Hypersignal®

Includes TCP/IP Network Support!

Create Image Applications that can use the internet!

ImPro Lab™

A powerful tool for Digital Image Processing

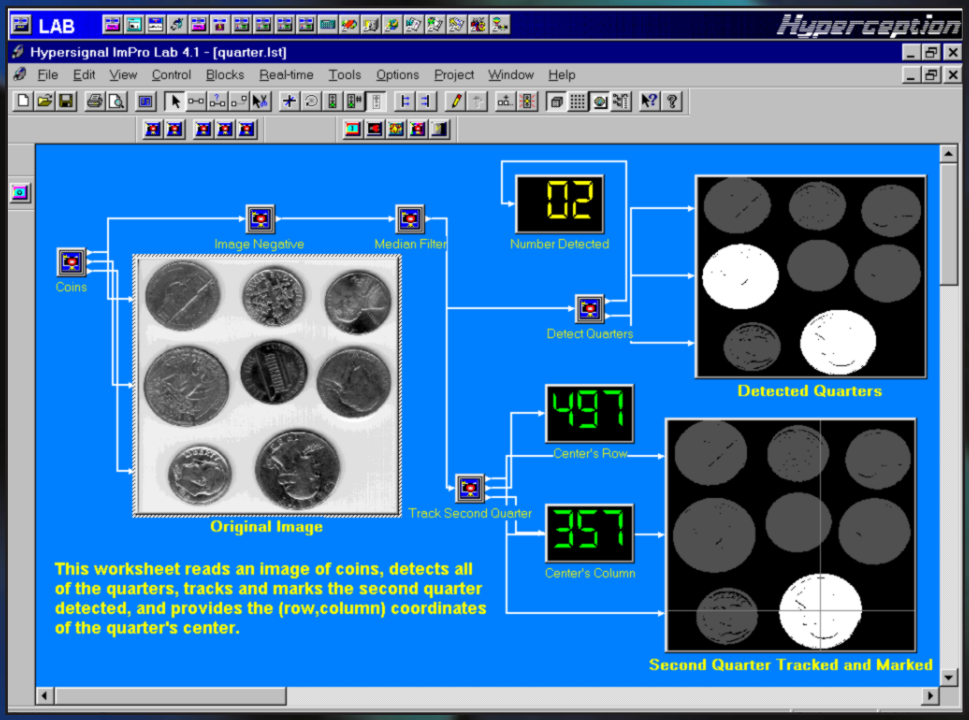


Image processing design environment with support for a variety of Industry-standard image capture hardware including standard PC video capture cards

Product Document: HSMK4050

Hyperception

The Leader in DSP

Hyperception * 9550 Skillman * Dallas, TX 75243 * 214-343-8525 * FAX 214-343-2457 * info@hyperception.com * www.hyperception.com

Hyperception, Inc. was founded in 1984 to provide advanced engineering software which combined the power and cost effectiveness of the IBM PC with software methodologies focused on providing drastic improvements in the way many engineering projects are developed.

ImPro Lab has been created using over a decade of experience in signal and image processing. A proven visual design approach has been leveraged to produce this product line.

Thank you for taking the time to examine the details of our advanced image processing tool, ImPro Lab.

Product Packages

P/N HSWN4000

ImPro Lab Standard Edition

The Standard Edition includes many fundamental image functions, and together with a basic PC, serves as a complete, low-cost image processing station. Support is even included for real-time image processing using low-cost video capture boards, allowing a very affordable image processing station!

P/N HSWN4100

ImPro Lab Professional Edition

The Professional Edition includes all of the image processing functions in the Standard Edition, and also includes an Application Builder to create stand-alone Windows Applications (executable programs for Windows 95/98/NT). This added capability makes ImPro Lab great for either an image processing lab or the image processing professional.

P/N HSWN4200

ImPro Lab Enterprise Edition

The Enterprise Edition includes all of the image processing functions of the above versions, including the application builder, and adds an automatic ANSI C Source Code Generator to create C source code from your image processing visual design. This is an important feature for those desiring source code to port to other platforms or to cross compile for DSP chips. The Enterprise Edition represents our most powerful image processing package yet!

Site Licenses & Academic Discounts

Special Discount Pricing

For multi-station environments, academic use, and laboratory setup, Hyperception offers special discount pricing, and the Academic Edition (P/N HSWN4300). Contact our sales department to receive a special price quotation for your particular application!

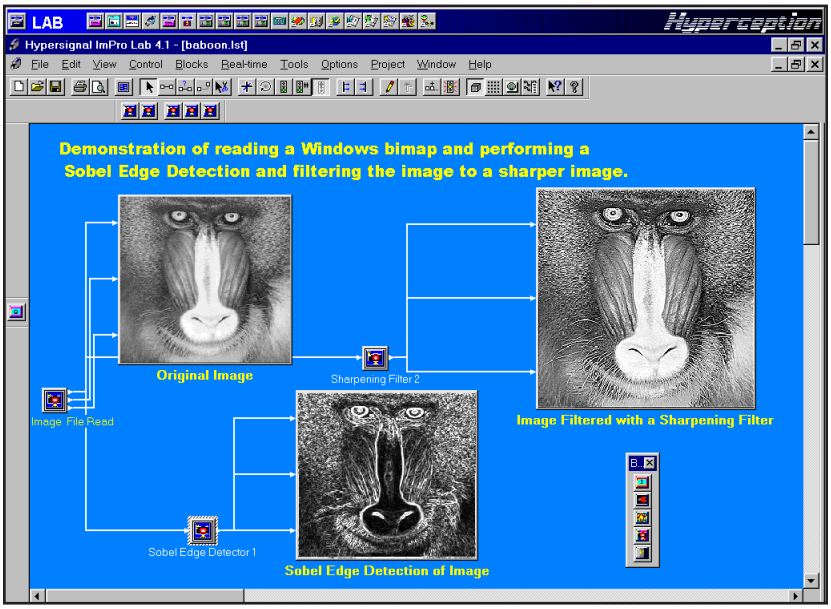
Exciting new Remote Capabiliy!

Internet Remote

For remote image processing applications, a built-in internet connectivity capability is available. This allows any two ImPro Lab stations connected by the internet, or an intranet (internal network), to work with each other. Simply using one of the ImPro Lab stations as a ‘Client’, and the other as a ‘Server’ allows the client station to receive images sourced by the server station. This feature is included on all editions of ImPro Lab Software!

ImPro Lab Overview

ImPro Lab - Advanced Digital Image Processing Tool



Digital Image Processing is made easier with Hypersignal ImPro Lab

Key Features

- ***Versatile and Cost-effective***
- ***Minimized Development Costs***
- ***Reduced Concept/Design Time***
- ***Produce Stand-alone Applications with Professional Edition***

Overview

Hypersignal ImPro Lab is a powerful new image processing environment created with the engineer in mind. ImPro Lab contains an extensive set of image processing functions that provide the high performance building blocks developers need to implement the latest image processing algorithms.

The Hypersignal ImPro Lab Image Processing System provides users with benefits such as shortened learning curves, lower development costs, and improved application development. This advanced digital image processing tool has been designed to run under Windows 95/NT/98 and provides you with a convenient environment to experiment with image processing algorithms without having to write complex image applications from scratch.

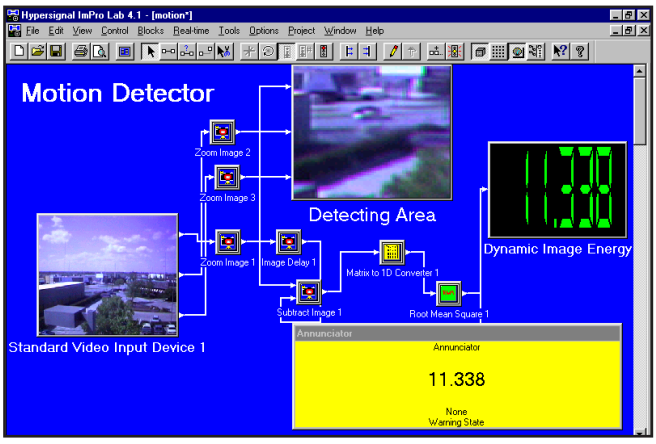
ImPro Lab allows you to graphically construct a block diagram to implement your image processing algorithm. The flexible environment executes the algorithm depicted in the block diagram at high speed, and allows viewing of images and display analysis results, such as histograms. The ability of this tool to provide both concept level 'what-if' scenarios and direct engineering for production applications makes ImPro Lab an excellent choice for many image processing projects.

Designed for Versatility

ImPro Lab includes an extensive library of image processing functions to provide solutions for a wide range of advanced image processing applications.

These functions are actually Windows DLLs that have been optimized for fast execution. In addition to this powerful image processing library, the user is able to easily integrate customized routines and extend the power of the ImPro Lab library.

ImPro Lab is based on Hyperception's unique visual design techniques, so it can save you plenty of program development and testing time. And by using an off-the-shelf image processing package backed by proven design techniques, you also reduce software maintenance and support costs.

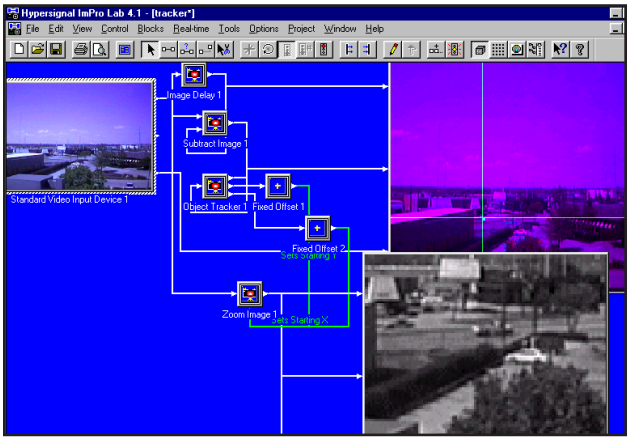


Motion Detection Example

Example of detecting motion using the real-time standard video input and additional block functions

Support for Video Capture

Real-time Image Processing using Standard Video Capture Hardware



Object Tracking Example

Run-time tracking application with position of tracked object being used to zoom in on region of interest

Exciting Live Video Processing

- ***Low cost video input support***
- ***Real-time image processing***
- ***Direct support for standard CCD cameras***
- ***Direct support for NTSC and PAL video***

Standard low-cost video capture cards for the PC are directly supported in ImPro Lab. Many PCI-based (and other bus-based) capture boards, parallel printer port image capture devices, and USB port video devices are supported.

This permits full motion image processing in real-time, depending upon the speed of the PC and the complexity of the image algorithm. Object detection, object tracking, image enhancement, and many other types of image processing can benefit from this direct link to real-time images from video capture cards.

. . . and standard file-based image support

Multi-media AVI File Support

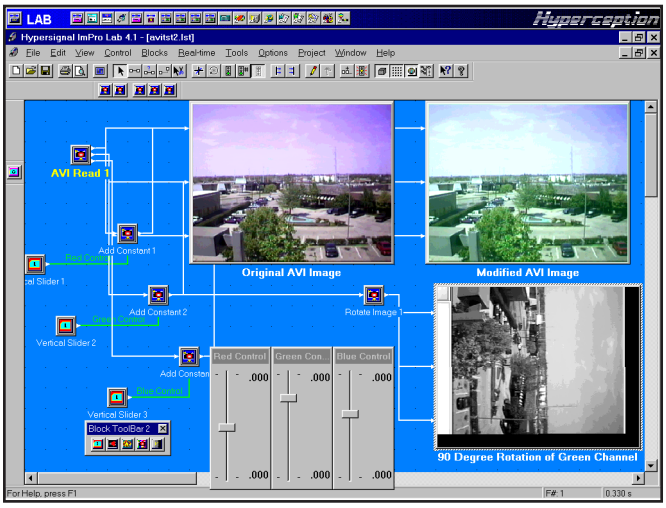
- ***Direct support for AVI multi-media files***
- ***Allows 'live' processing of video streams***
- ***Direct access to RGB planes from AVI files***
- ***'On-the-fly' image analysis/enhancement***

Standard Bitmap File Support

- ***Allows use of standard image files***
- ***Reads and Writes standard Bitmap images***

Raw Image File Support

- ***Direct support for raster-based image files***
- ***Supports 'pixel-only' types of image data***
- ***May be used to work with 1-D data and other types of data files***



AVI File Support

Example using slider controls to vary the RGB content of the streaming AVI file.

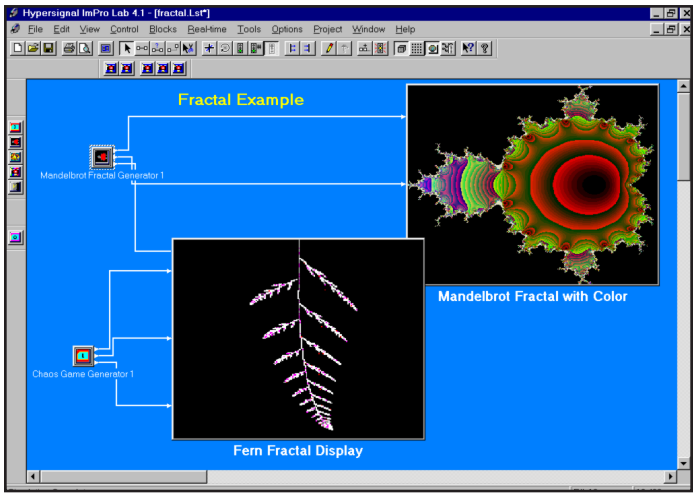
The interface to file-based data has been an important design consideration for ImPro Lab. It has been designed to work with a number of data file types to ensure many existing image files may be used, processed and interchanged within the environment, while still providing easy access to external applications and user-written programs.

Flexible Image Processing

Designed to be versatile for demanding image processing applications

Color Image Processing Support

Hypersignal ImPro Lab uses a plane-based approach to color image processing, providing support for monochrome and color images using Red, Green, and Blue (RGB) planes of data; each plane is treated independently and is easy to work with on an individual color basis. This format also has the additional advantage of allowing image data to be treated as matrix data, with matrix operations possible on the image. Although RGB support is directly available, it would be possible to work in other color spaces by creating new block functions.



Perform image applications as unique as fractal analysis

Ability to convert to/from 1-D

Conversion routines between one-dimensional data and two-dimensional data are included for performing a wide variety of image processing algorithms, using a mix of image processing specific functions and conventional one-dimensional functions. This permits a vector, or raster based approach for certain image processing applications, and simplifies many types of traditional image processing applications.

Flexible Image I/O

Getting images into and out of Hypersignal ImPro Lab may be accomplished through reading and writing image files. In addition to raw pixel data formats, standard Windows bitmap and AVI formats are supported for reading and writing image files. A powerful addition to ImPro Lab is the inclusion of a frame grabber function for direct capture of images from standard video cameras and capture cards.

Due to the open software architecture of Hypersignal ImPro Lab, custom or proprietary image capture, or frame grabber hardware may be supported easily by creating a new block function for the hardware.

Flexible Pixel Precisions

Hypersignal ImPro Lab supports a variety of precisions when working with pixel data; each pixel may be represented in formats such as 8-bit, 16-bit, floating point, and even double precision floating point. This can increase the dynamic range while experimenting with an image algorithm, reducing or eliminating numeric processing noise in complex algorithms.

Support for TCP/IP Transmission

Sending images (even live video images) over a standard TCP/IP network is supported within the environment. The speed of transmission will be related to the bandwidth of the network, but transmission over standard intranets and the internet are supported. Remote transmission/collection of image data is easily afforded by this capability.

Even simply cabling several computers together on a local network with a common ethernet link (10 base T) will allow high speed transfer and processing of images by the computers; a relatively easy way to get multiple computers to work together on the problem!

Other Capabilities

Plug-ins exist to enhance capabilities, address new projects, and allow for future growth!

Standalone Applications

After designing your project visually with Hypersignal ImPro Lab, use the application builder, Hypersignal HAppl, to create standalone Windows 95/98/NT applications. This feature is included in both Professional and Enterprise Editions.

C Source Code Generator

From your visual design, the C Source Code Generator will automatically generate ANSI C source code to help implement your algorithm in a C environment. This capability is included in the Enterprise Edition.

Many Standard Functions . . .

Partial List of Image Processing Functions

Add Constant
Add a constant to an image

Clip Image
Clips an image by comparing with two specified threshold levels

Flip Image
Flips an image

Image Negative
Creates a negative image

Image Square
Produces the square of an image

Image Square Root
Calculates the square root of an image

Threshold
Examines an image and outputs zero if the image element is not greater than the specified threshold

Zoom Image
Zooms an image based on the specified parameters

Multiply by Constant
Multiplies an image by a constant

Multiply Image
Multiplies two input images

Add Image
Adds two input images

Subtract Image
Subtracts two input images

Rotate Image
Rotates an image

RGB Display
Displays an image in RGB format

Isotropic Edge Detector
Detects the edges of an image using the Isotropic method

Laplace Edge Detector
Detects the edges of an image using the Laplace method

Prewitt Edge Detector
Detects the edges of an image using the Prewitt method

Roberts Edge Detector
Detects the edges of an image using the Roberts method

Sobel Edge Detector
Detects the edges of an image using the Sobel method

Point Detector
Detects the isolated points on an image

Horizontal Line Detector
Detects the horizontal lines on an image

45 Degree Line Detector
Detects the 45 degree lines on an image

Vertical Line Detector
Detects the vertical lines on an image

135 Degree Line Detector
Detects the 135 degree lines on an image

AVI Read
Reads an AVI file

Bitmap Read
Reads a Windows Bitmap file

Bitmap Write
Writes a Bitmap to a disk file

Maximum Filter
Performs a maximum filter on an image

Median Filter
Performs a median filter on an image

Minimum Filter
Performs a minimum filter on an image

Moving Average Filter
Performs a moving average filter on an image

Order Statistical Filter
Performs a order statistical filter on an image

Exponential Transform Histogram
Performs the exponential transform histogram on an image

Histogram
Calculates the histogram of an image

Histogram Equalization
Performs a uniform histogram on an image

Log Transform Histogram
Performs the log transform histogram on an image

Brightness
Measures the average intensity of an image

Contrast
Measures the variance of an image

AND Two Images
Performs the logical AND function on two input images

OR Two Images
Performs the logical OR function on two input images

XOR Two Images
Performs the logical XOR function on two input images

AND Constant
Performs the logical AND function on an image with a constant

OR Constant
Performs the logical OR function on an image with a constant

XOR Constant
Performs the logical XOR function on an image with a constant

Add Gaussian Noise
Adds noise with a Gaussian distribution to an image

Add Impulsive Noise
Adds impulsive noise to an image

Add Laplacian Noise
Adds noise with Laplacian distribution to an image

Add Uniform Noise
Adds noise with a uniform distribution to an image

Object Counting
Detects and counts objects

Object Tracker
Tracks an object(s) in an image

Sharpening Filter
Performs a sharpening filter on the input image

Mandelbrot Fractal Generator
Generates a Mandelbrot Fractal with specified parameters

Chaos Game Generator
Generates a fractal based on the chaos game

RGB Converter
Convert an RGB signal to the specified format

Image Delay
Delay a specified number of images

Sprite
Generates one of many Sprite images at a variable x,y

2-D FFT
Performs a 2-D FFT on input image

2-D Inverse FFT
Performs a 2-D Inverse FFT on input image

. . . plus easy expansion if needed

Ability to Add New Functions

Open Software Architecture

Since it is possible that your application may require a specialized function not included in the standard library of functions, the ability to extend the environment is important. Our product excels in this particular aspect to real-world designs. Our image functions are actually Windows DLLs that are produced by standard Windows C/C++ compilers so adding your own customized block functions is very straightforward. The included Block Wizard tool makes adding your own functions practically effortless, as it generates all the source files needed to create a new function, and even creates a sample function for you to modify.

Hierarchical Design

ImPro Lab supports n-level hierarchical design for advanced system and algorithm prototyping. The ability to use hierarchy in a simulation allows you to shrink complex worksheet designs into single block functions. By using hierarchy, you can visually create your own custom block functions from other block functions without having to write any source code or script files.

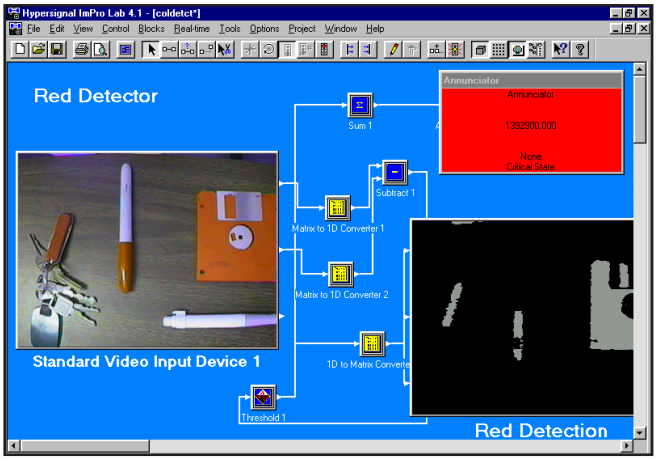


Image Processing Application showing red object detection

Advantages of ImPro Lab

Why use this tool as opposed to other types of tools?

Some Features

Hypersignal ImPro Lab's object oriented visual design environment provides you with a powerful setting in which to create your image processing system, analyze image data, and perform many types of image processing experiments.

Large Function Library

ImPro Lab contains a comprehensive library of functions which will allow you to target a wide variety of applications. We have tried to include the most commonly used functions for a variety of engineering applications thereby enabling users to get their projects up and working with the standard Hypersignal ImPro Lab product.

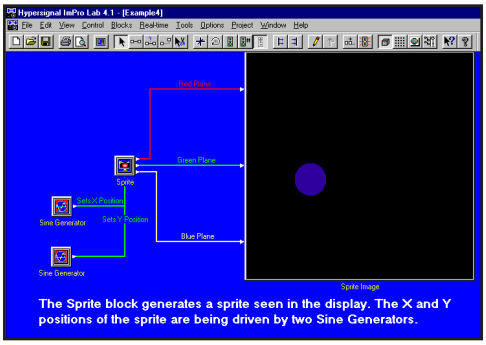


Image motion may be accomplished through use of the Sprite function, which places a shape at a specific x,y

Powerful Display Capability

You will easily be able to display your images with ImPro Lab. Within the framework of ImPro Lab, multiple image display windows can be opened simultaneously within your design. When combined with the image processing functions, the image display will assist you in visualizing and analyzing your image data.

Hierarchical Design

ImPro Lab supports n-level hierarchical design for advanced system and algorithm prototyping. The ability to use hierarchy in a simulation allows you to shrink entire worksheet designs into single block functions. By using hierarchy, you can visually create custom block functions without having to write any source code or script files.

Conditional Constructs

ImPro Lab allows you to implement conditional constructs for program control, looping, or other decision-based logic. Any block function can be conditionally connected to any other block. This allows control over whether or not the block (or group of blocks) will execute.

Recursive Feedback

Many types of DSP and numerical systems require recursive structures, or feedback paths. Many adaptive processes also require feedback structures for proper error update. A great deal of work has been put into ImPro Lab to address this area of algorithm support.

"On-the-Fly" Analysis

ImPro Lab provides interactive control and direct observation of the design at execution time. This allows you to explore "what if" scenarios and make "on-the-fly" adjustments. By using pop-up menus and user controls such as knobs & sliders, you can easily change design parameters. This capability prevents interruption of the design thought process. This results in more efficient design activities which can lead to a tremendous time savings.

Global Parameters

Allowing the user to globally set or change parameters is important in many types of simulations. ImPro Lab allows you to select meaningful, easy-to-understand character names for any of the parameters in the simulation. By referring to these descriptive names, you can quickly modify the values of all occurrences of these global parameters through use of a single location on the main menu.

Dynamic Parameters

The ability to control the parameters of a block function with another block as the system is running, allows you to model many types of algorithms. The dynamic parameter connect mode of ImPro Lab allows you to simply connect the controlling block to the target block for dynamic parameter modification.

Ability to Add New Functions

Since it is possible that your application may require a specialized function which is not included in the standard library of functions, the ability to extend the environment is important. Our product excels in this particular aspect to real-world designs. Since our block functions are actually Windows DLLs which are produced by standard Windows C/C++ compilers, adding your own customized block functions is very straightforward. The included Block Wizard tool makes adding your own functions practically effortless.

Exceptional User Interface

The user interface of ImPro Lab has been designed to facilitate your development. You can easily create custom toolbars which are appropriate to your application. A full Cut/Copy/Paste/Undo editing capability makes it easy to build applications. In short, we believe that this is the best user interface for the development of Digital Image Processing and related engineering projects.

Why is our Tool Best?

How does Hypersignal ImPro Lab compare to other "similar" products? First, ours is a more efficient implementation, and faster - all of ImPro Lab's functions are Windows DLLs which run at executable speed, not interpretive speed. This inherent efficiency tends to be quite important in many applications. The open software architecture of ImPro Lab coupled with the powerful and robust Block Wizard makes it easy to add user-defined block functions.

Direct support for standard low-cost PC-based video cameras combined with the fast architecture of ImPro Lab allow for live image processing at a very low cost. This live processing is essential to many types of image applications, and this feature represents cutting edge technology in image processing!

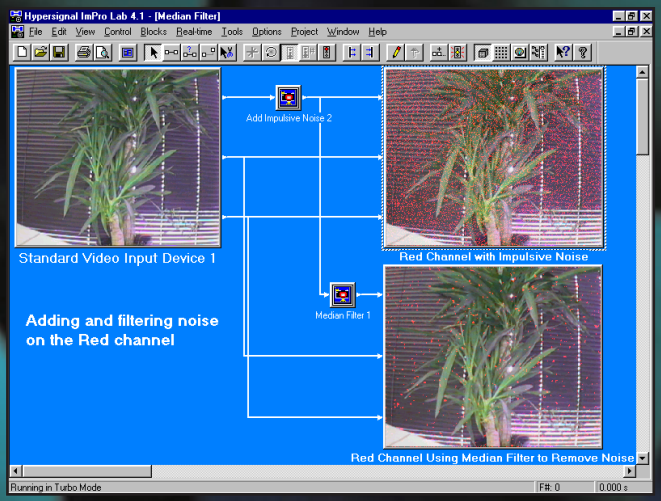
The capability for true n-level hierarchy design is another important consideration for many customers. With this capability, users can create subsystems of the overall design, and share these subsystems with other users. When a modification is made to the subsystem, it can be applied to all systems which use that hierarchical construct.

The ability to create highly efficient run-time applications directly from ImPro Lab in the Professional and Enterprise Editions allow for quick and easy generation of stand-alone applications from the visual design. These visually created programs are then ready to run under Windows 95/98/NT.

Yet another capability of our product is that it supports an optional ANSI C Source Code generator in the Enterprise Edition to obtain the C source code from a visual design. Few other products have this, and they tend to be considerably more expensive. This is significant for customers since they may not initially perceive that they require code generation. It minimizes the long term risk of both time and expense if later they decide that they do.

Finally, our products typically cost less than many of our competitors, and we believe that our price/performance ratio is much better than other potential solutions.

The ImPro Lab Image Processing System provides users with benefits such as shortened learning curves, lower development costs, and improved application development. ImPro Lab can be viewed as a two-level software package that is comprised of the ImPro Lab user interface and a library of functional blocks (which are simply Windows DLL's) that are run underneath. ImPro Lab includes the Block Wizard, which gives users the flexibility to easily create their own unique blocks in minutes should their application call for a function not already included among the standard set of functions.



Hypersignal ImPro Lab allows easy access to powerful digital image processing functions and direct 'on-the-fly' image operation and analysis

The ability to move your project out of the Hypersignal environment upon completion is possible through an run-time application builder, HAppl, included in the Professional Edition. This allows the user to create **stand-alone Windows 95/NT/98 applications** directly from their visual design. For even greater flexibility, the ANSI C Source Code generator included in the Enterprise Edition will **automatically generate ANSI C source code** representing an ImPro Lab worksheet that can then be cross-compiled for use with a particular DSP chip or moved to any environment supported by an ANSI C compiler, dramatically reducing the amount of source code need to be written by the end user.

ImPro Lab provides a top-notch image processing tool at an affordable price; with its direct support for low-cost pc-based standard video capture devices, it is an excellent choice for multiple station environments, or for outfitting entire labs.

Take a closer look at the unique merits of this latest method of image processing design!

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