

APHELION™

IMAGING TOOLS FOR WINDOWS™ 95/NT

	CENTROID.Y	ELONGATION	HEIGHT	PERIMETER	PIXEL COUNT
1	18.27	0.32	32	120.00	
2	20.58	0.27	28	136.00	
3	20.42	0.12	25	106.00	
4	21.83	0.29	24	110.00	
5	20.32	0.22	22	98.00	
6	58.34				
7	57.31				
8	59.11				
9	59.59				
10	57.50				
11	58.15				
12	95.55				
...

```

Sub main
AphImgOpen AphImg("Ima
AphImgHoleFill AphImg(
AphImgOpen AphImg("Ima
AphImgOpen AphImg("Ima
AphImgDilate AphImg("I
AphImgHoleFill AphImg(
  
```

Value

PERIMETER

[158, 176] = 26,000

IMAGE PROCESSING AND IMAGE UNDERSTANDING SOFTWARE

DEVELOPMENT AND RUN-TIME VERSIONS FOR END-USERS AND INTEGRATORS

FULL 32-BIT IMPLEMENTATION FOR WINDOWS™ 95 AND WINDOWS™ NT

HARDWARE SUPPORT FOR FRAME GRABBERS AND STAGE CONTROLLERS

MULTI-LANGUAGE SUPPORT (ENGLISH, FRENCH, KANGI...)

MACRO RECORDING, EDITING, AND DEBUGGING (VISUAL BASIC-COMPATIBLE)

32 BIT DLL'S FOR C++ AND VISUAL BASIC

APHELION

**FOR DEVELOPERS, INTEGRATORS,
AND END-USERS.**

Aphelion™ is a development environment and a delivery vehicle for image-based applications. It is the only software product for Windows™ 95 and NT environments that provides the very latest developments in mathematical morphology and symbolic representation, as well as the most effective tools for quantitative image analysis, pattern recognition, and classification. Jointly developed by Amerinex Applied Imaging, Inc. and ADCIS SA (France), Aphelion™ combines and enhances the best technology available to the two companies, including key elements of AAI's KBVision™ System, the X-LIM morphology software from the Paris School of Mines, and both companies' expertise in imaging systems. Aphelion™ contains an extensive operator library, developer's interface, script language, detailed on-line help, multiple language documentation, and professional quality data display tools. The developer's interface provides an MDI that can simultaneously display multiple objects such as images, graphics, text, spread-sheets, and presentation documents. Aphelion™: Image Processing and Image Understanding for OEMs, VARs, and end-users on Windows™ 95 and NT.

The screenshot shows the Aphelion software interface with several windows open. The main window displays a circuit board image with a 'Defect' window overlaid. Below the image is a data table with columns: AREA, BOUNDING_RECT_FILL, BR_TO_PERIMETER, and CENTROID. The table contains data for a specific object (56) and summary statistics (units, min, max, mean, sd). To the right, there is a 'Histogram' window showing a frequency distribution. Below the main window is a script editor with the following code:

```
original = AphImgNew()  
AphImgRead original, "c:\aphelio  
MsgOpen "Sample of a circuit", b  
Sleep bt1000  
MsgClose  
  
i1 = AphImgNew("Image1")  
AphImgSupremumOpen original, i1.  
MsgOpen "Filtering by Supremum o  
Sleep bt1000  
MsgClose
```

This dialog box contains various settings for image processing. It includes fields for 'XY' coordinates, 'Z' value, and 'Enable Z Focusing?'. There are also checkboxes for 'File Information', 'Object Set', and 'Image Information'. The 'Image Information' section shows 'Number of Images Detected' as 13 and 'Number of Images Compared' as 17. Buttons for 'OK', 'Cancel', and 'Apply' are at the bottom.

This dialog box is for configuring object sets and combination methods. It includes a 'Rule Set' dropdown, a 'Date' field, and a 'Combination Method' dropdown. The main area is a table with columns: Name, Select, Min, Max, Fluz, Rank, Weight. The table lists various parameters like HEIGHT, CONVOLUTION, COMPACTNESS, CENTROIDX, and AREA. Buttons for 'OK', 'Cancel', and 'Apply' are at the bottom.

PROCESS

- Image processing operators
- Innovative morphological operators
- Image understanding operators
- Image analysis operators
- Database for symbolic image features and measurements
- Parallel port control
- Image Acquisition
- Stage Control

VISUALIZE

- Visualization of b/w and color images
- Visualization of symbolic data (region, line, corner,...)
- Support of MDI (PC only), full interactivity between display and control windows
- Data interaction functions for each window of the MDI
- OLE 2.0 support
- Chart viewer for high quality presentation graphics

DEVELOP

- Largest processing library of any commercial product
- Full graphical user interface
- Menu-based or script-based for selection of operators
- Drag & drop of images, symbolic data, objects...
- Visual Basic script language (record, edit, playback, debug)
- Project based interface to control workspaces and data
- On line documentation and multi-language support

SYSTEM FUNCTIONALITY



EXTENSIVE OPERATOR LIBRARY

Processing operators can be controlled in two modes: normal or advanced. The normal mode requires the user to specify only the essential parameter values. Advanced mode allows the user to fine-tune the processing of the operator with optional parameter values. Operators may be exported for use with third-party software, and users may add their own operators.



VISUAL BASIC MACRO LANGUAGE

Includes a full debugger and interpreter. Macros are compatible with external Microsoft products. A dialog editor is provided to create custom application interfaces. Visual Basic programs can be created by recording user actions in the interface.



GRAPHICAL USER INTERFACE

A very intuitive GUI, the operator window of the standard interface allows the user to define input and output images, and other operator parameters with the mouse, making use of drag & drop. Image names can be automatically defined by the system. Other windows support the recording, editing, and running of Visual Basic scripts, and data visualization.



OLE 2.0 SUPPORT

All the objects of an application may be transferred via OLE into any other Windows application, such as a word processor, a spreadsheet, or a database. The MDI project window provides the user with the ability to import external objects.



SYMBOLIC DATABASE

Provides efficient storage, access, and display for image features such as regions, blobs, lines, chains, points, splines. Provides the opportunity to extract, group, classify, or filter the features, and gives the user all the tools necessary to handle the OLE 2.0 compatible database, and the ability to tailor the data display. All measured attributes can be computed in terms of user defined calibration units.



POWERFUL GRAPHIC SERVICES

All data summaries can be plotted in 2D and 3D, and the user has full interaction to move along the generated curves.



RECOGNITION TOOLS

Standard & optional tools provide Aphelion™ users with a broad set of capabilities for object recognition and classification. Manual and automatic ('show me') training, feature space graphs, and set and try classification allow non-programmers to quickly develop simple or sophisticated recognition schemes based on statistics or fuzzy logic.



GRAB LIVE IMAGES FROM A CAMERA

Several popular PCI based frame grabbers are supported. Grab single frames, or display live video to the screen in real time.



EASY REGION OF INTEREST SELECTION

The user may define any ROI with the mouse or by program, and may then control processing within the ROIs. The user may also merge any graphics with the image, and propagate the graphics along with the images. Binary images may be used as arbitrary ROI's.



VIRTUAL SCREEN VISUALIZATION

Users have access to more than one screen workspace at the same time. Tools are provided to manage the layout of images on a virtual screen.



CDROM DISTRIBUTION

All the Aphelion™ documentation and software is delivered on CDROM. This CDROM includes a full description of the interactive operators, User Guide, and getting started guide.



POWERFUL VISUALIZATION LIBRARY

Aphelion™ provides users with the ability to visualize images, graphs, symbolic data, and measurements in the same MDI interface. Window panes can be linked together to provide flexible, interactive control for operations such as selection, zoom, and pan.



ORGANIZE WORK AS PROJECT

Collections of images, graphics, macro files, symbolic objects, calibration, and text can be stored as an imaging project. Tools are available to operate on these objects, provide a history of processing, and to save and restore processing contexts.



MULTI-LANGUAGE SUPPORT

Both the GUI and the User Guide are available in several languages. During the same interactive session, users can switch from one language to another.



IMAGE FORMATS

Supported external image file formats include: TIFF, VIFF, BMP, DIB, KBVision™, and raw data. Internal formats for image data include: 8, 16 and 32 bit integer, 32 and 64 bit floating point, and color. Class support is provided for b/w, color, binary, label, edge, complex and frequency images.

APHELION™ OPERATOR LIBRARY

THE INDUSTRY'S MOST EXTENSIVE OPERATORS ACCESSIBLE THROUGH THE APHELION™ USER INTERFACE, VISUAL BASIC, AND C/C++ LINKABLE LIBRARIES (DLL'S)

ARITHMETIC AND LOGIC OPERATORS

Arithmetic • ImgAbs, ImgAdd, ImgBlend, ImgDivide, ImgInvert, ImgMask, ImgMaximum, ImgMinimum, ImgMultiply, ImgRemainder, ImgSubtract, MatrixMultiply

Bitwise Logic • ImgBitAnd, ImgBitNot, ImgBitOr, ImgLeftShift, ImgRightShift

Logic • ImgAnd, ImgLogicalDifference, ImgNAnd, ImgNOr, ImgNot, ImgOr, ImgXNOr, ImgXOr

Constants • ImgAddConstant, ImgMultiplyConstant, ImgSubtractConstFloor

FILTERING OPERATORS

Lowpass-Filters • ImgBlur, ImgBoxFilter, ImgGaussianFilter, ImgLowPass3x3, ImgLowPass5x5, ImgLowPass7x7

Highpass-Filters • ImgHighPass3x3, ImgHighPass5x5, ImgHighPass7x7, ImgLaplacian, ImgLaplacian3x3, ImgLaplacian5x5, ImgLaplacian7x7

Enhancement • ImgMedian, ImgMedian3x3, ImgMedian5x5, ImgMode, ImgMode3x3, ImgNagaoFilter, ImgRankValueFilter, ImgWallisFilter, ImgWeymouthFilter

Convolution • ImgConvolve, ImgConvolve3x3, ImgConvolve5x5, ImgConvolve7x7, ImgConvolveWithImage, ImgSeparableConvolve

EDGE DETECTION OPERATORS

Laplacian • ImgLaplacian

Linear • ImgCannyDericheEdges, ImgOneByTwoEdges, ImgPrewittEdges, ImgRobertsEdges, ImgSobelEdges, ImgZeroCrossEdges

Non-Linear • ImgRidgeValleyEdges

Utilities • ImgEdgesThin, ImgEdgesToEdgels

Morphology • ImgMorphGradientEdges, ImgInternalGradientEdges, ImgExternalGradientEdges

FREQUENCY DOMAIN OPERATORS

Fourier • ImgFFT, ImgInverseFFT, ImgPeakCut

Low Frequency Filters • ImgLPButterworthFilter, ImgLPExponentialFilter, ImgLPRectangularFilter, ImgLPTrapezoidalFilter

High Frequency Filters • ImgHPButterworthFilter, ImgHPExponentialFilter, ImgHPRectangularFilter, ImgHPTrapezoidalFilter

MORPHOLOGY OPERATORS

Erosion/Dilation • ImgDilate, ImgErode

Opening/Closing • ImgClose, ImgOpen

Distance • ImgGraphDistance

Features • ImgExtRegionalMaxima, ImgExtRegionalMinima, ImgLocalMaxima, ImgLocalMinima, ImgRegionalMaxima, ImgRegionalMinima, ImgUltimateErodedSet

Geodesy • ImgBorderKill, ImgGeodesicDilate, ImgGeodesicGraphDistance, ImgHoleFill, ImgReconstruct

Watershed • ImgConstrainedWatershed, ImgWatershed

Advanced Opening/Closing • ImgAddReconsClose, ImgAreaClose, ImgAreaOpen, ImgDilateReconsClose, ImgErodeReconsOpen, ImgInfimumClose, ImgSubtractReconsOpen, ImgSupremumOpen

Thinning/Thickening • ImgConstrainedThicken, ImgConstrainedThin, ImgHitOrMiss, ImgThicken, ImgThin

Skeletons • ImgConnectedSkeleton, ImgMinimalSkeleton, ImgOpenSkeleton, ImgThickSkeleton, ImgThinSkeleton

Filtering • ImgAlternateSequential, ImgAutoMedian

Contrast • ImgMorphContrast

TRANSFORM OPERATORS

Geometry • ImgCenter, ImgFlip, ImgRotate, ImgScale, ImgShear, ImgTranslate, ImgTranspose

Utilities • ImgCartesianToPolar, ImgPolarToCartesian

Color • ImgColorToRGB, ImgCompressRGB, ImgExcessRGB, ImgExpandRGB, ImgHSIToRGB, ImgNormalizedRGB, ImgRGBToColor, ImgRGBToHSI, ImgRGBToYIQ, ImgYIQToRGB

IMAGE ACQUISITION OPERATORS

Grab/Snap • ImgFreeze, ImgGrab, ImgSnap

IMAGE UTILITY OPERATORS

Generation • ImgCreateGaussianNoise, ImgCreateGaussianSurface, ImgCreateRamp, ImgCreateUniformNoise, ImgFree, ImgFreeAll

Utilities • ImgChangeDataType, ImgClear, ImgClip, ImgCopy, ImgCut, ImgFill, ImgFrame, ImgJoinBands, ImgJoinInterlace, ImgPaste, ImgRename, ImgSplitBands, ImgSubCopy

LUT/Point • ImgEqualizeHistogram, ImgLinearScale

Input/Output • ImgImport, ImgRead, ImgWrite

SEGMENTATION OPERATORS

Threshold • ImgEntropyThreshold, ImgExtremaThreshold, ImgHysteresisThreshold, ImgLocalHistogramThreshold,

ImgMaximumContrastThreshold, ImgMomentThreshold, ImgThreshold

Morphology • ImgBlackTophat, ImgClusterSplitConvex, ImgGrowRegions, ImgWhiteTophat,

Rectangles • ImgLabelsToRectangles

Polygons • PolygonArea, RegionConvexHullPolygons

Lines • ImgEdgesToLines, ImgGradientLines

Regions • ImgEntropyThresholdObj, ImgHysteresisThresholdObj, ImgLocalHistogramThresholdObj, ImgMaximumContrastThresholdObj, ImgMomentThresholdObj, ImgRegionGrowObj, ImgThresholdObj, ImgZeroCrossObj

Utilities • ImgClustersObj, ImgClustersToLabels, ImgEdgesToEdgels, ImgLabelsObj

Chains • ImgEdgesToChains

ANALYSIS OPERATORS

Global • ImgAreacompute, ImgBoundingBox, ImgCompare, .ImgConcavity, ImgConvexity, ImgCountObjects, ImgEdgeBands, ImgEuler, ImgFirstPoint, ImgGranulometry, ImgHistogram, ImgIntercepts, ImgMoments, ImgLocate, ImgPerimeter, ImgRange, ImgVolume

Image Analysis • ImgAutoCorrelate, ImgCooccurrence, ImgCrossCorrelate, ImgHoughTransform, ImgLocalVariance, TemplateMatch

Objects • ChainAttributes, ObjAttributeRatio, ObjComputeMeasurements, LineAttributes, RegionFerret, RegionHistogramAttributes, RegionShape, RegionStatistics, RegionTexture

Interactive • Angle Distance, ImgPixelDump, ImgProfile, Pick, Project, Velocity

OBJECT PROCESSING OPERATORS

Geometry • ObjRotate, ObjScale, ObjShear, ObjTranslate

Region • RegionClose, RegionDilate, RegionErode, RegionHoleFill, RegionOpen

Lines • RegionLineFit

Chains • ChainLineFit

Grouping • EdgelNeighbors, EdgelsToChains, RegionOverlap, RegionSplitConvex, RegionSplitStatistical, RegionSplitUnconnected

OBJECT UTILITY OPERATORS

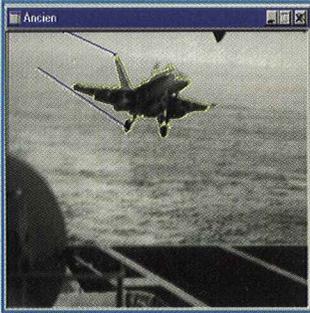
Object I/O • ObjExport, ObjFree, ObjFreeAll, ObjRead, ObjWrite

Cut/Copy/Paste • ObjFree, ObjCopy, ObjDeleteAttribute, ObjFilter, ObjAppend, ObjMerge

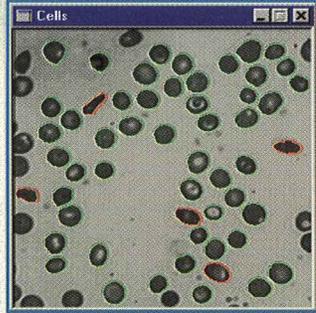
Graphics • ObjDraw, ObjRemoveOverlay

Conversion • ObjSpatialAttributeToImage, ObjSpatialAttributeToRegion

EXAMPLE APPLICATIONS



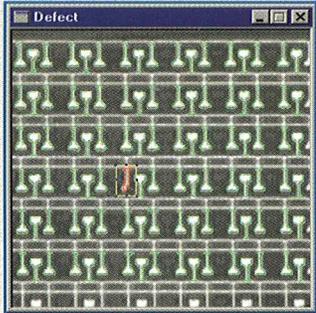
OBJECT TRACKING



CYTOLOGY



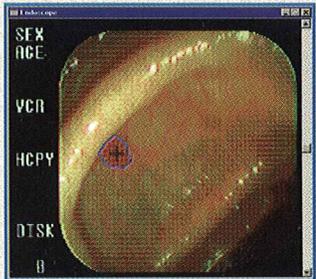
COLOR PROCESSING



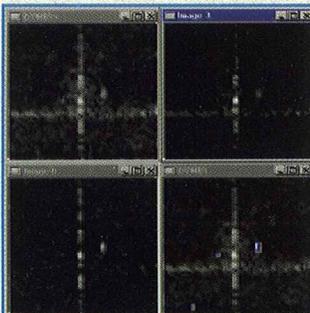
DEFECT INSPECTION



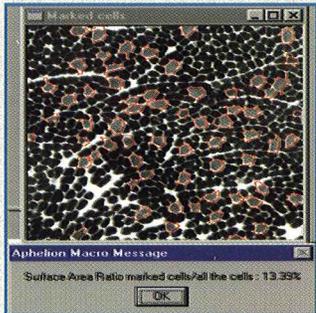
VEHICLE GUIDANCE



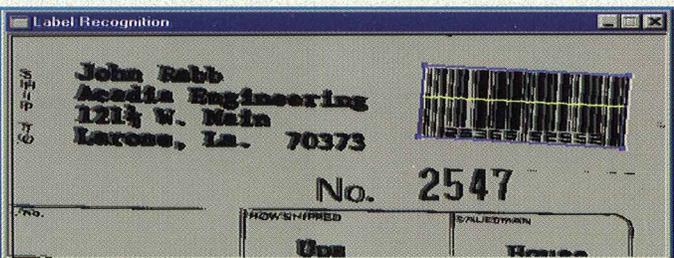
MEDICAL DIAGNOSIS



RADAR ANALYSIS



SURFACE AREA RATIOS



DOCUMENT RECOGNITION

- **CYTOLOGY**
- **BIOLOGY**
- **RADIOLOGY**
- **MRI**
- **GEL ANALYSIS**
- **3D RECONSTRUCTION**
- **PETRI DISH & DNA QUANTIFICATION**
- **PHARMACOLOGY**

- **METALLURGY**
- **POROSITY MEASUREMENT**
- **GEOLOGY**
- **PETROLEUM EXPLORATION**
- **REMOTE SENSING**

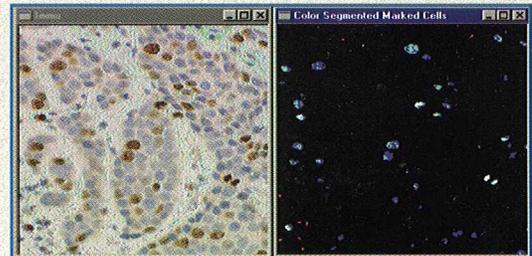
- **PART DEFECT ANALYSIS & INSPECTION**
- **FOOD INSPECTION**
- **TEXTILE ANALYSIS**
- **ROBOTICS**

- **AUTOMATIC TARGET RECOGNITION**
- **OBJECT TRACKING**
- **MOTION ANALYSIS**

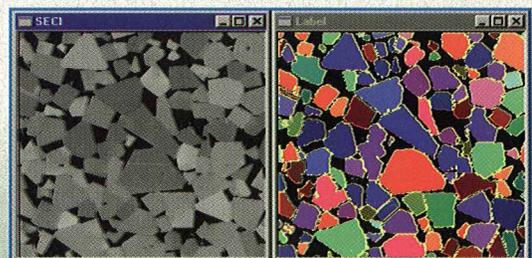
- **TRAFFIC CONTROL**
- **SECURITY & SURVEILLANCE**

- **X-RAY IMAGING**
- **INFRARED IMAGING**

- **DOCUMENT IMAGING**
- **DOCUMENT UNDERSTANDING**



MARKED CELL DETECTION



GRAIN BOUNDARY ANALYSIS

APPLICATION DEVELOPMENT & PRODUCT SUPPORT

OEM'S AND VAR'S • Aphelion™ has been designed to meet the needs of OEMs and VARs. Functions from the DLL library may be embedded into any 3rd party product. Market specific applications may be developed using C/C++ or Visual Basic in a very short time.

END-USERS • The Developer Module includes all the necessary tools for processing, display, and macro recording and debugging. It also includes a Graphical User Interface, and all the tools to develop image processing and image understanding applications. Users with different levels of computer vision experience will all find the Aphelion™ interface to be very intuitive, powerful, and versatile.

PRODUCT DISTRIBUTION • The Aphelion™ software package is distributed on CDROM.

SYSTEM REQUIREMENTS • Minimum requirements for running Aphelion™ are: Pentium 100 MHz processor, 24 MBytes memory, SVGA graphics, and Windows™ 96/NT operating system.

PRODUCT SUPPORT • AAI has developed and supported computer vision software environments since 1986, and is well known for providing excellent customer service. In addition, AAI uses its own products to develop software for both commercial and government contracts, which means that the most advanced and up-to-date algorithms are found in the Aphelion™ operator libraries. Telephone, facsimile, and the Internet are used to support customers worldwide.

WORLD WIDE WEB USERS:

Check out AAI's World Wide Web Site.
Our Uniform Resource Locator (URL) is:
<http://www.aai.com/>

COMPANY PROFILE

Amerinex Applied Imaging, Inc. (AAI) develops and markets software products that employ computer vision technology. AAI's first commercial offering in 1987, the KBVision™ System, was the most innovative and advanced imaging toolset ever introduced commercially. It has been widely used in image understanding research, and has been embedded in third party systems developed by AAI and its OEM customers. AAI's products and technology have established the company as the leading software developer of image understanding tools and solutions. • In recognition of AAI's expertise, the company has received both government and commercial contracts to develop imaging software systems. The Advanced Research Projects Agency awarded AAI a U.S. government contract to develop the IUE (Image Understanding Environment), an advanced system for government sponsored imaging research. AAI was also selected by a major stock exchange to develop stock certificate reading software that uses image understanding rather than template matching to effectively deal with free-form documents. Other imaging applications with which AAI has experience include feature-based detection and tracking, and 3D analysis and visualization. • AAI has developed the VisionTutor™ System, a computer vision course that teaches basic and advanced concepts of image processing and image understanding. The VisionTutor™ materials can be used as a college course or as training in a company setting. VisionTutor™ is now an Aphelion™ option and is available on CDROM. • In 1995, AAI established a strategic partnership with the French company, ADCIS (Advanced Concepts in Imaging Software), to develop Aphelion™ software, and to collaborate on other products and projects. The two companies will cooperate to market their products worldwide. • The combination of AAI's technology and market focus, its commercial and government relationships, its strategic collaboration with ADCIS, and its professional staff of software engineers and imaging scientists enable AAI to remain a leader in the development of imaging tools and applications.



409 Main Street, Amherst, Massachusetts 01002
Tel: 413/256-8941 Fax: 413/253-4203

ADCIS SA, 7 rue A. Kastler, 14000 CAEN, France
Tel: 33-31-46-26-58 Fax: 33-31-46-26-51