

Overview

Nature DSP Signal library is a collection of signal processing routines needed for implementation of typical algorithms for voice/audio processing. Special memory management optimizes performance and allows designer to utilize efficiently cache or DARAM/SARAM spaces and place most memory consuming blocks into the slow memory. Unique "filter-on-the-fly" feature enables fast filter synthesis in a real time.

Features

- **real-time** accurate LPF/HPF/notch/peak filter synthesis
- **efficient memory management** – no need to think about alignment, memory spaces, etc.
- **economy** DARAM/cache usage
- **wide variety** of windowing functions
- envelope detection, adaptive averaging, RSSI, etc.
- **true fixed point** implementation with saturation, no floating point
- code is reentrant, supports multithreading, DSP-BIOS **compatible**
- **fully portable** ANSI C code
- library for MS Visual Studio **for free** – enables development under PC

Applications

- software defined radio
- telephony
- audio/voice
- codecs

Specifications

Function	Input precision			saturation
	16-bit	32-bit	Complex	
FIR filter	x		x	x
Notch/peak filters	x		x	x
Universal multi-rate polyphase interpolator	x		x	x
On-the-fly filter synthesis	x			x
Windowing functions	x			x
Envelope detection	x		x	x
Averaging with leakage	x	x	x	x
Adaptive averaging	x	x	x	x
RSSI measurement	x		x	x
AWGN generation	x			x
Voice AGC/componders	x			x

Availability

This library is available in binaries and in source code written on fully portable C-language for:

- Texas Instruments TMS320C54xx, TMS320C55xx, TMS320C64xx, OMAP, DaVinci
- ARM7, ARM9, ARM9E
- MS Windows

Contacts

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Performance

MIPS performance depends on multiple factors, i.e. DSP family, memory layout, call frequency and so on. Numbers given below are measured for C5510 DSP, maximum allocated scratch DARAM block 256 words, call frequency 100 times/sec and sample rate 8000 samples/sec.

	MIPS		MIPS
Window functions (filter length 64)		Filters (with output shift and scaling)	
Blackman window	0,46	FIR length 171	1,14
Blackman-Harris window	0,62	IIR stage	0,11
Nuttall window	0,62	Envelope detection	1,92
Hamming window	0,28	RSSI	0,67
Hanning window	0,28	Polyphase interpolator, ratio 11025/8000	1,55
Triangle window	0,05	Polyphase interpolator, ratio 8000/2600	1,07
Bartlett window	0,05	Miscellaneous	
Gaussian window	0,36	Gaussian noise generation	3,35
Bartlett-Hann window	0,26	Compression A-law	0,56
Maximum flat window	0,75	Compression: u-law	0,47
Bohman window	0,37	Compression: true envelope	2,34
Tapered cosine window	0,22	Expanding: A-law	0,33
Kaiser window	0,18	Expanding: u-law	0,42
Filter synthesis:		Expanding: true envelope	2,34
LPF, length 255, Blackmann-Harris window	3,32		
HPF: length 151, Gaussian window	2,46		
Notch IIR stage	0,05		

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