Level 0x08

Moar Steganography

Topics

- Hacker History
- Audio Steg
- Printer Steg

Upcoming Events

- December hacking contests
  - Advent of Cyber - [TryHackMe.com]()
  - Sans Institute [Holiday Hack Challenge]() - Less CTF, more game, probably more incident responder and defender focused
  - [Advent of Code]() - Programming challenges. Used to be 25 2-parters, now reducing down to 12 days of challenges
  - [Pwn.College]() is going to do an Advent of Pwn

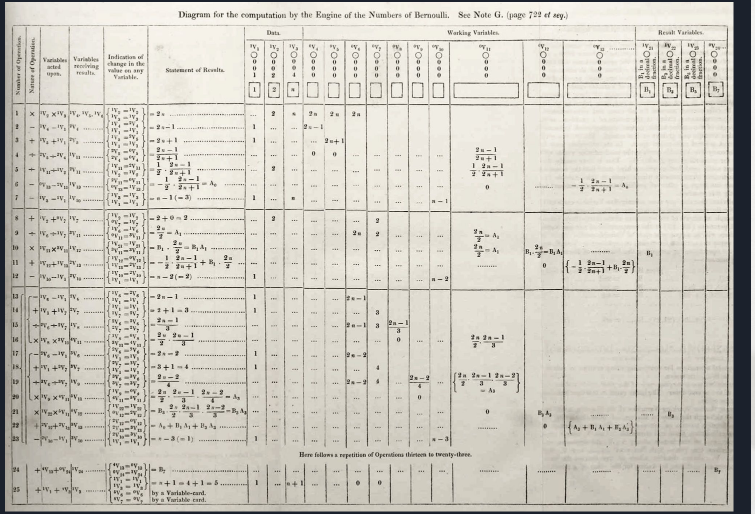
Lady Ada - Limor Fried

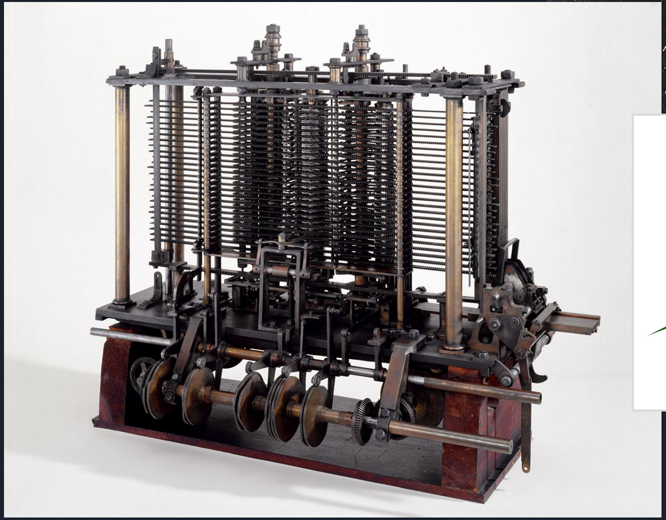
adafruit

- Bachelors and Masters in Electrical Engineering and Computer Science from MIT
- Founded Adafruit Industries in 2005
- Champion of
    - Maker movement
    - Open Source HW
    - Wearable electronics
- Adafruit sells the best electronic kits
- Best tutorials on how to use new kits / hardware
- Libraries for arduino / Raspberry Pi

Ada King, Countess of Lovelace

- 1815 - 1852
- First computer programmer (disputed?)
  - Charles Babbage's Analytical Engine

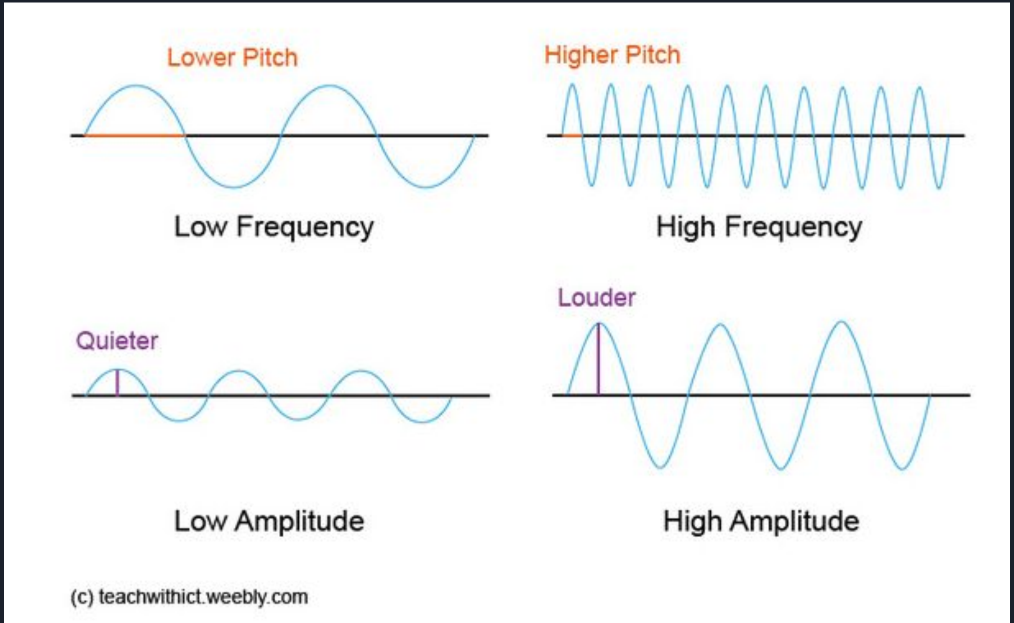




Ada

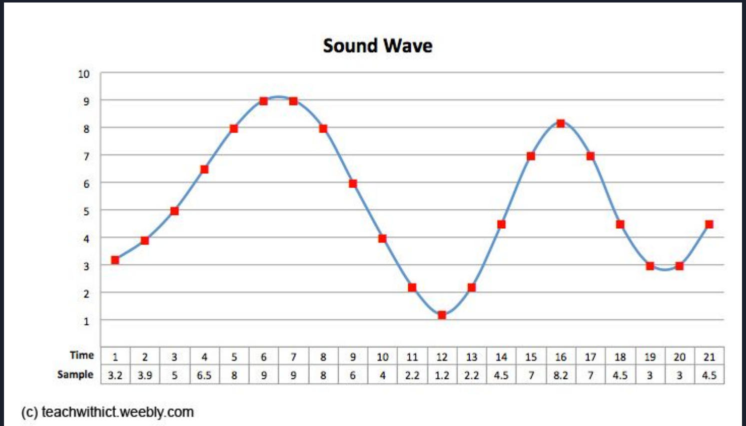
In Strong Typing We Trust

What is sound?



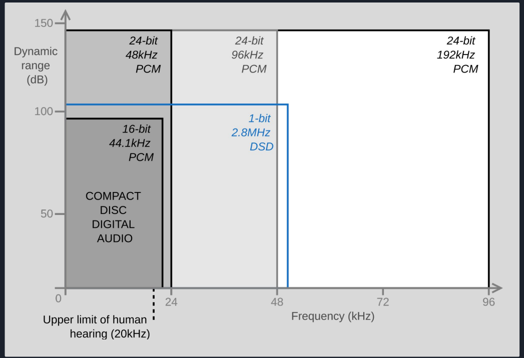
How does a computer encode sound?

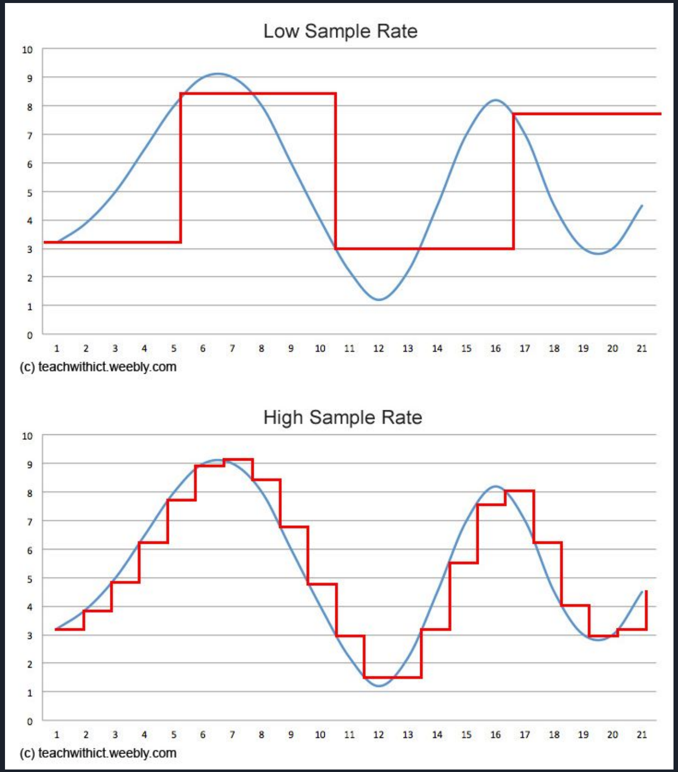
- Plots the points on the waveform (just like Algebra 2?)
- <u>Sample Rate</u>: Number of points per second
- Amplitude: From -1.0 to +1.0



Tradeoffs on audio encoding

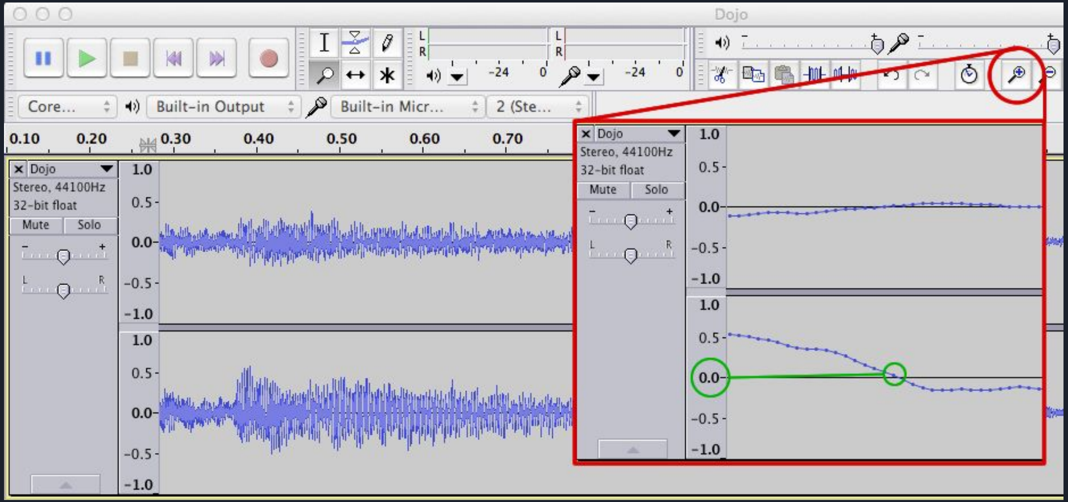
- High sample rate
  - Better quality sound
  - Larger data file
- Accuracy of the amplitude
  - Quality of the Analog-to-Digital converter (ADC) used (or DAC during playback)
  - Raspberry Pi Pico is 12-bit
- What is loss-less audio?





Audio LSB Steganography

- Would a listener know the difference in 11-bit DAC vs 12-bit DAC?
  - Least Significant Bit



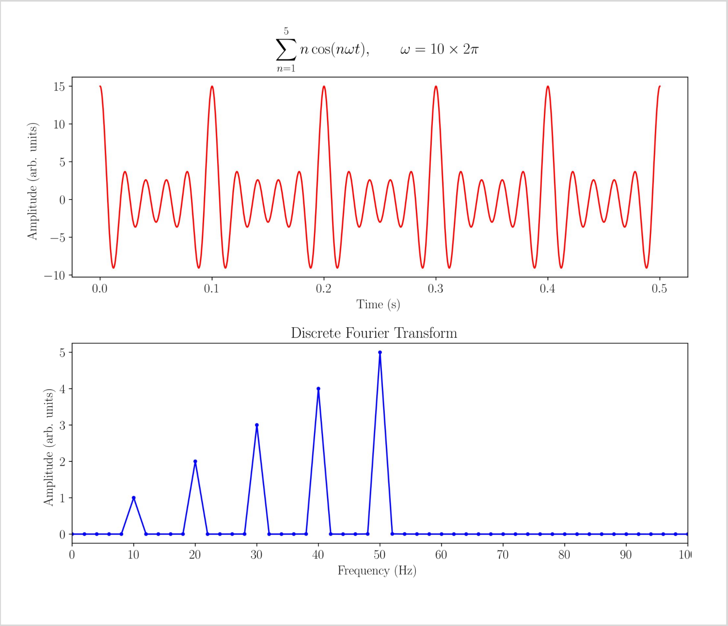
Audio Data Compression

Audio CD Specs: 650MB, 44.1kHz, 16-bit

- 70 min of stereo audio

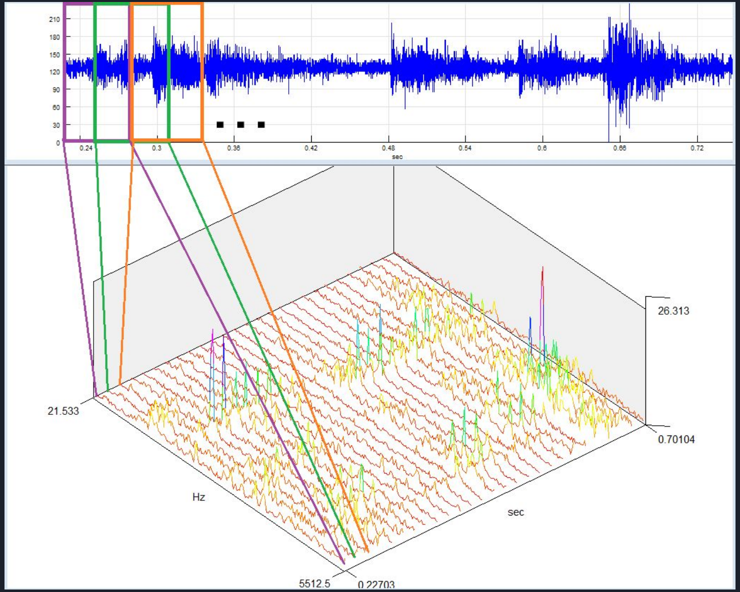
How else could we represent that sound wave?

- Think back to math class…
- Divide audio into small samples / frames
- FFT/DFT/MDCT to determine frequencies



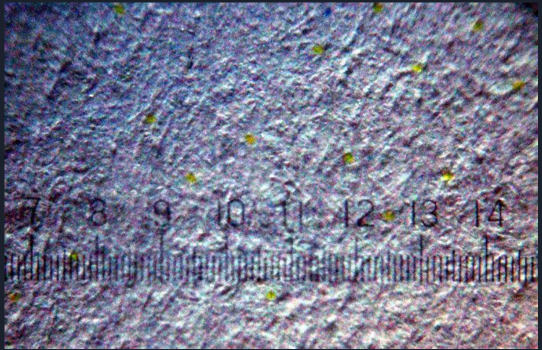
FFT vs time / Spectogram

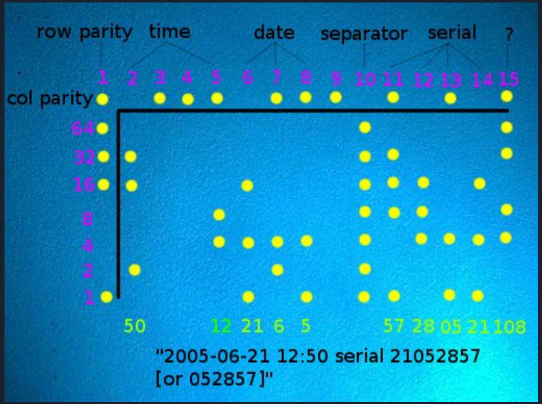
- Do frequencies change over time?

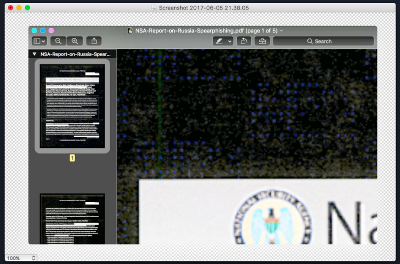


Printer Steganography

- Printer tracking dots created by Xerox in mid 1980s
    - Discovered publicly in 2004
- Used to detect counterfeit currency / track culprits
- [Intercept]() publishes leaked data about Russian interference in US elections
    - Posted PDFs of the scanned in documents (fold marks visible)
    - Identified the printer owned by the government that they were printed from, leading to arrest of Reality Winner

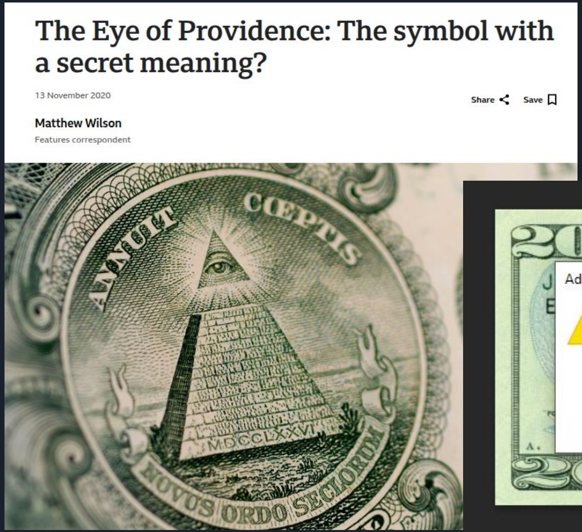






Secret Messages in Money!?

- Eurion constellation prevents scanning, editing, copying


The Eye of Providence: The symbol with a secret meaning?

13 November 2020

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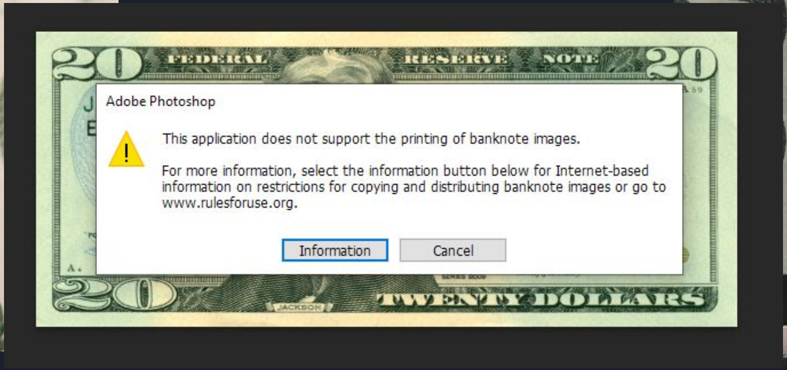
Matthew Wilson
Features correspondent



Links

- https://www.teachwithict.com/binary-representation-of-sound.html
- https://sigview.com/help/Time-FFTSpectrogram.html
- https://en.wikipedia.org/wiki/Fast_Fourier_transform
- https://en.wikipedia.org/wiki/Ada_Lovelace
- https://blog.erratasec.com/2017/06/how-intercept-outed-reality-winner.html
- https://www.bbc.com/culture/article/20201112-the-eye-of-providence-the-symbol-with-a-secret-meaning
- https://en.wikipedia.org/wiki/EURion_constellation
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