.
  - **Frequency (Pitch analysis)** – Can control color or movement.
  - **Envelope (Attack, decay, sustain, release)** – Can add smooth transitions or pulses.

💡 **Example Use:** Louder sounds could increase brightness, while bass frequencies could trigger wave distortions.

## 2. SIGNAL PROCESSING:

**Purpose:** Converts the analyzed audio into a format that can be used to modify animations and generate control signals.

### Components:

- **Microcontroller (Arduino, Teensy, etc.) or Raspberry Pi:**
  - Processes the extracted audio data.
  - Maps the data to control parameters.
  - Sends instructions to both **animation playback** and the **visual synthesizer**.
- **CV (Control Voltage) or MIDI Conversion:**
  - If using an analog video synthesizer, audio data needs to be converted into **CV signals** (like modular synths).
  - If using digital visuals, it may be converted to **MIDI messages** to trigger animations.

💡 **Example Use:**

- A high-frequency sound could trigger a **glitch effect**, while a bass drum hit could **switch between animation loops**.

## 3. ANIMATION CONTROL AND MODULATION:

**Purpose:** Modifies hand-drawn animation loops in response to sound.

### Components:

- Animation Playback Module (Raspberry Pi, PC, or media player):
  - Stores and plays hand-drawn animation loops.
  - Modifies animation speed, color, distortion, or blending based on the sound.
- Effects Processing (Shaders, OpenFrameworks, TouchDesigner, or Max/MSP):
  - Digital effects can be applied before the animation is sent to the visual synthesizer.

💡 Example Use:

- A snare drum hit might reverse the animation for a split second.
- A soft ambient sound could increase motion blur or trails.

#### 4. ANALOG VISUAL SYNTHESIZER:

**Purpose:** Processes the animation and adds real-time analog effects to the visuals.

##### Components:

- Oscillator Module (LZX, BPMC, or DIY circuits):
  - Generates waveforms that distort and blend animations.
- Color Modulation & Feedback:
  - Changes hues, saturation, or brightness based on sound input.
- Glitch Effects (Circuit Bent Processors, VHS Distortion, CRT Feedback):
  - Adds analog noise, tearing, and artifacts to enhance the visuals.

💡 Example Use:

- A deep bass could pulse the contrast, while treble sounds add visual static/glitches.

#### 5. OUTPUT DISPLAY:

**Purpose:** Displays the final audio-reactive visuals on a screen or projector.

##### Components:

- CRT Monitor / Projector / LED Wall:
  - Analog outputs work best with CRT monitors for deep distortion effects.
  - Digital outputs can go to projectors or LED setups.
- Video Mixer (Optional, like V4EX, Edirol V8):
  - If combining multiple sources, a mixer can blend live cameras, synth visuals, and animations.

💡 Example Use:

- A **strobe effect** could be triggered by sharp drum hits.
- The screen could **flash between animation layers** on beat.

## FULL WORKFLOW SUMMARY

1. Audio is captured → Processed into amplitude/frequency/envelope data.
2. Data is converted into Control Voltage (CV) or MIDI.
3. Animations respond dynamically in real-time.
4. The visual synthesizer adds analog effects to distort and shape the visuals.
5. The output is projected onto a screen, fully synchronized with the sound.