

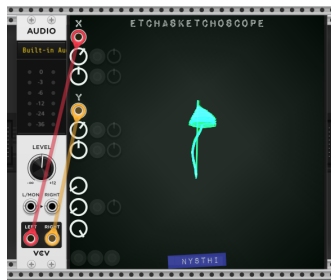
Drawing with Sound

From Drawing Mushrooms on Oscilloscopes towards Driving a Plotter

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Updateringar 2024-11-02

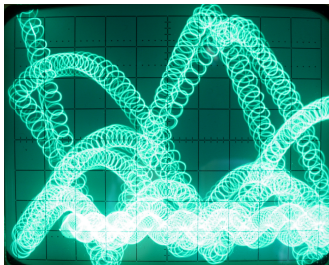
Drawing Mushrooms with Sounds



<https://www.youtube.com/watch?v=rtrR63-ecUNo>

Jerobeam Fenderson: How To Draw Mushrooms On An Oscilloscope With Sound (3:07 min)

Bouncing Ball



Source: https://www.analogmuseum.org/english/examples/bouncing_ball/, Bernd Ulmann 2006/2008

- ▶ Physics simulation on analog computers (or modular synthesizers)
- ▶ The “ball” can be drawn using sin and cos functions/waves

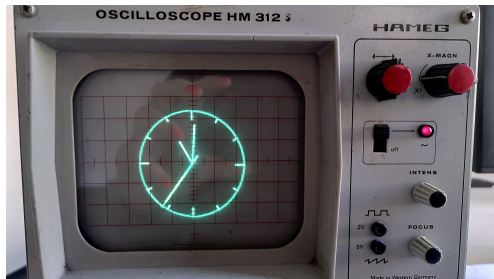
Look Mum No Computer: Bouncing Balls With DIY Electric Analog Circuits..

<https://www.youtube.com/watch?v=se68Wq4Gn6M&t=1080s>

Bernd Ulmann: bouncing ball

<https://www.youtube.com/watch?v=jTf7AFdIS2Y>

Oscilloscope

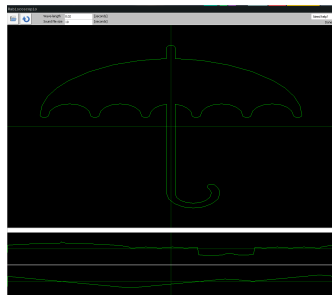


- ▶ Lab equipment to draw voltage relative to the time axis
- ▶ Alternative: x-y mode with two input channels
- ▶ Classically: CRT with afterglowing phosphor layer

ElectroBOOM: What's an OSCILLOSCOPE?

<https://www.youtube.com/watch?v=DgYGRtkd9Vs>

Vector Graphics on Oscilloscopes



- ▶ Rabiscopio

<https://github.com/aporto/rabiscopio/>

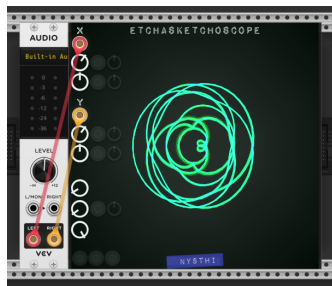
- ▶ PureData patches

<https://github.com/macumbista/vectorsynthesis>

Henry Birdseye Jr.: SVG to Wave - How to turn a vector graphic into a waveform

<https://www.youtube.com/watch?v=aLJeInPJ9oo>

Oscilloscope Music



- ▶ Interesting patterns and (mostly) interesting sound: Nuclear White Noise
(https://www.youtube.com/watch?v=T_815m0Lb8s),
Nuclear Black Noise
(<https://www.youtube.com/watch?v=YqSvkNjWnnQ>)
- ▶ Beats and pictures: Osilloscope Music Trailer
(<https://www.youtube.com/watch?v=qnL40CbuodU>),
Attractor
(https://www.youtube.com/watch?v=3uL_CZ1wWnI)

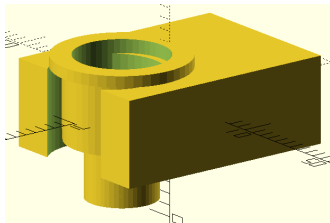
Plotter



Plotter

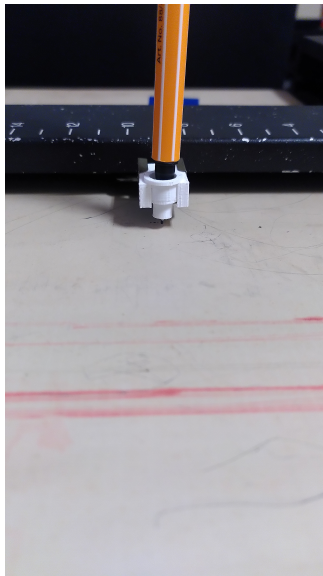
- ▶ Basically an oscilloscope that draws on paper
- ▶ Uses pen instead of electron ray
- ▶ Separate channel for pen up/down

Pen Holder

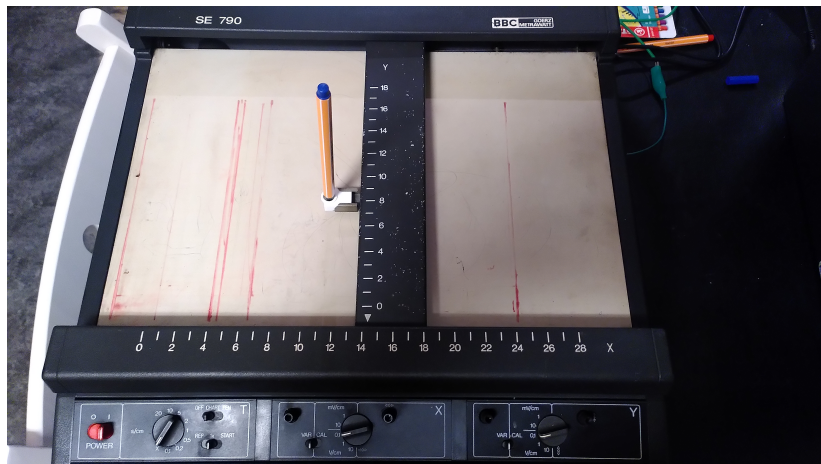


- ▶ First version: ballpoint pen
- ▶ Second version: Stabilo fine liner

Pen Holder



Pen Holder



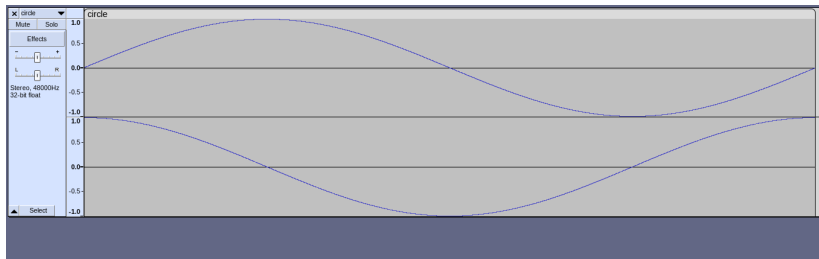
Why Sound?

- ▶ Sound cards are basically two channel digital-to-analog converters
- ▶ Already present in almost any computer

But:

- ▶ Potentially limited frequency range
- ▶ Sound quality matters a lot (sampling rate, noise, etc.)

Plotting



Plotting

Plotting video

Turtles

- ▶ Turtle robots (William Grey Walter, late 1940s)
- ▶ LOGO language (Seymour Papert et al., 1967)
- ▶ vector graphics using a relative cursor (the "turtle") upon a Cartesian plane (x and y axis) (Source https://en.wikipedia.org/wiki/Turtle_graphics)
- ▶ three attributes: a location, an orientation (or direction), and a pen
- ▶ commands to move, rotate, and modify pen

Turtle robot

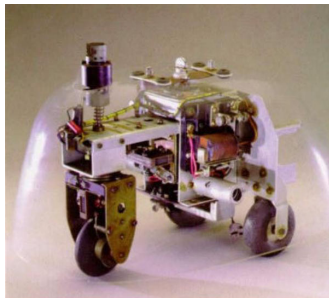


Figure 2 - Machina Speculatrix

Source:

<https://home.csulb.edu/~wmartinz/content/w-grey-walter-and-his-turtle-robots.html>, ArthurEdLeBouthillier2010

[https://roamerrobot.tumblr.com/post/23079345849/
the-history-of-turtle-robots](https://roamerrobot.tumblr.com/post/23079345849/the-history-of-turtle-robots)

turtle2wav

- ▶ Implemented in Haskell with Parsec combinators
- ▶ Stack-based language
- ▶ Goal: “compile” to WAV files
- ▶ <https://github.com/daherb/turtle2wav>

turtle2wav

```
data Operation =  
    Forward | Backward | Left | Right --  
    | Pen  
    | Heading | Position  
    | Push Int | Pop | Dup | Swap  
    | Add | Sub  
    | Label Int | Jumpz Int  
deriving Show
```

Keep on plottin'

Another plotting video

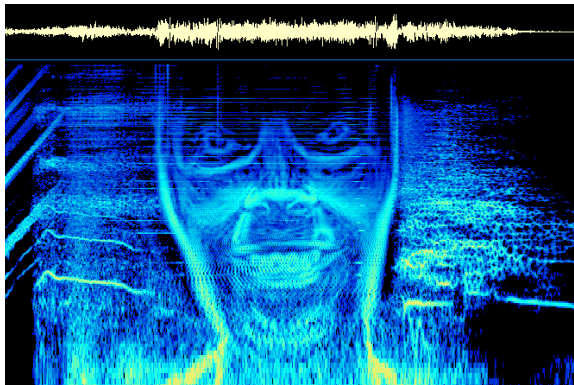
Bonus: More Info

- ▶ <https://www.oscilloscopemusic.com>
- ▶ <https://www.youtube.com/@jerobeamfenderson1>

Virtual oscilloscopes:

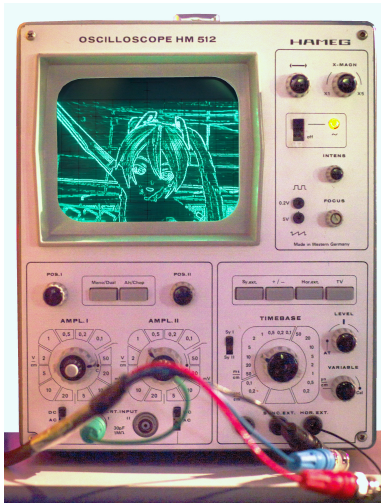
- ▶ <https://www.oscilloscopemusic.com/software/oscilloscope/>
(Win, Linux (with Wine), Mac)
- ▶ <https://vcvrack.com/> (Win, Linux, Mac)

Bonus: Drawing in the Spectrogram



Source: <https://mixmag.net/feature/spectrogram-art-music-aphex-twin>, Becky Buckle 2022

Bonus: More Oscilloscope



Source [https://commons.wikimedia.org/wiki/File:](https://commons.wikimedia.org/wiki/File:Oscilloscope_Hameg_HM-512_with_manga-style_image-produced_via_a_hack,_chaos_communication_congress_2017_(34C3),_cropped_and_removed_background.jpg)

`Oscilloscope_Hameg_HM-512_with_manga-style_image-produced_via_a_hack,_chaos_communication_`
`congress_2017_(34C3),_cropped_and_removed_background.jpg`