tester: guruboolez
date: 2006.01.10 & 11 [YY.MM.DD]
object: LAME warbling/rumblig/noise in lowest frequencies
number of samples: 33
origin of samples: personal gallery + 3 samples from Wombat (*Birds*, *Deploration* & *Moon*) + *TomsDiner*

tested encoder: LAME 3.97 beta 2 and LAME 3.98 "Christmas" from Robert Hegemann, sent on December, 25th
tested parameters: -V5 –vbr new; abr 128; both with and without *--ns-bass -8*

I noticed in the past several artifacts corresponding to unusual rumbling in the lowest part of the spectrum. These problems are occurring on tonal moments and are therefore meeting more often the same kind of 'tonal' instruments: flute, violin, organ and in general the family of strings (erhu, gamba, viola….) and wind instruments (clarinet, trombone and different kind of flute….).

I noticed it first last years, when I privileged ABR as encoding method for my portable player. I switched later to VBR, and noticed than this issue was still present, with different samples this time but still "tonal" ones. In other words: one sample could be fine with ABR but not VBR; another one could be noisier with ABR; some others are equally distorted whatever the encoding method; etc...

I gathered several samples illustrating these issues. But my sample collection is messy, and I don't know which samples are problematic for ABR and which ones are distorting VBR settings… As a consequence, I decided to test them all and to draw a table. You may wonder why **–ns-bass -8** is included as additional investigation field. It's simply because Gabriel (*?*) suggest me once to test this setting to measure the impact on the warbling. I quickly evaluate this in the past with -V5 and if all warbling issues are not fully solved I immediately noticed real improvements. Unfortunately this additional parameter has a significant impact on bitrate with -V5: ~6...7 kbps which may not immediately appear as worrying but which is IMO if you keep in mind that bitrate always inflates, even when there's no rumbling effect. I measured the impact on bitrate with classical music only and I don't know if it also applies to different recordings. I considered this test as a good occasion to evaluate more rigourously this LAME command.

You'll notice that I didn't give any mark: I replaced numbers by colors. There are few nuances, corresponding to the intensity of the problem:

- **green**: no problems
- **yellow:** subtle issue
- **rose**: slight issue
- **purple**: annoying issue
- **red**: very irritating issue
- **dark red**: very irritating issue

This colored ranking is of course approximative. What really matters is the comparison between two settings to see if improvements were noticed and in this case if improvements are important or not. When I ensured my feeling by ABX (*see below*), the score is present in the cells. The ABX tests are not-sequential: I've stopped when I feel that it was enough and follow when I felt the necessity of doing it. The tables are ugly: I apologize.

Few notes about the testing method.

It's important to note that I never « coloured » a cell alone: I always compare an encoding to a second one: ABR vs VBR; 3.97 vs 3.98; VBR vs VBR –ns-bass; etc... I did it through foobar2000, **without any reference to the original sample** (I'm basing my evaluation on the amount of noise, which should be totally absent of the original recording). The evaluations were first **non-blind** ones: all files are loaded in the playlist, and I'm comparing them by double clicking. Then you'll notice **ABX scores** with the third tests and all tests performed later: at this stage I decided to load the compared samples in the ABX module of foobar2000, to be really sure that a difference occur.

This PDF includes five comparisons:

• ABR vs VBR with 3.97 beta 2	***purpose**: see which samples are concerned by noise with ABR, VBR or both*
• VBR between 3.97 beta 2 & 3.98 alpha	***purpose**: measure the impact of the tunings introduced with 3.98 alpha "Christmas" with VBR*
• VBR vs VBR –nsbass -8 with 3.97 beta 2	***purpose**: measure the impact of –ns-bass -8 with VBR*
• ABR between 3.97 beta 2 & 3.98 alpha	***purpose**: measure the impact of the tunings introduced with 3.98 alpha "Christmas" with ABR*
• ABR vs ABR –nsbass -8 with 3.97 beta 2	***purpose**: measure the impact of –ns-bass -8 with ABR*

I didn't mixed 3.98 alpha and the –ns-bass setting.

TEST No. I ABR vs VBR at ~130 kbps with 3.97 beta 2

Are tested:

- 3.97 beta 2 ***–abr 128***
- 3.97 beta 2 ***-V5 –vbr-new***

	3.97b2 abr 128	3.97b2 vbr new V5	
[Bagpipe] S44	√	√	
[Bassoon] S45	√[1]	√	
[Chorus] Song for all Seas	√	√	big difference in favor of VBR
[Clarinet] S48	√		
[Erhu] Rainbow Dance	√	√	
[Erhu] S04		√	
[Flute Pan] Kusturica		√	big difference in favor of ABR
[flute] Chinese hsiao	√	√	
[flute] Chinese ti_A	√	√	
[flute] Chinese ti_B	√	√	
[Flute] Mozart KV 314	√		big difference in favor of VBR
[Gamba] Beatus vir	√		big difference in favor of VBR
[Gamba] S05	√	√[2]	
[Horn] E49	√	√	
[Horns] Feueursymphonie	√		
[Instrument] Moon_short	√	√	
[Organ] S19	√		
[Saxophone] S53	√	√	big difference in favor of ABR
[Synthetic Strings] Deploration	√	√	
[Trombone] S54	√	√	
[Trumpet] S55	√	√	
[Violin] E03	√	√	
[Violin] Estro armonico#05	√	√	
[Violin] Julia Fischer	√	√	
[Violin] Sigiswald Kuijken	√	√	
[Violin] Westhoff	√	√	
[Voice countertenor] King Henry	√	√	
[Voice female chorus] Compostelle	√	√	big difference in favor of VBR
[Voice Soprano] Ciofi_A	√	√	big difference in favor of VBR
[Voice Soprano] Ciofi_B	√		big difference in favor of VBR
[Voice Soprano] V21		√	
[Voice Woman Reverberated] Birds	√	√	
[Voice woman] TomsDiner		√	

[1] small 'pops'
[2] problem occurs on a different part

In summary:

problem absent with ABR but introduced by VBR:	4 samples (*S4; Kusturica; V21; TomsDiner*). The latter is the most interesting (from green to dark red)
problem absent with VBR but introduced by ABR:	6 samples (*S48; Mozart; Beatus Vir; FeuerSymphonie; S19; Ciofi_B*). Difference is often a big one
problem for both but VBR is worst:	7 samples (*S44; RainbowDance; Chinese ti_A; Moon; S53; S54; Westhoff*). Biggest difference: *Kusturica* & *S53*
problem for both but ABR is worst:	11 samples (*S45; Song for all Seas; Chinese hsiao; S05; E49; Deploration; Julia Fisher; Sigiswald Kuijken; King Henry; Compostelle; Ciofi_A*).
no difference or similar amount of noise:	5 samples (*Chinese ti_B; S55; E03; Estro Armonico; Birds*)

=> on my selection, 17 samples are worse with abr; 11 samples are worse with vbr whereas 5 samples have approximately a similar amount of extra-noise. I can't say if my gallery of 33 samples is representative or not from a bigger collection and therefore if VBR can be considered as better in the optic of this warbling issue.

TEST No. II 3.97 beta 2 vs 3.98 alpha with VBR

Are tested:

- 3.97 beta 2 ***-V5 –vbr-new***
- 3.98 alpha "Christmas" ***-V5 –vbr-new***

	3.97b2 vbr new V5	3.98 "Xmas" vbr new V5
[Bagpipe] S44	√	√
[Bassoon] S45	√	same
[Chorus] Song for all Seas	√	same
[Clarinet] S48		same
[Erhu] Rainbow Dance	√	same
[Erhu] S04	√	same
[Flute Pan] Kusturica	√	same
[flute] Chinese hsiao	√	same
[flute] Chinese ti_A	√	same
[flute] Chinese ti_B	√	same
[Flute] Mozart KV 314		same
[Gamba] Beatus vir		same
[Gamba] S05	√	same
[Horn] E49	√	same
[Horns] Feueursymphonie		same
[Instrument] Moon_short	√	√
[Organ] S19		same
[Saxophone] S53	√	same
[Synthetic Strings] Deploration	√	same
[Trombone] S54	√	√
[Trumpet] S55	√	
[Violin] E03	√	same
[Violin] Estro armonico#05	√	same
[Violin] Julia Fischer	√	√
[Violin] Sigiswald Kuijken	√	same
[Violin] Westhoff	√	√
[Voice countertenor] King Henry	√	same
[Voice female chorus] Compostelle	√	√
[Voice Soprano] Ciofi_A	√	same
[Voice Soprano] Ciofi_B		same
[Voice Soprano] V21	√	same
[Voice Woman Reverberated] Birds	√	same
[Voice woman] TomsDiner	√	√

=> The experimental encoder highly improves the clarity of two samples: *S44* (bagpipe) and *TomsDiner*. The improvement is less obvious with 6 samples and for 25 samples I didn't noticed anything.

TEST No. III 3.97 beta 2 VBR with and without –ns-bass

Are tested:

- 3.97 beta 2 ***-V5 –vbr-new***
- 3.97 beta 2 ***-V5 –vbr-new –ns-bass -8***

	3.97b2 vbr new V5	3.97b2 vbr new V5 --nsbass -8	3.97b2 vbr new V5	3.97b2 vbr new V5 --nsbass -8	
[Bagpipe] S44	√	√	105	113	+8 kbps
[Bassoon] S45	√	same	117	120	+3 kbps
[Chorus] Song for all Seas	√	abx=7/8	122	126	+4 kbps
[Clarinet] S48		same	99	105	+6 kbps
[Erhu] Rainbow Dance	√	√	126	131	+5 kbps
[Erhu] S04			126	132	+6 kbps
[Flute Pan] Kusturica	√	√	105	113	+8 kbps
[flute] Chinese hsiao	√	abx=5/5	157	163	+6 kbps
[flute] Chinese ti_A	√	abx=8/8	133	141	+8 kbps
[flute] Chinese ti_B	√	abx=7/8	129	135	+6 kbps
[Flute] Mozart KV 314		same	130	136	+6 kbps
[Gamba] Beatus vir		same	123	127	+4 kbps
[Gamba] S05	√	abx=6/6	126	133	+7 kbps
[Horn] E49	√		132	136	+4 kbps
[Horns] Feueursymphonie		better!	146	151	+5 kbps
[Instrument] Moon_short	√	abx=6/6	129	133	+4 kbps
[Organ] S19		same	123	128	+5 kbps
[Saxophone] S53	√	abx=6/6	94	100	+6 kbps
[Synthetic Strings] Deploration	√	abx=6/6	144	150	+6 kbps
[Trombone] S54	√	abx=6/6	108	115	+7 kbps
[Trumpet] S55	√	abx=6/6	119	125	+6 kbps
[Violin] E03	√	same	143	148	+5 kbps
[Violin] Estro armonico#05	√	abx=9/10	116	123	+7 kbps
[Violin] Julia Fischer	√	√	115	121	+6 kbps
[Violin] Sigiswald Kuijken	√	√	121	128	+7 kbps
[Violin] Westhoff	√		113	121	+8 kbps
[Voice countertenor] King Henry	√	abx=8/8	117	122	+5 kbps
[Voice female chorus] Compostelle	√	√	145	150	+5 kbps
[Voice Soprano] Ciofi_A	√	abx=9/10	129	134	+5 kbps
[Voice Soprano] Ciofi_B		same	135	139	+4 kbps
[Voice Soprano] V21	√	√	105	112	+7 kbps **bitrate is based on longest samples**
[Voice Woman Reverberated] Birds	√	√	141	147	+6 kbps
[Voice woman] TomsDiner	√	√	96	104	+8 kbps

bitrate is based on longest samples

=> --ns-bass -8 improves the quality of most (26) samples. The improvement is often noticeable, but it's rarely a high one. **Nevertheless, it's enough to solve the rumbling issue on 7 samples.** *TomsDiner* is much better whereas *Rainbow Dance* has still severe problems despite the addition of –ns-bass -8.

TEST No. IV 3.97 beta 2 vs 3.98 alpha with ABR

Are tested:

- 3.97 beta 2 –***abr 128***
- 3.98 alpha "Christmas" –***abr 128***

	3.97b2 abr 128	3.98 "Xmas" abr 128	
[Bagpipe] S44	√	abx=6/6	
[Bassoon] S45	√[1]	same	
[Chorus] Song for all Seas	√	same	
[Clarinet] S48	√	abx=7/8	
[Erhu] Rainbow Dance	√	same	
[Erhu] S04		same	
[Flute Pan] Kusturica		same	
[flute] Chinese hsiao	√	same	
[flute] Chinese ti_A	√	same	
[flute] Chinese ti_B	√	same	
[Flute] Mozart KV 314	√	same	
[Gamba] Beatus vir	√	abx=6/6	big improvement
[Gamba] S05	√	abx=6/6	
[Horn] E49	√	abx=5/6	
[Horns] Feueursymphonie	√	abx=6/6	
[Instrument] Moon_short	√	abx=6/6	
[Organ] S19	√	same	
[Saxophone] S53	√	same	
[Synthetic Strings] Deploration	√	abx=7/8	
[Trombone] S54	√	abx=7/8	
[Trumpet] S55	√		
[Violin] E03	√	same	
[Violin] Estro armonico#05	√	same	
[Violin] Julia Fischer	√	abx=5/5	
[Violin] Sigiswald Kuijken	√	same	
[Violin] Westhoff	√	same	
[Voice countertenor] King Henry	√	abx=8/8	
[Voice female chorus] Compostelle	√	abx=7/8	big improvement
[Voice Soprano] Ciofi_A	√	abx=8/8	
[Voice Soprano] Ciofi_B	√		big improvement
[Voice Soprano] V21		same	
[Voice Woman Reverberated] Birds	√	same	
[Voice woman] TomsDiner		same	

=> The experimental encoder was slightly disappoiting with VBR; it's also the case with ABR.I didn't noticed any difference with 18 samples. **3 samples were really improved.** For 4 sample the noise issue was gone. And for the 8 remaining ones the progress is audible but rather small. **There are good things in this encoder but it's not enough to solve most problems.**

TEST No. V 3.97 beta 2 ABR with and without –ns-bass

Are tested:

- 3.97 beta 2 –***abr 128***
- 3.97 beta 2 –***abr 128 –ns-bass -8***

	3.97b2 abr 128	3.97b2 abr 128 --ns-bass -8
[Bagpipe] S44	√	abx=6/6
[Bassoon] S45	√[1]	same
[Chorus] Song for all Seas	√	abx=6/6
[Clarinet] S48	√	
[Erhu] Rainbow Dance	√	same
[Erhu] S04		same
[Flute Pan] Kusturica		same
[flute] Chinese hsiao	√	√
[flute] Chinese ti_A	√	abx=8/8
[flute] Chinese ti_B	√	abx=8/8
[Flute] Mozart KV 314	√	abx=8/8
[Gamba] Beatus vir	√	abx=6/6
[Gamba] S05	√	abx=5/5
[Horn] E49	√	abx=5/5
[Horns] Feueursymphonie	√	abx=5/5
[Instrument] Moon_short	√	abx=5/5
[Organ] S19	√	
[Saxophone] S53	√	same
[Synthetic Strings] Deploration	√	abx=8/8
[Trombone] S54	√	
[Trumpet] S55	√	
[Violin] E03	√	abx=8/8
[Violin] Estro armonico#05	√	13/16
[Violin] Julia Fischer	√	abx=6/6
[Violin] Sigiswald Kuijken	√	abx=6/6
[Violin] Westhoff	√	
[Voice countertenor] King Henry	√	
[Voice female chorus] Compostelle	√	abx=6/6
[Voice Soprano] Ciofi_A	√	
[Voice Soprano] Ciofi_B	√	
[Voice Soprano] V21		same
[Voice Woman Reverberated] Birds	√	same
[Voice woman] TomsDiner		same

=> this test with ABR confirms the findings of the VBR one: --ns-bass -8 has a positive impact on quality with these samples and could reduce the amount of extra-noise audible in lowest frequencies. The bitrate is slightly highered, but is still inferior to the target. I didn't noticed any form of regression, but I must admit that I entirely focused my attention on one problem — further tests is needed to see if –ns-bass has a negative impact on quality with other phenomenons (ringing, pre-echo).

GENERAL CONCLUSION

The « bass noise » issue is maybe not a unique one: all problem samples are not reacting the same on different settings. Some are improved by the new encoder, some are improved by using VBR, some others are improved with –ns-bass -8. Therefore, the rumbling issue is **maybe a multiple problem** with multiple cause.

The 3.98 "Christmas" **alpha encoder** has a positive impact on LAME quality and could reduce and even solves rumbling issues audible as well with ABR and VBR. Nevertheless this improvement is apparently limited to a minority of samples. It can't solve nor reduce the rumbling artifacts of most problem samples I gathered.

It also appear that most issues audible with 3.97 beta 2 could be partially and sometimes fully solved with **–ns-bass -8**. This additional setting doesn't seem to have a negative impact on quality (I can make a better checking if it may be helpful) but has a negative one on efficiency with VBR and especially -V5 –vbr-new (inflated bitrate even when it's unecessary).

N.B. My tests are based on samples which are a bit longer than those I uploaded. I shortened them all *after* the test to reduce the filesize. Theoretically, the shortened samples should suffers from the same issues (same form, same intensity) than the native ones. I quickly verified it, and it seems OK. Now that samples are very short, I would say that some green cells would probably be colored in yellow (subtle amount of noise are easiest to detect when the sample only contains a problematic part). **For the next tests, I'll use the shortened version as reference.**