Intel Signal Processing Library

What's New in Version 3.0

The Intel Signal Processing Library Version 3.0 includes, for the first time, 200 functions which process integer data types. The Signal Processing Library includes DLLs and static libraries optimized for the Intel486™, the Pentium® Pro Processor, the Pentium® Processor, and with this release, the Pentium® Processor with MMX™ Technology. Approximately 70% of the integer functions have been optimized for the Pentium Processor with MMX technology.   Because MMX technology accelerates primarily integer arithmetic, the floating-point functions do not use MMX technology.

What is the Intel Signal Processing Library?

The Intel Signal Processing Library provides a set of signal processing functions for the Intel Architecture similar to those available for most Digital Signal Processors (DSPs). The computing power of the Pentium processor enables many signal processing functions which were done previously by add-in DSPs to be done natively on a host Intel Architecture processor. The library includes functions for FIR and IIR filters, Fast Fourier transforms, tone generation, and many vector operations.

The functions process 16-bit integer data, single- and double-precision, floating-point data, as well as their complex variations.

The library also contains test programs in the `\examples\nspperf` directory. You can use these programs to test the performance and accuracy of particular groups of signal processing functions (for example, the FIR fucntions, the Arithmetic functions, and so on).   For more information on the test programs, see the `readme.txt` file in the `\examples\nspperf` directory

The Intel Signal Processing Library is a C-callable library which can be used in conjunction with Microsoft Visual C++ and Borland C++ compilers. Online documentation has also been provided.

The routines in the Signal Processing Library require that your system be able to run 32-bit applications. If you have a Windows* 3.1 system, you must install WIN32s* if it is not already installed.

Representative Performance Specifications

Selected Functions	Execution Times		Units
	150 MHz. Pentium with floating point	150 MHz. Pentium with MMX	
1024 dim. Add	3.9	0.6	clock/element
1024 dim. Multiply	3.9	0.6	clock/element
1024 dim. Minimum	3.1	0.7	clock/element
1024 dim. Square Root	47.3	9.0	clock/element
1024 dim. Std. Deviation	3.1	0.4	clock/element
1024 dim. Dot Product	41.0	6.0	μsec.
32 tap x 1024 dim. FIR Filter	1225.0	519.0	μsec.
32 tap x 1024 dim. Convolution	1648.0	536.0	μsec.

(The performance specifications above are results averaged over many repetitions of each function call. Data is in cache. All results are for floating point versions of the functions. Results were measured using a 150 MHz. Pentium processor PC with a 256K second level cache. The tests were run under Windows* NT 3.5.)

Version 1.0 was the first public release of the SP Library. It was originally released to alpha sites in mid-March of 1995 and given general distribution on the IAL June 1995 CD ROM. It consisted of a Pentium-optimized static library form of the functions.

Version 2.0 released in September 1995 added processor-specific, dynamically linked libraries (DLLs). A DLL detects the processor type at the time the DLL is loaded and loads a processor-specific DLL which is optimized for either the Intel486, Pentium processor, Pentium processor with MMX technology or the Pentium Pro Processor.

This release, Version 3.0, uses MMX technology to accelerate the integer functions within the library. Both a static library and a processor specific DLL are provided which take advantage of MMX technology. The Signal Processing Library is currently available on the Performance Tool Set CD-ROM.

The Library includes an application (Windows* NT, Windows* 95, Win32s* compatible) which will measure the performance of the library functions on any Intel Architecture based PC. Source code for the test program and a `MAK` file are provided should you wish to modify the way the performance is tested to be more relevant to your application.

Installing the Signal Processing Library

To use the Signal Processing Library, you must install it.

License Considerations

This software is licensed under the terms and conditions set out in the `license.wri` file in the root directory of the CD-ROM. Please read the license carefully before using the software. The release notes for this release of the Signal Processing Library are installed during the library installation.

Release Notes

See the Release Notes for more information about this release of the Signal Processing Library.

Intel Signal Processing Library Demos

The following demos show how to use Signal Processing Library functions to manipulate touch-tones used in telephony and show the frequency response characteristics of FIR filters based on library functions. The Intel Signal Processing Library Reference Manual describes these functions in detail.

FIR Filter Demo

The FIRDEMO demo program is an example of using the Intel Signal Processing Library functions. The program lets you manipulate filter parameters with slider controls and observe graphically the frequency response of an FIR filter based on the Signal Processing Library's FIR filter function.

Instructions

The FIRDEMO application window consists of three sections: scroll bars, radio buttons, and the graph display windows. Here is a brief explanation of how to use the application:

Use the scroll bars to set the FIR filter tap length, and the passband and stopband cutoff frequencies.

- **Taps** - number of FIR filter coefficients
- **Fp**, **Fs** - for band-pass filters, it is the passband and stopband frequency values
- **Fp** - for low-pass and high-pass filters, it is the cutoff frequency value

Use the radio buttons to select the filter mode, and the windowing mode.

- **Filter** - used to choose one of the three filtering modes:
    - **Lowpass** - low-pass filter mode
    - **Highpass** - high-pass filter mode
    - **Bandpass** - band-pass filter mode
- **Window** - used to choose one of the two windowing modes:
    - **Hamming** - use Hamming window
    - **Bartlett** - use Bartlett triangle window

The graph display windows show the filtered output signal, and the coefficients of the filter taps.

- Upper window - draws a result of the filtered signal. The input signal is a mixture of some cosines. The curve represents the spectrum of the output signal.
- Lower window - draws coefficient values of the filter that was being designed.

Running the Demo

To run the FIRDEMO program, execute `firdemo.exe`.

The FIRDEMO program does not have a menu bar and does not support any application commands. Use the system menu to close the application.

Dial Tone Demo

The dialtone demo program uses the Intel Signal Processing Library functions to encode and decode touchtone (DTMF) signals. The program uses only standard Windows API calls.

Instructions

To run the Dial Tone Demo, execute `dialtone.exe`.

Select a `.WAV` file by using the **Open** option in the **File** menu or by clicking on the *File Open* icon.

Use the Windows **Help** command to bring up the Help file.

Some of the features are:

- **Action/Dial** command to input a phone number.
- **Action/Play** command to hear the dialtone play back.
- **Options** command to change the characteristic of the dialtone.
- After changing any options, select the **Action/Dial** command again to force the effect to take place.
- Use the **File/Open** and **File/SaveAs** commands to import or export Windows `.WAV` files.

Technical Support and Feedback

To give feedback or to report any problems with installation or use, use the contact information in the customer letter included with your CD-ROM package.