INTRODUCTION TO MUSIC PRODUCTION – WEEK5

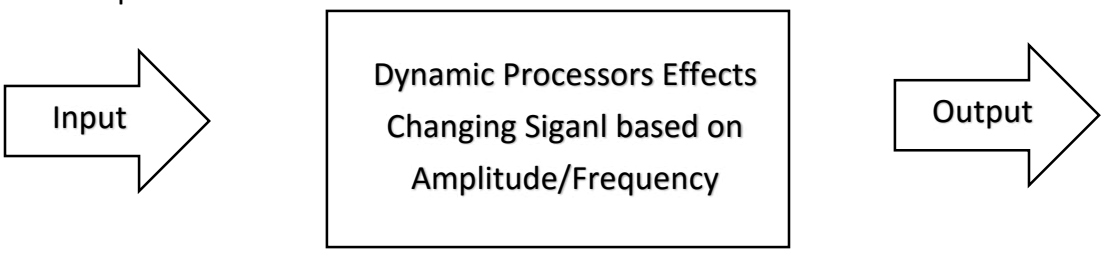
DYNAMIC PROCESSORS & CONTROLS - BY AKASH KODIGANTI (B. TECH - INDIA)

Describe the concept behind dynamic processors and describe threshold, ratio, attack and release.

Introduction:

The dynamic range of an audio passage is the ratio of the loudest signal to the quietest signal. For signal processors the magnitude of the power supply voltages restricts the maximum output signal and the noise floor determines the minimum output signal.

Dynamics processors alter an audio signal based upon its frequency content and amplitude level. The four most common dynamics effects are compressors, limiters, gates and expanders.



All the above techniques work on different control parameters like dynamic control parameters, delay control parameters and filter control parameters etc.

So coming to controls that helps in **Dynamic processors** are threshold, ratio, attack and release. And these are called Dynamic processing controls.

Dynamic Processing Controls

1. Threshold:

Always try to adjust the threshold based on signal input because lower sounds may not hit the threshold and if it doesn't hit the threshold then the device neglects the signal part. Hence the compressor/expander can't perform any operation though.

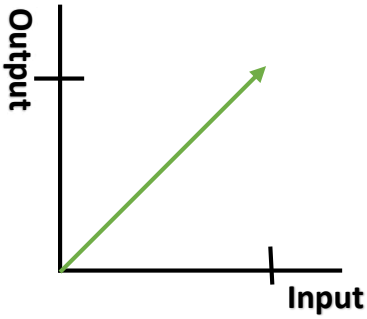
If the vocal levels are too low at a moment, you can reduce the threshold level to accept the low-sounding vocals.

Reducing the threshold level means that more peaks of the signal will trigger the compressor to turn down the gain, increasing the threshold level means that an expander or gate will turn down more low level signals.

2. Ratio:

The ratio control determines how much the signals that are being compressed or expanded will be turned down. Better understanding can be drawn from the below example:

CASE I

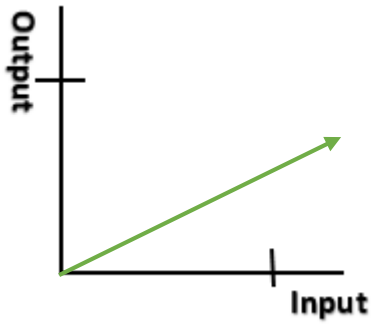


Both axis is having equal scaling.

Say 10 volts input gives 10 volts' output.

This turns out to be 1:1 ratio so as output is having same **dB.**

CASE II

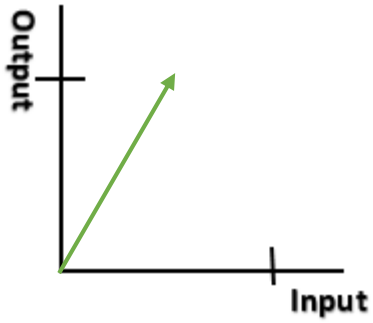


Example of a compressor.

Say 10 volts input gives 5 volts' output.

This turns out to be 2:1 ratio, hence output **dB** decreases.

CASE III



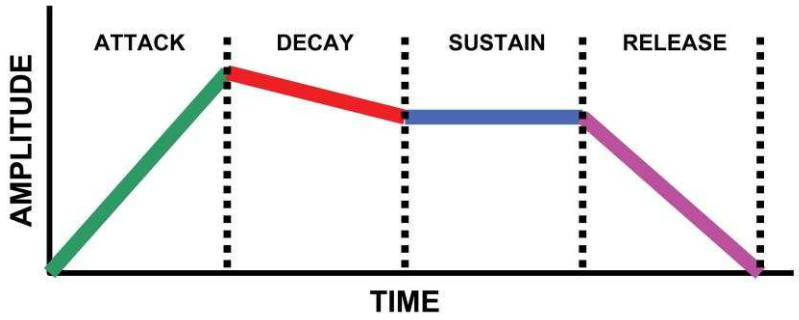
Example of an expander.

Say 5 volts input gives 10 volts' output.

This turns out to be 1:2 ratio, hence output **dB** increases.

3. Attack:

The attack time is how fast the dynamic processor will react to a signal crossing the threshold level going up. In a compressor it is the time it takes to reduce gain on high level passage. On the contrary, for expanders it is time that the expander takes to restore full gain after the audio level comes up after a low level passage.



Like in music we have ADSR parameters where the attack and release control parameter corresponds to transient level, where the amplitude changes a lot in small amount of time.

The 'attack phase' is the period when the compressor is decreasing gain to reach the level that is determined by the ratio.

4. Release:

The release time is how fast the dynamic processor will react to a signal crossing the threshold level, going down. In a compressor, it is the time it takes the unit to restore gain after the high level passage is over with. Expander works on the other way.

Best practice: Fast attack times are good and release times should be adjusted for the frequency and how percussive the signal is. Fastest release time that sounds natural is the best for both compression and expansion.

The 'release phase' is the period when the compressor is increasing gain to the level determined by the ratio, or, to zero dB, once the level has fallen below the threshold.

Conclusion:

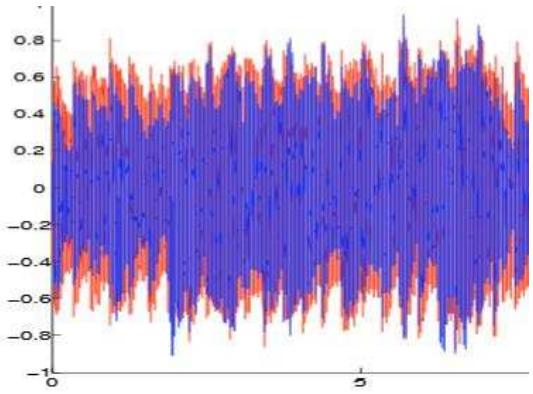
Name	Attack	Release	Ratio
Vocals	25 ms to 100 ms	100 ms to 500 ms	2:1 to 4:1
Clicky Bass	25 ms	25 ms	4:1 or higher
Mushy Bass	100 ms to 500 ms	100 ms to 500 ms	4:1
Raging Electric Guitar	25 ms	1 sec - 2 sec	4:1 or higher (more sustain)
Acoustic Guitar	100 ms to 500 ms	100 ms to 500 ms	4:1
Drums (kick, snare)	25 ms	25 ms	4:1
Drums (cymbals)	25 ms	1 sec - 2 sec	2:1 to 10:1

The above mentioned are the best practice-starting points in a compressor setting.

Additional Information:

I. Compressors:

Compressors & Limiters work the same way and these devices/plugins used to reduce the dynamics of the input signal.

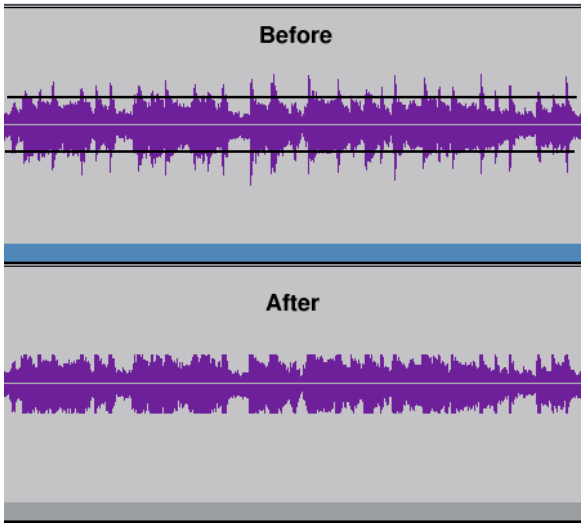


- ✓ The 'quiet parts' are boosted up
- ✓ And same levels are maintained for 'loud parts' in **Compressor** (not exactly decreasing the overall sounds).
- ✓ Compressor also helps from damaging equipment.
- ✓ Original – Red, Compressor - Blue

Fig1.1: Signal before & after applying Compressor effect

II. Limiters:

Limiters when applied prevents signal spikes by limiting to a static curve as shown here.

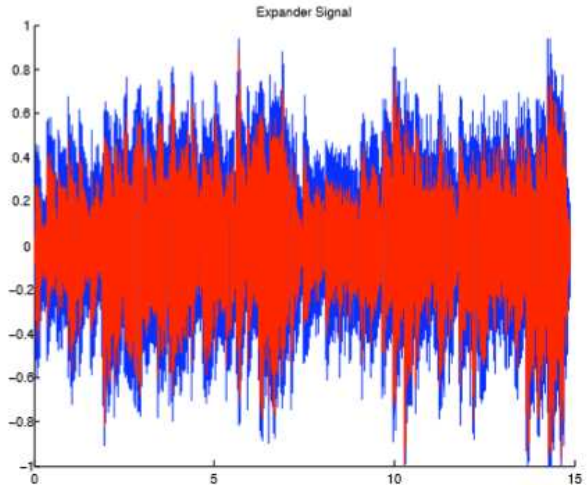


- ✓ The signal before is having spikes which may damage the equipment
- ✓ After applying limiter effect the spikes are removed and the signal is maintained at a static curve
- ✓ Limiting is used not only on single instrument but on final (multichannel) audio for CD mastering, radio broadcast etc.

Fig 1.2: Before and after applying limiter effect

III. Expanders:

Expanders are the devices/plugins that operate on low signal levels and boost the dynamics in these signals. Used to create a livelier sound characteristic.



- ✓ It works exact opposite to compressor effect
- ✓ The original signal – Red color
- ✓ Expander Effect – Blue color

Fig 1.3: The compressor effect input & output

IV. Noise Gates:

As compressor which attenuates signals *above* a threshold, noise gates attenuate signals that register *below* the threshold.

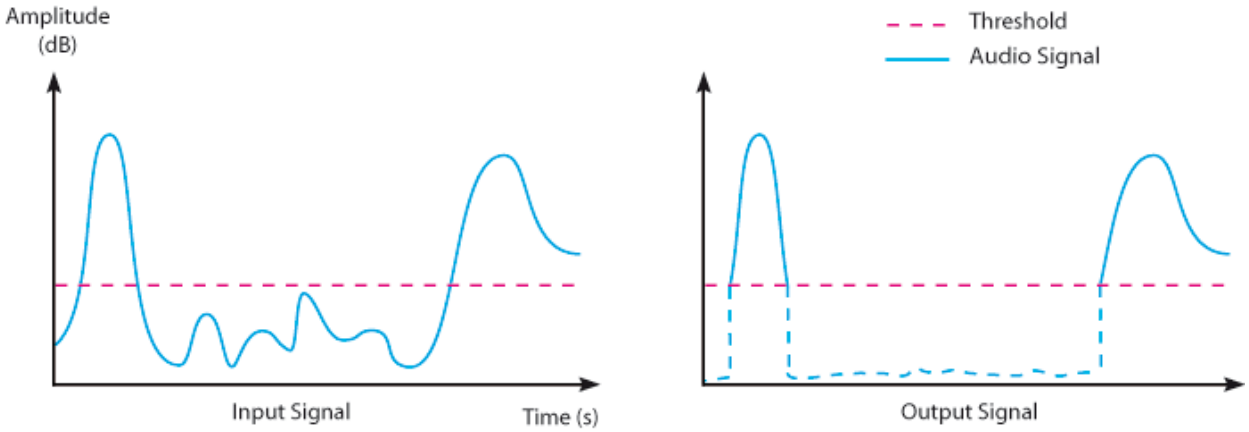


Fig 1.4: The below threshold hence removes the bottom part of the signal.