GE Fanuc
Intelligent Platforms

AXISLIB – RSPL

Performance Optimized Signal Processing Library

Features

- Standalone or integrated within the AXIS software environment
- Comprehensive signal and vector processing functionality
- Hand-coded for PowerPC® + AltiVec
- Configured for development mode with error checking or production mode for maximum performance
- Not constrained by standard API and functionality – easily extended
- Supports Freescale 74xx /8641D and PA Semi PWRficent processor families
- Portable across operating systems (VxWorks®, LynxOS®, INTEGRITY, Linux®)

**Supports SBCs with AltiVec processors only*

Maximizing the performance of embedded real-time signal processing applications

The Signal and Vector Processing Library is a high performance AXIS software module providing over 450 digital signal processing and mathematical functions created to help developers maximize system and application performance. It is designed to support the most advanced real-time embedded signal processing applications and can operate in a standalone mode or as an integral software module within the AXIS Advanced Multiprocessor Integrated Software environment.

The Library is highly optimized for the PowerPC, taking maximum advantage of the processor pipeline and SIMD architecture of the AltiVec vector processing unit.

The API provides the developer complete control over the data flow, data management and customization, providing rapid development of real-time application code, while ensuring that memory management is as efficient as possible.

Providing excellent portability between operating systems, as well as interoperability between present and future GE Fanuc Embedded Systems products, the Library minimizes costs while providing flexibility and peace of mind.

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Math

Length = N

$$\hat{y}[k] := \sum_{i=0}^{M-1} r[j]\left(x[k + i - [M/2]]^*\right) \quad \text{for} \quad 0 \le k \le [M/2]$$

$$y[k] := \hat{y}[k]^* \begin{cases} 1/\left(k + [M/2]\right): 0 \le k < [M/2] \\ 1/M : [M/2] \le k < N - [M/2] \\ 1/\left(N + [M/2] - 1\text{-}k\right): N - [M/2] \le k < N \end{cases}$$

Minimum (not zero padded):

Length = N - M + 1

$$\hat{y}[k] := \sum_{i=0}^{M-1} r[j]\left(x[k + j]^*\right) \quad \text{for} \quad 0 \le k \le N - M$$

$$y[k] := y[k] / M$$

$$\text{Where } \left(x[j]\right) = \begin{cases} x[j]: \le j < N \\ 0 : \text{otherwise} \end{cases}$$

AXIS Multicomputer

Open Architecture, COTS Multiprocessor Solutions

Customer Application
AXIS Advanced Multiprocessor Integrated Software
Universal Interface Layer (UIL)
Board Support Package (BSP)
Built-in-Test (Configurable POST)
I/O, SBCs, Multiprocessors, Fabric Switches

Features

Function Set	Description
Scalar	
Complex Scalar	40 functions for performing complex scalar math
Index Scalar	4 functions for indexing matrix elements
Random Number Generation	
Random Numbers	8 functions for generating random numbers, vectors and complex vectors
Vector and Elementwise Operations	
Elementary Mathematical	18 functions performing elementary vector math (sin, cos, tan, atan, exp, log, sqrt, etc.)
Unary Operations	35 functions for operating on a single vector or matrix
Binary Operations	57 functions for operating either two vectors or matrices or one vector and a scalar
Ternary Operations	24 functions for operations requiring three inputs
Logical Operations	8 functions for performing logical operations on vectors or matrices
Selection Operations	23 functions for selecting a subset of a vector or matrix
Bitwise and Boolean Logical Operators	12 functions for performing Bitwise and Boolean operations on vectors and matrices
Element Generation and Copy	37 functions for copying and generating vector elements
Manipulation Operations	18 functions for vector and matrix manipulation (e.g. scatter, gather and swap)
Vector Conversion and Rounding	18 functions
Signal Processing	
FFTs	43 functions for performing 1D and 2D FFTs (real-complex, complex-real, complex-complex in place and out-of-place)
Windowing	4 windowing functions (Blackman, Hanning, Kaiser, Chebyshev)
Filter	8 functions for FIR filtering
Convolution	3 functions convolutions (1D)
Correlation	3 functions correlations (1D)
Histogram	1 function histograming
Linear Algebra	
Matrix and Vector Operations	86 functions for performing linear algebra on vectors and matrices
SVD	3 functions for performing Singular Value Decomposition
Linear System Solvers	29 functions

Sample Function Times – 1K Vectors

Function	Description (All timings are for 1024 points)	Data in L1 Cache *
rad_ccfftip_split_f	Split complex to complex 1D in-place FFT	6.63 µs
rad_crfftop_split_f	Split complex to real 1D out-of-place FFT	5.06 µs
rad_cvmul_split_f	Split complex vector multiply	1.6 µs

** Results obtained on Freescale 8641D (single core) running @ 1.5 GHz and measured in µs*

Ordering Information

AXISLIB-RSPL1M

Maintenance Agreement. Includes the right to use license and 1 x runtime license. Annually renewable.

AXISLIB-RSPL1RC

Run-Time license.

About GE Fanuc Intelligent Platforms

GE Fanuc Intelligent Platforms is a leading global provider of embedded computing solutions for a wide range of industries and applications. Our comprehensive product offering includes many types of I/O, single board computers, high performance signal processors, fully integrated, rugged systems including flat panel displays, plus high speed networking and communications products. The company is headquartered in the U.S. and has design, manufacturing and support offices throughout the world. Whether you're looking for one of our standard products or a fully custom solution, GE Fanuc Intelligent Platforms has the breadth, experience and 24/7 support to deliver what you need. For more information, visit www.gefanuc.com.

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Additional Resources

For more information, please visit the GE Fanuc Intelligent Platforms web site at:

www.gefanuc.com