Imaging Software

NIS-Elements
Advanced Solutions for your Imaging World
Nikon offers total solution covering image capture, archiving, and analysis

NIS-Elements is an integrated platform of imaging software developed by Nikon to achieve comprehensive control of microscope image capturing and document data management. NIS-Elements handles multi-dimensional imaging tasks flawlessly with support for capture, display, peripheral device control, and data management & analysis of images of up to six dimensions to achieve a more productive workflow. The system also contributes to experiment efficiency with a database building feature developed to handle archiving, searching, and analysis of large numbers of multi-dimensional image files. Unified control of the entire imaging system offers significant benefits to users for cutting-edge research, such as live cell imaging.

Flexible, easy-to-use core architecture
NIS-Elements supports plug-in-based software modules to expand functionality. The software can be used seamlessly for anything from device control of microscopes or cameras to EDF and deconvolution.

Easy multi-dimensional image acquisition

High-level quantitative analysis

User-friendly macro function

Various device support

The NIS-Elements suite is available in two distinct packages scaled to address users’ specific application requirements.

- **NIS-Elements AR** - Advanced Research software for fully automated acquisition and device control through full six-dimensional image (X, Y, Z, λ, T, Multi-point) acquisition and analysis.
- **NIS-Elements BR** - Basic Research software for acquisition and device control through four-dimensional (X, Y, T, I) or (X, Y, Z, I) acquisition.

Multi-layer Document Structure
Each document (Image windows) is a three-tiered layer structure, and is therefore ideally suited for analysis. Multiple layer save is available with JPEG2000/ND2/LIM format.

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Selectable Layouts
NIS-Elements comes with the built-in layouts “Docked Controls” and “Full Screen.” Layouts of all windows and toolbars can be freely customized by the user and saved. Switching between layouts is achieved by a single mouse click.

Report Generator
Report Generator enables the user to create customized reports containing images, database descriptions, measured data, user texts, and graphics. PDF format files can be created directly from NIS-Elements.
Acquisition Color Setting
LUT
Color modification can be easily set with the LUT (look-up table). Indexed-color pixels are mapped into a selected set of true color values. The histogram, threshold, gamma parameter, and brightness of RGB components are adjustable. Modifications on live image processing can be easily accomplished on the GUI.

Parameters for Each Dimension
Z-series
Images with different Z axis distances can be captured once the motorized Z focus control is set. Two methods of capture in the Z axis—Absolute positioning and Relative positioning—are available. The Relative positioning method has Symmetric and Asymmetric variations.

Multichannel Fluorescence
Images using defined filters can be captured to view in various light wavelengths. In addition to predefined filter settings, customized filter settings can also be saved. Simply define the color of channels and optical configuration that is to be used for capturing the set of images.

Time Lapse
The sophisticated but user-friendly time lapse process enables the staggering of image capture simply by defining interval, duration, and frequency of capture.

Multipoint Experiments
With the motorized stage installed, it is possible to automatically capture images at multiple points in XYZ during the ND experiment.

Converting Images to ND Documents
A series of images from time lapse acquisition, or captured Z stack images, can be easily converted to ND2 format. The converted images can be viewed and processed using features of NIS-Elements multidimensional document.

View Synchronizer
View Synchronizer enables the comparing (run and view) of two or more N-Dimensional documents. It automatically synchronizes the views of all documents added.

View
ND Viewer (Multidimensional image display)
Easy-to-use parameters for multi-dimension image operation are located on the frame of the screen.

Process

RAM Capturing
RAM capturing enables the recording of sequences displaying very quick acquisitions lasting tens of milliseconds, by using a part of virtual memory to store temporary data of live images.
Image Processing Functions

Color Adjustment
contrast/background subtraction/component mix
NIS-Elements is suitable for hue adjustment, independently for each color, transforms color image to one of the RGB or HSI components.

Filters
smoothing/sharpening/edge detection
Filters are available from smoothing, sharpening, edge detection etc.

Morphology
open/close/erode/dilate
NIS-Elements offers a rich spectrum of mathematical morphology functions (close, erode, dilate, open, close, smooth), morphologic segmentation functions, linear morphology functions, fill functions (fill holes, close holes), skeleton functions (medial axis, skeletonize, pruning) and other functions (such as: binary invert, convex hull, contour, skeletonize, homotopic marking, zones of influence, etc.)

Merge Channels
The merge channels function enables the creation of one merged image from images captured with different optical filters or under different camera settings. It combines color planes, stored in separate files, into one RGB image.

Image Arithmetic
A+B/A-B/Max/Min
NIS-Elements performs arithmetic operations on color images.

Measurement Functions

Image Segmentation
Using the RGB or HSI color spaces, NIS-Elements can segment the image and create binary images. Using the binary image, Automatic Measurement records length, area, angle and colorimetry.

Automatic Measurement
Using binary objects, it can automatically measure sets of length, area, density and colorimetry parameters. About 30 different object features can be measured.

Interactive Measurement
The measurement is performed by, for example, directly drawing two parallel lines on the screen. Features are available from, taxonomy, counts, length, semiaxes, area, angle or profile—and all output statistics and histograms can be exported to MS Excel.

Profile
There are five possible interactive profile measurements: free line, two-point line, horizontal line, vertical line, and polyline.

Classifier
Classifier allows segmentation of the image pixels according to different user-defined classes, and is based on different pixel features such as intensity values, RGB values, HSI values, or RGB values ignoring intensity. The classifier enables data to be saved in separate files.

Time Measurement
Time measurement, records the average pixel intensities within defined probes during a time interval, can be performed on live camera signals.

Plug-in Modules

EDF (Extended Depth of Focus)
Extended Depth of Focus (EDF) is an additional software plug-in for NIS-Elements. Thanks to the EDF function, images that have been captured in a different Z-axis can be combined to create an all-in-focus image. Also, it is possible to create stereo vision image & 3D surface image for a virtual 3D image.

Deconvolution
Using the deconvolution module, haze and blur of the image can be reduced by a single click. Available in two- and three-dimensional image stacks.

Database
NIS-Elements has a powerful built-in image database support that enables the creation of an image database, including text, memo, number, and date values. The NIS-Elements image database tool will help to solve the image management problem. Filtering, sorting and multiple grouping are also available according to the database field given for each images.

Microscope Control
Nikon motorized microscope (Eclipse TE2000, Eclipse 90i) & motorized devices can be controlled through NIS-Elements. “NIS-Elements Microscope Control Pad” offers all necessary functions grouped in one window.

Large Image Stitching
The samples are scanned automatically using a motorized XY stage with auto-focus capability and captured images are stitched into one large image. Special algorithms ensure maximum accuracy, resulting in ultra high-resolution images.

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Original Contour Threshold Zones of Influence + Scale

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Focused image created from a sequence of Z-stack images

Before deconvolution
After deconvolution

Before deconvolution
After deconvolution

Real-time 2D deconvolution

Volume rendered image

Virtual 3D image
## Devices Corresponding to NIS-Elements

### Nikon Devices
- **Digital Sight**: DS-2M series, DS-5M series, DXM1200F
- **Microscope**: Eclipse TE2000E, Eclipse 90i, 90i Motorized ND Filter Unit, 90i Motorized XY Stage
- **Digital Imaging Heads**: DiH-M/E, LV100A Nosepiece Controller
- **Optional**: TE2000-FPS (Perfect Focus System), COOLSPECFE

### Other Devices
- **Camera**: Roper cameras, Hamamatsu ORCA series
- **Optional**: XY scanning stages (Prior and Marzhauser), Shutter (Uniblitz/Sutter Lambda 10-2), Remote 2-focus Accessory (Conix), Dual-view (Optical Insights), X-Cite 120 series (EXFO), Piezo Pi E-622

### Comparison Chart

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### Operating Environment

All PC environments should meet the following requirements:
- **CPU**: Pentium IV 3.2 GHz or higher
- **RAM**: 1GB or higher
- **OS**: Windows XP Professional SP2 English
- **Hard disk**: 600MB or more required for installation
- **Video**: 1280x1024 dots, True Color mode
- **User**: Administrator Authorized Users for installing, Administrator Authorized Users for operating

Please note that Nikon cannot guarantee operability of NIS-Elements software even when all of the above requirements are met.

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*Monitor images are simulated.*

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