

AXISLib – GPU

Performance Optimized Signal Processing & Vector Math Libraries for NVIDIA CUDA GPUs

Features

Functionality

- Comprehensive signal and vector processing functionality, providing the VSIPL API with over 500 functions.

Performance

- Optimized for CUDA
Fully optimized NVIDIA CUDA architecture libraries for GE GPGPU platforms.
- **Multithreaded**
Takes maximum advantage of the massively parallel architecture of GPUs.
Core computations implemented as CUDA kernels.

Portability

- VSIPL API
Provides industry standard API for maximum portability.
- VSIPL Core Lite compliant plus many functions from Core 1.0 profile.
- Portable across operating systems (Windows™, Linux®)
- 32-bit and 64-bit support.

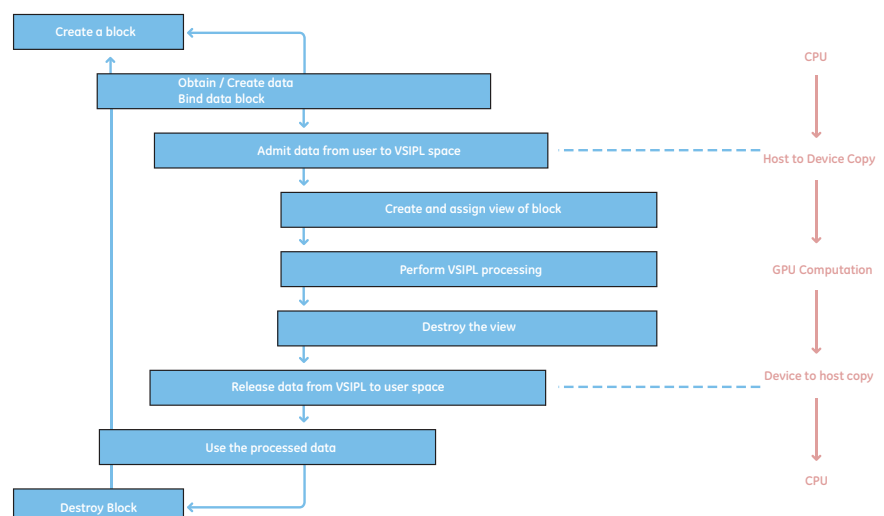
AXISLib-GPU is a set of Signal and Vector Processing Libraries providing over 500 high performance digital signal processing and vector math functions created to help developers maximize system and application performance on deployed mission pay loads.

General purpose computing on graphics processing units (GPGPU) can offer substantial performance increases in radar, sonar, signal and image processing applications when compared to CPU only solutions. AXISLib-GPU provides a suite of commonly used DSP and math libraries to get the most out of GE's latest, rugged NVIDIA GPGPU platforms.

Designed to support the most demanding high performance digital signal processing

applications for size, weight and power (SWaP) constrained mission computing platforms, AXISLib-GPU compliments GE's optimized libraries for Intel and Power Architecture platforms enabling application developers to harness the performance required to best suite their application needs.

The VSIPL library provides a standard application programming interface (API) as defined by the VSIPL Forum. Designed to support embedded real-time signal processing systems, it provides enhanced application portability between platforms and consistency across data types, processors and vendor implementations – accelerating engineering development and new technology insertion over the entire program life cycle.



The VSIPL concept of 'user space' and 'VSIPL space' fits well with the GPGPU paradigm of CPU (host) and GPU (device) memory. VSIPL hides the concept of copying data between the host and device memory by performing the operations during the VSIPL admit and release stages.



AXISLib-GPU – Signal processing & vector math libraries

Math

$$\text{Length} = N$$

$$\hat{y}[k] = \sum_{j=0}^{M-1} r[j] \{x[k + j - [M/2]]^*\} \text{ for } 0 \leq k \leq N - 1$$

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

Minimum (not zero padded):
Length = N - M + 1

$$\hat{y}[k] = \sum_{j=0}^{M-1} r[j] \{x[k + j]^*\} \text{ for } 0 \leq k \leq N - M$$

$$y[k] = \hat{y}[k] / M$$

Where $\{x[j]\} = \begin{cases} x[j]: 0 \leq j < N \\ 0: \text{otherwise} \end{cases}$

Ordering Information

AXISLib-GPU-01M

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

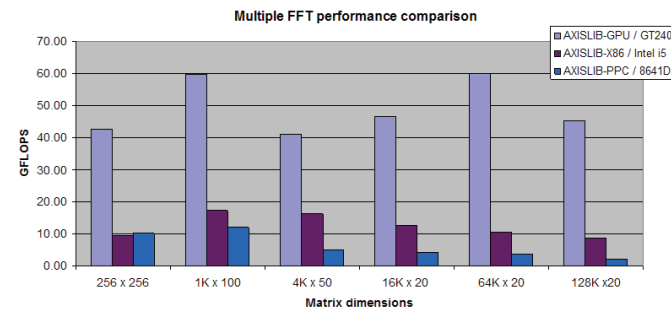
AXISLib-GPU-01R

Runtime license.

Functionality

Function Set	Description
Scalar	
Complex Scalar	23 functions for performing complex scalar math
Random Number Generation	
Random Numbers	6 functions for generating random numbers, vectors and complex vectors
Vector and Elementwise Operations	
Elementary Mathematical	21 functions performing elementary vector math (sin, cos, tan, atan, exp, log, sqrt, etc.)
Unary Operations	13 functions for operating on a single vector or matrix
Binary Operations	29 functions for operating either two vectors or matrices or one vector and a scalar
Ternary Operations	19 functions for operations requiring three inputs
Logical Operations	8 functions for performing logical operations on vectors or matrices
Selection Operations	16 functions for selecting a subset of a vector or matrix
Bitwise and Boolean	24 functions for performing Bitwise and Boolean operations on vectors and matrices
Element Generation and Copy	40 functions for copying and generating vector elements
Manipulation Operations	28 functions for vector and matrix manipulation (e.g. scatter, gather and swap)
Signal Processing	
FFTs	21 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	4 functions convolutions (1D and 2D)
Correlation	4 functions correlations (1D and 2D)
Histogram	1 function histogramming
Linear Algebra	
Matrix and Vector Operations	82 functions for performing linear algebra on vectors and matrices
Linear System Solvers	17 functions

Performance Comparisons



About GE Intelligent Platforms

GE Intelligent Platforms, a General Electric Company (NYSE: GE), is an experienced high-performance technology company and a global provider of hardware, software, services, and expertise in automation and embedded computing. We offer a unique foundation of agile, advanced and ultra-reliable technology that provides customers a sustainable advantage in the industries they serve, including energy, water, consumer packaged goods, government and defense, and telecommunications. GE Intelligent Platforms is a worldwide company headquartered in Charlottesville, VA and is part of GE Home and Business Solutions. For more information, visit www.ge-ip.com.

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