FilterlessDACSimulator

Contents

FilterlessDACSimulator is supplied as a zip file, filterlessdacsimulator.zip. When unzipped it should contain:

> FilterlessDACSimulator.exe
> recfilt.dat
> CT_Pro.dll

and this information file.

Description

FilterlessDACSimulator provides a means of assessing whether digital-to-analogue converters (DACs) without reconstruction filtering sound better than conventional DACs with linear-phase reconstruction filters. It processes a stereo 16-bit, 44.1kHz Wave file to generate two 24-bit, 176.4kHz Wave files which can either be replayed via computer (if you have a sound card compatible with 176.4kHz sampling rate) or burnt to recordable DVD using DVD-Audio authoring software, for replay via a DVD-A player. These two output files are generated by first applying 4× 'sample and hold' upsampling to the input file, a process which mimics the unfiltered stepped output waveform from a DAC. This raw, unfiltered waveform is written to the 'unfiltered' output file and contains ultrasonic image distortion. The second, 'filtered' file is generated by applying an FIR linear phase reconstruction filter of 215 coefficients with the following design parameters:

passband upper frequency	20kHz
stopband lower frequency	24kHz
passband ripple	0.01dB
stopband attenuation	101dB

The filtered file has the ultrasonic image distortion removed but may contain audible artefacts resulting from the filter's extended impulse response. Both files have uncorrected sinc(x) frequency response error and so are 3.2dB down at 20kHz reference the input file.

System requirements

FilterlessDACSimulator should run under any Windows 32-bit operating system, from Windows 95 onwards. It has been tested on Windows XP Pro.

To run, FilterlessDACSimulator requires that the supplied CT_Pro.dll be installed in the same directory as the executable. This file contains the runtime files of Perfect Sync Inc's Console Tools Pro (http://perfectsync.com) which provides enhanced control over the console window's appearance and function.

FilterlessDACSimulator is not optimised for speed. In particular, it uses conventional convolution to apply reconstruction filtering to the filtered output file, which is slower than FFT convolution for the length of filter used. Particularly when processing large Wave files, the utility's speed may be determined principally by disc reading/writing operations,. If there is intensive hard disk activity as FilterlessDACSimulator runs, this indicates that your computer is having to use virtual (hard disk) memory. Operation will be significantly faster if all the memory operations can be achieved within RAM. To facilitate this you may need to close other applications. If virtual memory is required even when FilterlessDACSimulator alone is running, a RAM upgrade will be needed for your computer to run it faster. Or you can chose to process shorter Wave files.

Operation

FilterlessDACSimulator first asks you to identify the Wave file to be processed. If the Wave file is not in the same directory as the executable then you must specify a complete path, *eg* c:\audio\guitar.wav. Note that the .wav extension must be included. If the specified file is not found this will be reported in an error message. Error messages will also be generated if the specified file is not a Wave file (*ie* not identified as such in its header), if it is not in PCM format, if it is not stereo, if it has a sampling rate other than 44.1kHz or if it has any resolution other than 16-bit. (Note that the Wave file must have WAVE_FORMAT not WAVE_FORMAT_EXTENSIBLE structure and the signal data must be in Subchunk 2.)

If these tests are passed, FilterlessDACSimulator reports the number of channels, sampling rate and length of the specified Wave file before beginning to generate the two output files. These are written to the same folder as the input file and have the same name with 'FDS unfiltered' and 'FDS filtered' appended respectively.

Licence

This software utility may be freely distributed provided that it is unaltered and distributed in its entirety, including the supplied DLL, dat file and this information file. It may not be used for any commercial purpose. No support or warranty is implied or given – you use this software at your own risk. If you encounter any bugs or have suggestions for improvements you are invited to email them to freeware@audiosignal.co.uk.

Keith Howard
October 2007