



## IPSDK - Main image processing algorithms

Arithmetic image operations	Modules containing arithmetic operations on images, pixel by pixel	version
<b>Addition</b>	Addition of 2 images (or image and scalar)	0-1-0-1
<b>Abs</b>	Computation of the absolute value of an image, pixel by pixel algorithm	0-1-0-1
<b>Blending</b>	Blending of 2 images	0-1-0-1
<b>Bounding</b>	Algorithm allowing to bound image values to a given range algorithm	0-1-0-1
<b>Cartesian to polar</b>	cartesian to polar coordinates transformation	1-5-0-0
<b>Divide</b>	Division of 2 images	0-1-0-1
<b>Formula</b>	Generation of an image using a formula string	1-5-0-0
<b>L1Norm</b>	L1 norm of two or three images	0-1-0-1
<b>L2Norm</b>	L2 (euclidian) norm of two or three images	0-1-0-1
<b>LinearCombination</b>	Linear combination of 2 images	0-1-0-4
<b>MaxAbs</b>	Maximum of the absolute values of 2 images, pixel by pixel	0-1-0-1
<b>Maximum</b>	Maximum of 2 images, pixel by pixel algorithm	0-1-0-1
<b>Minimum</b>	Minimum of 2 images, pixel by pixel algorithm	0-1-0-1
<b>Multiplication</b>	Multiplication of 2 images (or image and scalar)	0-1-0-1
<b>MultiplyAddScalar</b>	Process an operation of type AX+B with X an input image	1-0-0-0
<b>Polar to Cartesian</b>	polar to cartesian coordinates transformation	1-5-0-0
<b>Rounding</b>	Round values of a floating point image algorithm	0-1-0-1
<b>Square root</b>	Computation of the square root of an image	0-1-0-1
<b>Square</b>	Computation of the square of an image	0-1-0-1
<b>Subtraction</b>	Subtraction of 2 images (or image and scalar)	0-1-0-1

  

Logical Image operations	Modules containing bitwise operations on images, pixel by pixel	version
<b>Bitwise and</b>	Bitwise and operation on 2 input images	0-1-0-1
<b>Bitwise nand</b>	Bitwise nand operation on 2 input images	0-1-0-1
<b>Bitwise nor</b>	Bitwise nand operation on 2 input images	0-1-0-1
<b>Bitwise not</b>	Bitwise not operation on one input image	0-1-0-1
<b>Bitwise nxor</b>	Bitwise nxor operation on 2 input images	0-1-0-1
<b>Bitwise or</b>	Bitwise or operation on 2 input images	0-1-0-1
<b>Bitwise exclusive or</b>	Bitwise exclusive or operation on 2 input images	0-1-0-1
<b>Logical not</b>	Logical not on binary images	0-1-0-5
<b>Mask filter (one input image)</b>	Mask filter, computing an output image for which each pixel equals to either corresponding pixel in input image or 0, depending on whether corresponding input mask image pixel equals 1 or 0 algorithm	0-1-0-1
<b>Mask filter (two input images)</b>	Mask filter, computing an output image for which each pixel equals to corresponding pixel in either first or second input image, depending on whether corresponding input mask image pixel equals 1 or 0 algorithm	0-1-0-1

  

Utility image processing algorithms	Modules containing binarization operations on images	version
<b>Image comparison</b>	Algorithm allowing to compare two images	0-1-0-1
<b>Image conversion</b>	Algorithm allowing to convert an image to a given type	0-1-0-1
<b>Image copy</b>	Algorithm allowing to copy an image	0-1-0-1
<b>Image erasing</b>	Algorithm allowing to erase values of an image	0-1-0-1
<b>Image uniform random initialization</b>	Algorithm filling an image with uniform random sampled values	0-1-0-1
<b>Image normal random initialization</b>	Algorithm filling an image with normal random sampled values	1-0-0-0
<b>Image sequences append</b>	Algorithm concatenating two images sequences	1-3-0-0
<b>ROI insertion</b>	Algorithm inserting a given ROI into an image	1-3-0-0
<b>ROI extraction</b>	Algorithm extracting a given ROI from an image	1-3-0-0
<b>Extract image values</b>	Extraction of values at specific coordinates into image	1-4-0-0

  

Color image operations	Utility image processing algorithm modules	version
<b>lightness</b>	Lightness computation for an input RGB color image	0-1-0-1
<b>RGB to YUV</b>	Convert a RGB color image to a YUV color image algorithm	0-1-0-1
<b>YUV to RGB</b>	Convert a YUV color image to a RGB color image algorithm	0-1-0-1

  

Binarization algorithms	Image binarization algorithm modules	version
<b>Simple Threshold</b>	Algorithm allowing to convert an image to a binary image using a range of greylevel	0-1-0-1
<b>TopHat</b>	TopHat binary threshold	0-1-0-3
<b>Adaptative Threshold 2d</b>	Binarize an input image according an adaptative threshold based on the pixel's neighbourhood	1-1-0-0
<b>Kapur Threshold</b>	Kapur binary threshold on one image	1-1-0-0
<b>Kittler Threshold</b>	Kittler binary threshold on one image	1-1-0-0
<b>IsoDataThreshold</b>	Isodata binary threshold on one image	1-6-0-0
<b>Hysteresis Threshold</b>	Hysteresis threshold on one image	1-6-0-0
<b>Adaptative Threshold 3d</b>	Binarize an input 3d image according an adaptative threshold based on the voxel's neighbourhood	1-6-0-0
<b>Otsu Threshold</b>	Algorithm allowing to convert an image to a binary image using a range automatically computed by the otsu method	0-1-0-1

  

Greyscale transform algorithms	Image greyscale transform algorithm modules	version
<b>Histogram equalization</b>	Computes an output image associated to histogram equalization of an input image	0-1-0-1
<b>Equalization LUT computation</b>	Computes look up table used to equalize an histogram	0-1-0-1
<b>LUT Transformation</b>	Application of a look-up table on an input image algorithm	0-1-0-1
<b>Normalization</b>	Normalizes the intensity of an image from an optional given input range to a given output range	0-1-0-1
<b>Smart paraboloid shading correction</b>	Corrects an input image for shading, and normalize output image so that it fits an expected dynamic range	1-4-0-0
<b>Smart Shading correction</b>	Corrects an input image for shading, and normalize output image so that it fits an expected dynamic range	0-1-0-2
<b>MatchHistogram</b>	Adjust an image histogram using a reference histogram (or image)	1-0-0-0
<b>MatchStats</b>	Adjust image statistics using reference statistics (or image)	1-0-0-0
<b>Inverting</b>	Algorithm allowing to invert 2d or 3d image intensity	1-2-0-0
<b>Paraboloid shading correction</b>	Computes a shading-corrected image, taking a paraboloid as the white image	1-4-0-0
<b>Shading correction</b>	Computes a shading-corrected image	0-1-0-2
<b>Forward Discrete Fourier Transform</b>	forward Discrete Fourier Transform for an input image	1-5-0-0
<b>Backward Discrete Fourier Transform</b>	backward Discrete Fourier Transform for an input image	1-5-0-0
<b>Color mapping</b>	Generates an output color image by applying a color map on a grey level input image	1-6-0-0
<b>Image standardization</b>	Standardizes an image	1-5-0-0

  

Morphological algorithms	version	
<b>Erosion</b>	Generic algorithm for image erosion	0-1-0-3
<b>Boundary</b>	Algorithm allowing to extract boundary of a binary image	0-1-0-1
<b>RemoveBorder</b>	Removal of connected components in contact with image borders in binary images	1-1-0-0
<b>FillHole</b>	hole filling algorithm for binary images	1-1-0-0
<b>Closing</b>	Algorithm for image closing	0-1-0-3
<b>Opening</b>	Algorithm for image opening	0-1-0-3
<b>Morphological Gradient</b>	Gradient computation on an image using morphological operations	0-1-0-3
<b>Dilatation</b>	Generic algorithm for image dilatation	0-1-0-3
<b>Distance map</b>	Exact distance map transform of binary image	0-1-0-4
<b>ConnectedComponent</b>	Connected component image labeling algorithm	0-1-0-5
<b>BinaryReconstruction</b>	Binary reconstruction of an input image with a marker image	0-1-0-5
<b>GreyReconstruction</b>	Grey reconstruction of an input image with a marker image	1-2-0-0
<b>Generic Seeded Distance Map</b>	generic version of seeded distance map algorithm	1-1-0-0

<b>Seeded Distance Map</b>	automatic version of seeded distance map algorithm	1-1-0-0
<b>LocalExtrema</b>	extraction of local extrema from an image	1-2-0-0
<b>DilateLocalExtrema</b>	extraction of dilated local extrema from an image	1-2-0-0
<b>RemoveSmallShape</b>	removal of small connected component in binary or label 2d/3d image	1-1-0-0
<b>KeepBigShape</b>	keep only the big connected components in binary or label 2d image	<b>1-6-0-0</b>
<b>SeededWatershed</b>	seeded watershed algorithm	1-2-0-0
<b>WatersheBinarySeparation</b>	Binary separation algorithm based on watershed transformation	1-2-0-0
<b>WatersheGreySeparation</b>	Greyscale separation algorithm based on watershed transformation	1-2-0-0
<b>MaxPropagation</b>	Propagation of maxima	0-1-0-5
<b>MinPropagation</b>	Propagation of minima	0-1-0-5

<b>Filtering algorithms</b>		
<b>high-pass filter</b>	high-pass filter algorithm	0-1-0-4
<b>mean filter</b>	Smooth an input image computing local mean of pixels	0-1-0-1
<b>gaussian filter</b>	Smooth an input image convolving it with a Gaussian kernel	0-1-0-1
<b>gaussian gradient</b>	Compute gradients of an input image convolving it with Gaussian kernels	0-1-0-1
<b>convolution</b>	Compute convolution of an input image with a kernel	0-1-0-1
<b>anisotropic Diffusion</b>	Anisotropic diffusion smoothing filter algorithm for 2d/3d images	1-3-0-0
<b>median</b>	Median filter algorithm	0-1-0-4
<b>unsharp mask</b>	Unsharp mask image filter algorithm	0-1-0-4
<b>Bilateral smoothing</b>	Bilateral filter algorithm	0-1-0-4
<b>Separated Bilateral smoothing</b>	Fast approximated version of bilateral filter algorithm	1-0-0-0
<b>LaplacianDog</b>	Laplacian difference of gaussian approximation	0-1-0-4
<b>Laplacian DoG deblur</b>	2d image deblur algorithm using Laplacian kernels based on a difference of Gaussian approximation	1-0-0-0
<b>Patch-based bilateral smoothing</b>	Denoises image using patch-based bilateral filter algorithm	1-4-0-0
<b>Pearson colocalization mapping</b>	builds the Pearson's colocalization map computing the Pearson correlation coefficient on each pixel	<b>1-6-0-0</b>
<b>Richardson-Lucy deblur</b>	2d image deblur algorithm using Laplacian kernels based on the Richardson-Lucy algorithm	1-0-0-0
<b>Normalized Cross-Correlation</b>	Computes the Normalized Cross Correlation between an image and a kernel	1-0-0-0
<b>Despeckle Filtering</b>	Smooths the input image replacing aberrant values by the neighbourhood's mean intensity	1-5-0-0
<b>Band-pass frequency filtering</b>	Filters an image in Fourier domain by selecting a frequency range	<b>1-6-0-0</b>
<b>Sobel gradient</b>	Compute gradients of an input image using a Sobel kernel	1-4-0-0

<b>Statistic algorithms</b>		
<b>kurtosis</b>	Local image kurtosis computation	0-1-0-3
<b>skewness</b>	Local image skewness computation	0-1-0-3
<b>variance</b>	Local image variance computation	0-1-0-3
<b>local entropy</b>	local entropy	0-1-0-4
<b>local energy</b>	local energy	1-5-0-0
<b>local histogram module</b>	local histogram module	1-5-0-0
<b>Law's texture energy measures</b>	Law's texture energy measures	1-5-0-0

<b>Global measures</b>		
<b>histogram</b>	Computes the histogram of an image	0-1-0-1
<b>Masked histogram</b>	Computes the histogram of the portion of an image (portion is defined by a mask image)	1-5-0-0
<b>XProjection</b>	Statistical information on x image data projection	1-0-0-0
<b>YProjection</b>	Statistical information on y image data projection	1-0-0-0
<b>Seq Projection</b>	measure of common statistics indicators in the image sequence	1-0-0-0
<b>Similarity Measurement</b>	Similarity measurement on a image (PSNR, SSD)	1-0-0-0
<b>Gaussian Noise Measurement</b>	Gaussian noise measurement on an image	1-0-0-0
<b>ParaboloidImgFit2d</b>	Fitting of a paraboloid with a 2d image seen as a 3d surface (with the pixel intensities as the heights)	1-4-0-0
<b>Pearson Correlation Coefficient</b>	computes the Pearson correlation coefficient in the image	<b>1-6-0-0</b>
<b>Statistics (Min, max, mean stddev)</b>	Measure of common statistics indicators in the image (mean, max, etc.) algorithm	0-1-0-1
<b>Masked statistics (Min, max, mean stddev)</b>	Masked version of measure of common statistics indicators in the image (mean, max, etc.) algorithm	1-0-0-0
<b>Kernel density estimation</b>	algorithm allowing to estimate probability density function of an image	1-5-0-0

<b>Feature detection</b>		
<b>Canny edges 2D detector</b>	Extracts edges in a 2D image	1-4-0-0
<b>Canny surfaces 3D detector</b>	Extracts surfaces in a 3D image	1-4-0-0
<b>Local Extrema Extraction</b>	Finds the local extrema in an image	1-0-0-0
<b>Harris Corners</b>	Extracts the corners in an image	1-4-0-0
<b>Hough Circles</b>	Detects circles in image using Hough algorithm	1-0-0-0

<b>Shape Analysis</b>		
<b>Shape Analysis 2d</b>	Shape 2d analysis and measurement algorithm	1-0-0-0
<b>Shape Analysis 3d</b>	Shape 3d analysis and measurement algorithm	1-2-0-0
<b>Shape Filtering 2d</b>	Shape 2d filtering algorithm	1-0-0-0
<b>Shape Filtering 3d</b>	Shape 3d filtering algorithm	1-2-0-0

<b>Shape Segmentation</b>		
<b>Label Shape Extraction 2d</b>	Shape extraction from label 2d image	1-0-0-0
<b>Label Shape Extraction 3d</b>	Shape extraction from label 3d image	1-2-0-0
<b>Shape to Label image 2d</b>	Creation of a label 2d image from a collection of shape	1-4-0-0
<b>Shape to Label image 3d</b>	Creation of a label 3d image from a collection of shape	1-4-0-0

<b>Registration</b>		
<b>Extract grey signed features</b>	Extraction of grey signed features from image	1-4-0-0
<b>Registration from grey signed features</b>	Compute motion transform linking two sets of grey signed features	1-4-0-0
<b>Image grey signed features registration</b>	Computation of motion transform linking two images based on a grey signed features algorithm	1-4-0-0
<b>Tracking step</b>	Tracking stage for intensity based registration 2d algorithm	1-5-0-0
<b>Training step</b>	Training stage for intensity based registration 2d algorithm	1-5-0-0
<b>Registration tracker</b>	Intensity based 2d registration tracker	1-5-0-0

<b>Classification</b>		
<b>PCA image reduction</b>	reduces temporal dimensionality of an image using PCA	<b>1-6-0-0</b>
<b>K-Means</b>	classifies an image using k-means algorithm	1-5-0-0

<b>Geometric transformation</b>		
<b>Image zoom</b>	Algorithm resizing an image using a given interpolation method	1-3-0-0
<b>Image regular resampling along z-axis</b>	Algorithm resampling along z-axis a 3d image with regularly spaced z-plans	1-5-0-0
<b>Image custom resampling along z-axis</b>	Algorithm resampling along z-axis a 3d image with unregularly spaced z-plans	1-5-0-0
<b>Image flipping</b>	Algorithm flipping input image along one of its axis	1-5-0-0
<b>Image cylinder unrolling</b>	Algorithm unfolding a cylinder contained in a 3D input image into a 2D output image	1-5-0-0
<b>Image ring unrolling</b>	Algorithm allowing ring surface unrolling	<b>1-6-0-0</b>
<b>Image warping</b>	Algorithm allowing to apply a motion transformation warping operation on an image	<b>1-6-0-0</b>