

Web Audio Codelab #6

Non-linear Effects

Music 220A Summer 2021

Dynamic Range

Amplitude → Loudness

Decibel (dB)

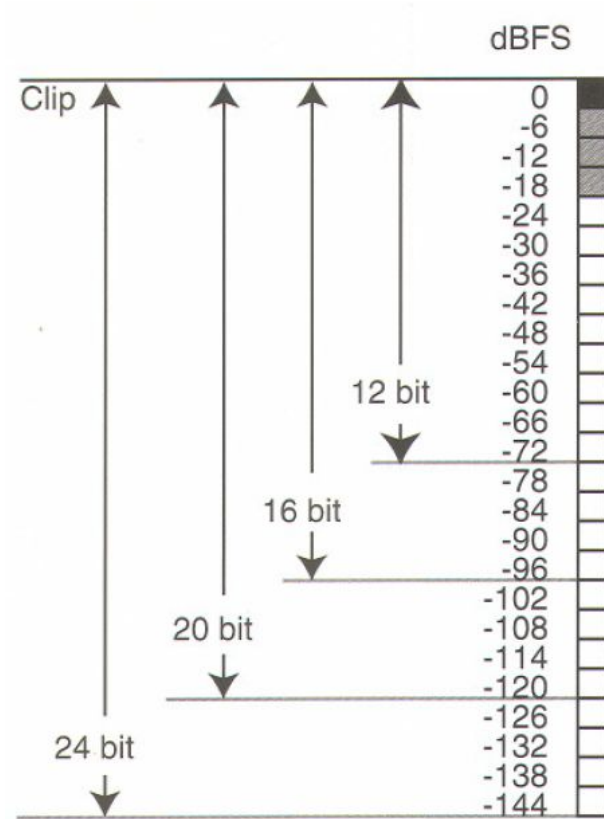
- A unit of measurement used to express the **ratio** of one value to another on a **logarithmic** scale
- A unit for loudness
 - About 2X louder = 10dB
 - About 4X louder = 20dB

Loudness in Music

- Normal piano practice: 60~70dB
- Chamber music (small auditorium): 75~85dB
- Violin: 82~92dB
- Timpani and bass drum: 106dB
- Symphonic music (peak): 120~137dB
- Rock music (peak): 150dB

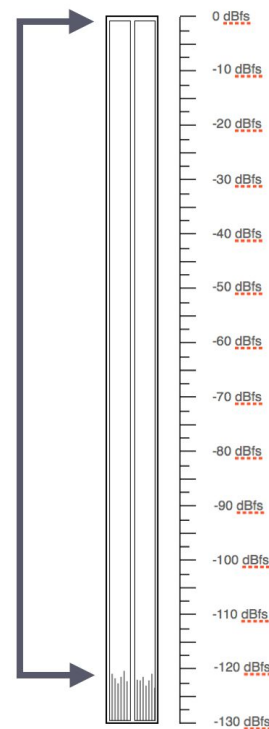
dBFS (Decibel Full-Scale)

- A unit of measurement in digital systems which have a defined maximum peak level
- 1 bit \approx 6dB

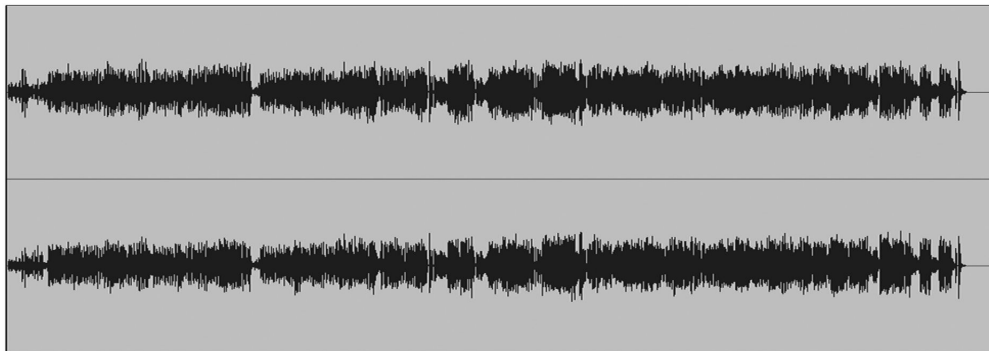


Dynamic Range

- The **difference** between the quietest and loudest volume in a part or piece of music
- Affected by:
 - Resolution (bit depth)
 - Noise Floor
 - Total Harmonic Distortion



Queen: "Seaside Rendez-vous" (1975)

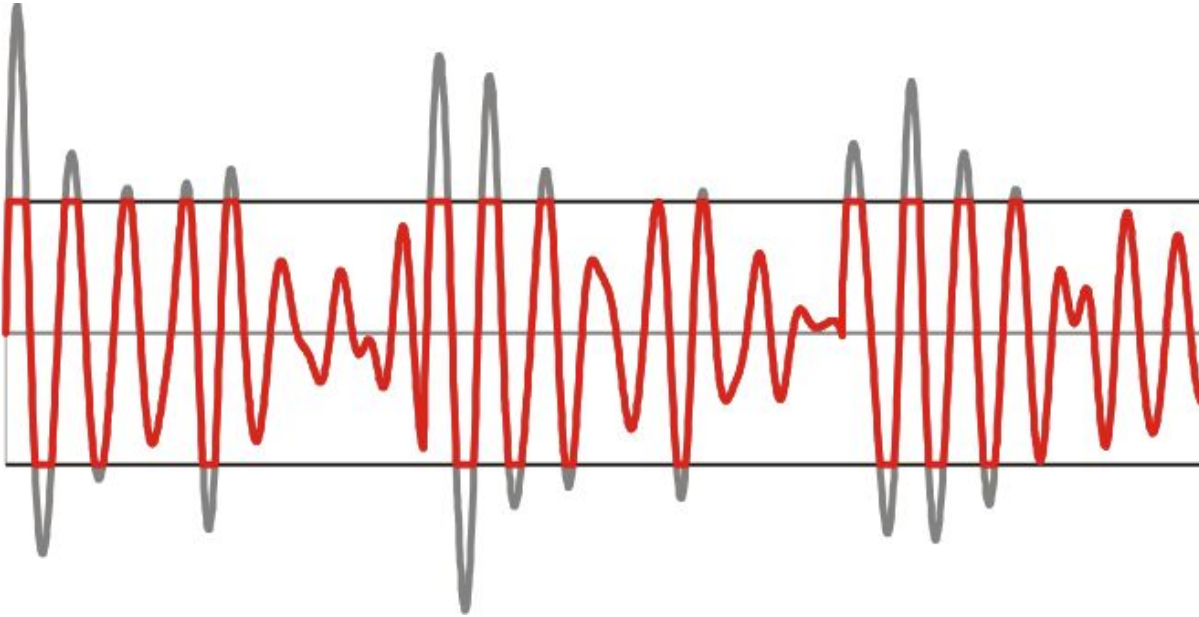


Red Hot Chili Peppers: "Californication" (1999)



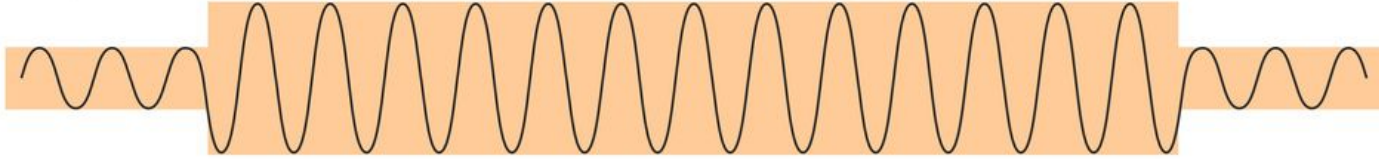
[link](#) | [link](#) | [link](#)

Clipping



Clipping

Original Signal



Clipped Signal

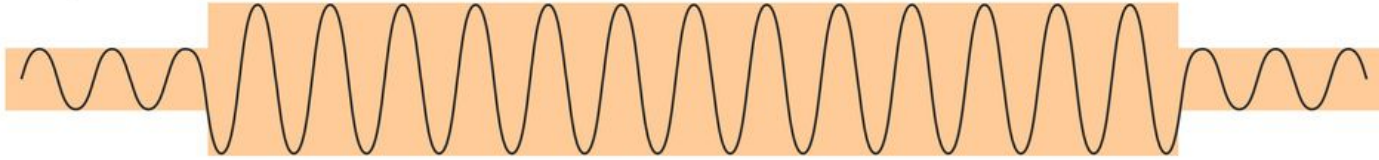


Gain Riding

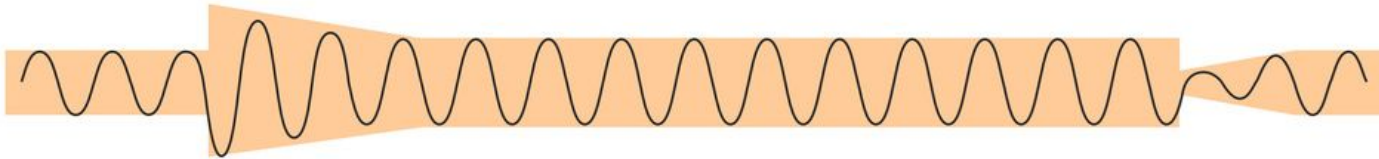


Gain Control

Original Signal



Limited Signal



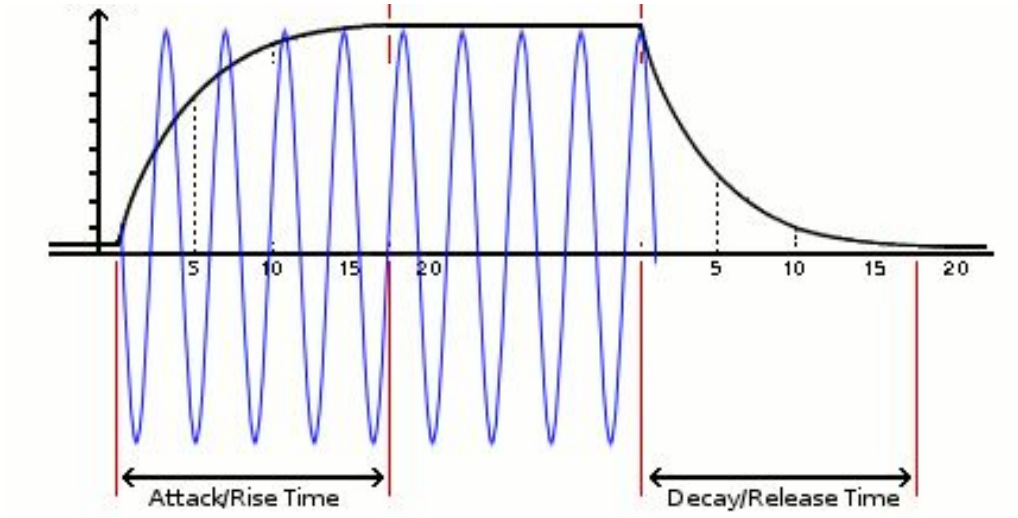
Compressor



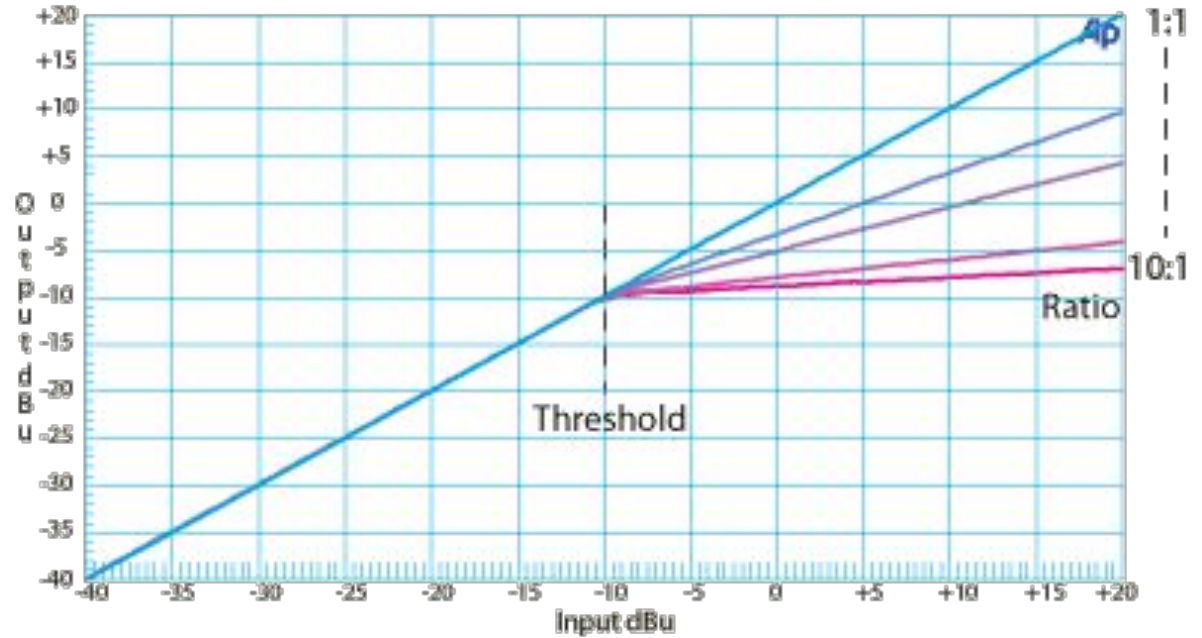
Compressor

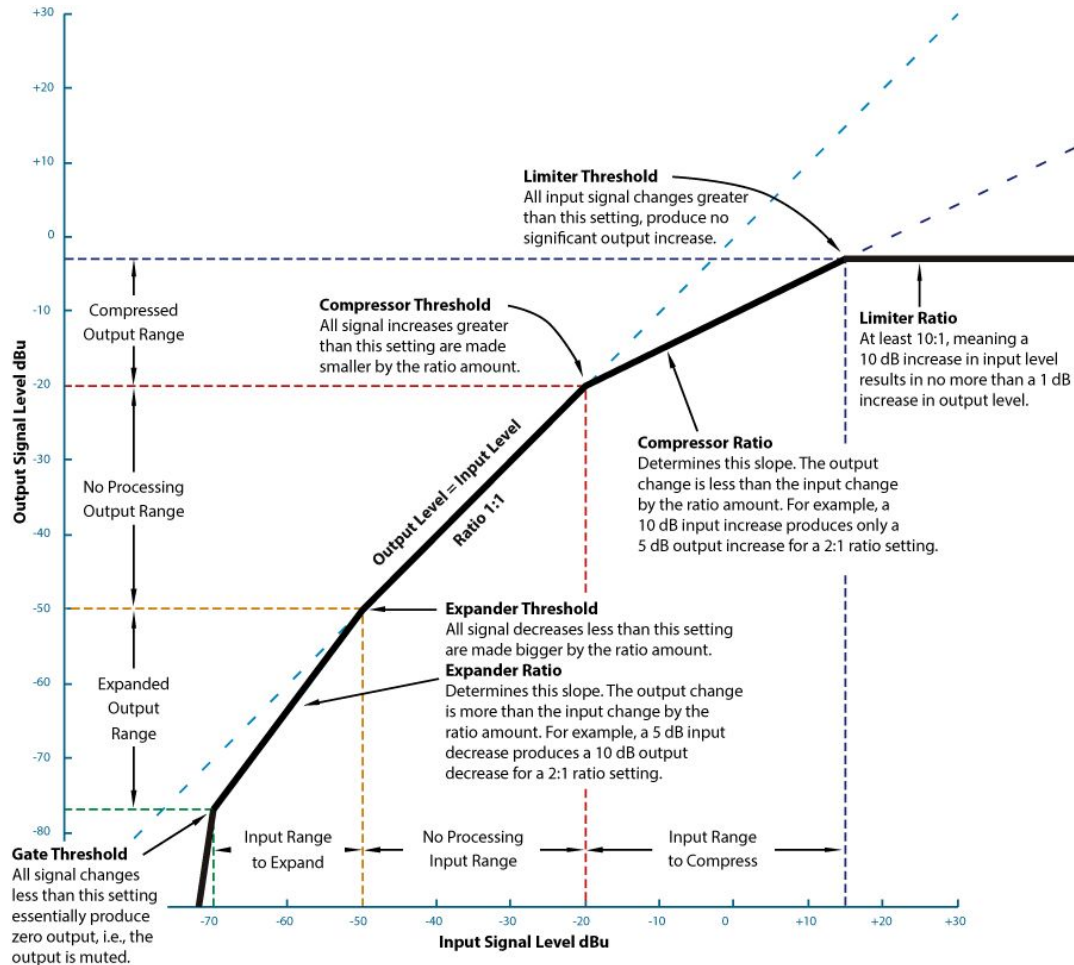
- Envelope Follower
- Gain Computer
 - Transfer Function
 - Parameters: Threshold, Ratio, Knee, Attack, and Release
- Gain Control

Envelope Follower: Attack/Release



Transfer Function





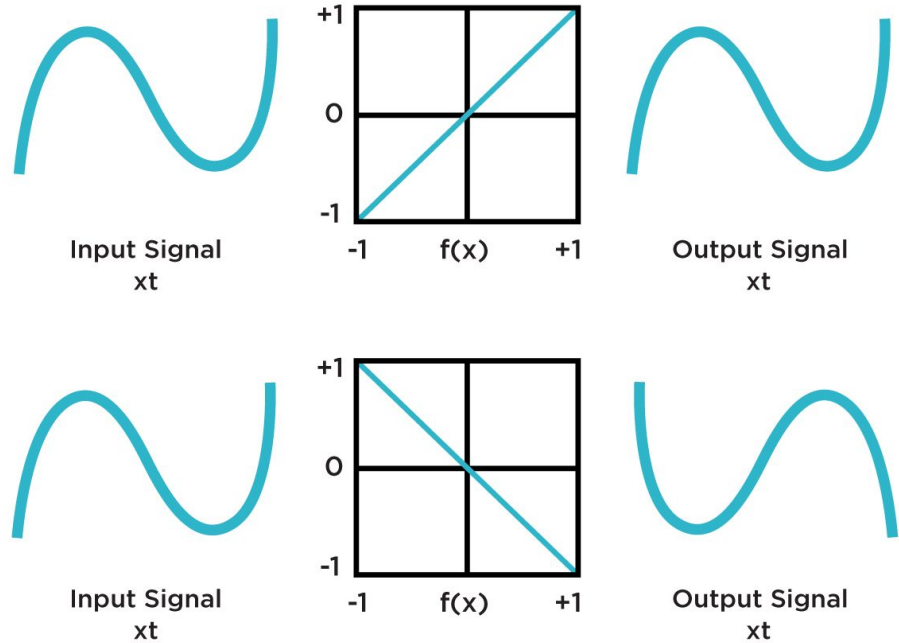
CodeLab

Wave Shaping

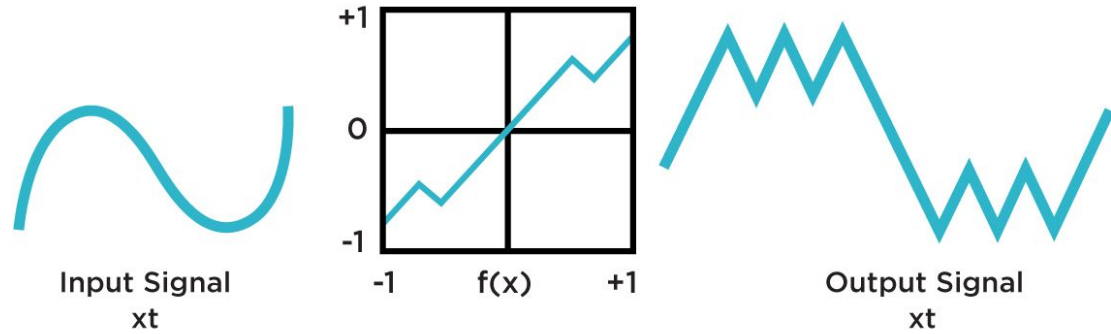
Wave Shaper

- Transfer Function
 - Works directly upon incoming bipolar signal (i.e. no envelope follower)
 - Based on lookup table or polynomial
- Common use cases: distortion, overdrive, or saturation
 - Also a lot of room for creativity!

Transfer Function



Transfer Function



CodeLab