


PixL Image Processing Algorithm Library



The RACE++™ Series PixL™ library is a comprehensive set of integer-based mathematical routines that help developers meet the stringent high-throughput, low-latency demands of image processing applications. Designed specifically for RACE++ and RACE multicomputers from Mercury Computer Systems, the PixL library includes more than 130 common image processing routines that accelerate integer mathematical

operations by 8 to 16X over scalar operations. It also provides an easy-to-use programming interface that reduces time to market and overall development costs.

High Performance

The PixL library combines Mercury's expertise in algorithm development with its comprehensive understanding of image processing applications. PixL is optimized to take advantages of unique integer processing capabilities of the AltiVec microprocessor family, giving developers easy access to dramatic performance gains. Further, the most commonly used routines have been hand-optimized for Version 1 of the PixL library based on Mercury's extensive knowledge of processor operations and algorithm development. Many more will be optimized in later versions. These enhancements result in performance improvements in deployed application code.

Ease of Use

The PixL library has been designed to reduce the complexity of optimized application code. It includes separate, interoperable libraries for application development and deployment performance. The development library provides parameter checking, which is eliminated from the performance library to

maximize processing speed. Further, the PixL product also includes a workstation version of the library, coded on C, that runs on Mercury-supported development host computers. This lets developers code on workstation platforms and port applications easily to deployment environments.

The PixL library's application programming interface (API) will also be familiar to developers with experience using Mercury's Scientific Algorithm Library (SAL). This shortens the programmer's learning curve and cuts development time.

Flexible

The PixL library provides a flexible programming model by including two separate applications programming interfaces (APIs). In the traditional direct API, data is handled as a two-dimensional block of memory. The indirect API, useful for stripmining applications and cache optimizations, allows data to reside in noncontiguous locations.

Most routines have multiple entry points, supporting different data types such as 8-bit or 16-bit, signed and unsigned integers. Each combination of routine and supported data type is termed an "entry point." The PixL library includes more than 2,200 different entry points.

Recognized Expertise

The PixL integer processing library focuses Mercury Computer Systems' leadership in high-performance algorithm development on the challenges facing image processing system developers. It is a product of the same development team that created Mercury's industry-leading SAL archive of more than 400 key routines for floating-point signal processing applications. Users will benefit from applying Mercury's expertise to their integer image processing applications.

**High-Performance
Integer-Based Image
Processing**

**16X Increase in
Performance**

Optimized for AltiVec

**Reduces
Development Costs**

PixL System Requirements

Mercury Systems

RACE++ and RACE Series VME-based systems, or
 RACE++ and RACE Series MultiPort™ systems, or
 RACE++ and RACE Series VantageRT™ PCI systems
 RACE++ Series ImpactRT cPCI systems

Compute Elements (CEs)

PowerPC

MC/OS™ runtime environment

MC/OS 5.6.1 greater

Development Hosts

Solaris™, Windows NT® or Windows 2000®

Runtime Hosts

Solaris, Windows NT, VxWorks®, or Windows® 2000

PixL Routines

Table 1 PixL Supported Data Types

Packed 8-bit data (b8)
 Unsigned 8-bit data (u8)
 Signed 8-bit data (s8)
 Unsigned 16-bit data (u16)
 Signed 16-bit data (s16)
 Unsigned 32-bit data (u32)
 Signed 32-bit data (s32)

Table 2 PixL Routine Classes

Arithmetic	Numeric operations such as addition, subtraction, multiplication, and dot product
Comparative	Operations that compare one element to another to calculate the output result
Filters	See Table 3
Histogram	Operation that counts the number of elements in an image that have a given intensity value
Logical	Operations derived from Boolean Algebra (and, or, not, compare)
Look-up Tables	A continuous block of memory organized to compute the values of a function of one variable
Manipulation	Operations that reorganize the elements (conversion, interpolation, replication, reduce, reflection, & rotation)
Shifting	Shift each element by a fixed value
Statistical	Perform statistical functions on an image (examples: mean, variance, and root-mean-square)
Threshold	Segmentation operation on an image (binarize, for example)
Utilities	Operations that copy, clear, or fill an image
Handle	Routines that operate on the PixL handle

Table 3 PixL Filter Classes

Comparative	Statistical filters that compare a window of elements to calculate the output
Edge Detection	Edge filters that enhance the high-frequency features (Kirsch, Prewitt, & Sobel)
General Convolution	General convolution with a user-specified kernel
Separable	General convolution with a user-specified decomposed kernel
Gradient Detection	Gradient filters that enhance the high-frequency features (example Laplace)
Morphological	Spatial filters operations applied to change the shape of a binary-valued region. Used for noise reduction and feature detection (examples: erode, dilate, open, and close).
Spatial	Location transforms that enhance or suppress certain spatial properties (Gauss, Rank & Statistical)

For more information, go to www.mc.com

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Ordering Information

Contact Mercury for a free product demonstration or for ordering information.



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