LAB REPORT 2: DISTORTION GUITAR EFFECT WITH BAND BOOSTER FILTER

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**dist_with_booster**

Distortion with band boost filter.

**Syntax**

```matlab
[y] = dist_with_booster( wave,gain,mix,cf_Hz,bw_Hz,boost,fs)
```

**Description**

This function distorts the input signal after boosting the bandwidth specified by the user.

**Input:**
- `wave`: input signal
- `gain`: amount of distortion, >0
- `mix`: mix of original and distorted sound, 1=only distorted
- `cf_Hz`: passband central freq. (in Hz, cycles/sec)
- `boost`: gain at fm for boost/cut (=1 original signal
  - >1 boost
  - <1 cut
  - =0 notch filter)
- `bw_Hz`: width of bandpass transformation at -3dB (in Hz, cycles/sec)
- `fs`: the frequency of signal sampling (in Hz, cycles/sec)

**Output:**
- `y`: Distorted output signal of the function

**Algorithm**

For band boosting an implementation of the famous Allpass filtering Regalia-Mitra (IEEE Trans. ASSP-35, no.1, January, 1987) is used. The structure of the Regalia-Mitra filter is shown in Figure 1.
For distorting the signal a non-linear function presented in [1] is used.

\[ f(x) = \frac{x}{|x|} \left( 1 - e^{\frac{x^2}{4}} \right) \]

Example

[w fs]=wavread('nov_rain_mono');
[ Y ] = dist_with_booster( w,20,.5,8000,6000,10,fs)
Diagnostic

In order to produce a good distorted sound weaker harmonics in bottom or end (depending on whether the distortion is intended for lower frequencies or high frequencies) must be boosted and then distorted. Effects of levels of boost and gain varies with the input signal; but as a rule of thumb gains greater than 10 and lower than 100 with a good mix with the original sound and boost levels greater than 1 and smaller than 20 gives out a good distorted sound.

References

1. DAFX: Digital Audio Effects Udo Zolzer Copyright q 2002 John Wiley & Sons, Ltd ISBNs: 0-471-49078-4 (Hardback); 047084604-6 (Electronic)

Matlab code for my_regalia_mitra:

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