Chapter 10. Meeting 10, Compression and Limiting

10.1. Announcements

• Materials for second processing report will be out on Wednesday

• Next quiz on Monday, 19 March

10.2. Review Quiz 2

• ?

10.3. Preamps in MOSS

• True 8

• TwinQ

• Vintech

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10.4. Dynamics: Background

- Amplitude is not the same as perceived loudness
- Perceived loudness has more to do with average signal level (RMS)
- Our ears are more sensitive to amplitudes in certain frequency ranges
- Transients (the attack of instruments) carry essential sonic information

10.5. Dynamics Processors: Terms

- Threshold: a point of amplitude reference within the dynamic range
- Ratio: used to transform amplitudes by converting input values into output values
  - 2:1 means for every 2 dB in over the threshold, 1 dB comes out
  - 6:1 means for every 6 dB in over the threshold, 1 dB comes out
- Attack: how quickly processing starts on onset of amplitude above threshold
- Release: how quickly processing stops on onset of amplitude below threshold
10.6. Dynamics Processors: Input-Output Transformation

- Graph input amplitude to output amplitudes via transfer curve

![Transfer Curve Diagram](image)

- A ratio of 1:1 is no change, or bypass
- A shifting the 45 degree line up or down is a boost or cut in amplitude

10.7. Dynamics Processors: Two Basic Families

- Processors that reduce amplitudes when amplitudes are above a threshold (downward compression and limiting)
- Processors that reduce amplitudes when amplitudes are below a threshold (downward expansion and gating)
- While amplitudes are reduced, this does not mean that dynamic effects only make sounds more quiet

10.8. Gain Reduction Above a Threshold: Compressor

- Reduces (compresses) dynamic range and increases average signal level
- Handles situations where a track needs to be turned up but cannot be turned up without clipping
- Often used to reduce the amplitude volatility of a signal: vocals
- Can raise level of quiet signals: can increase sustain, background, and ambience
- Can increase leakage and noise floor
10.9. Compression: Two Steps

- Two steps
  - 1. Reduce gain above a threshold with a ratio
  - 2. Increase gain of the modified signal
- Steps
10.10. Compression: Ratio

- Ratio


10.11. Compression: Knees

- Hard and soft knee

- Attack and release
• Attack times generally around 20-50 ms
• Release times generally around 100-300 ms
• Slower attack times are critical for letting transients pass unaffected: this is often desirable
• Fast attack times can result in lifeless and unnatural percussion sounds
• Slower release times continue to reduce gain of sustain of instruments
• Pumping: attack and release are too fast and compression is audible; sustain of a signal fades in and out after attack of louder signals
• Breathing: hearing the noise floor slowly rise after the signal falls below threshold; remove by decreasing release time

10.13. Gain Reduction Above a Threshold: Limiter
• A compressor taken to an extreme ratio
• Ratios are in the range of 10:1 to infinity:1
• Flattens the top of amplitudes (generally) without distortion (depending on attack)
• Often used to protect equipment and limit dynamic ranges

10.14. Limiting: Example
• Example
10.15. Reading: Katz: How to Manipulate Dynamic Range for Fun and Profit

- What does Katz say should be the paradigm of sound quality? Why is this often not possible?
- Why was “popcorn noise” necessary for mastering audio for movies?
- According to Katz, what affect does hard-knee compression have?
- Why does Katz state that, in regard to attack and release times, its “probably better to remove all the labels on the knob (except slow and fast) and just listen!”
- How is lookahead implemented in digital compressor?
- What is a brick-wall limiter?
- How does Katz describe the release characteristics of an opto-compressor?
- What is soft clipping, as found as a feature on some digital processors?
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