# IPSDK Introduction

Complete and optimized library dedicated to image processing

Available in C ++ and Python, **IPSDK** offers a full range of image processing features that are essential for leveraging your data. **IPSDK** proposes you to use the full power of your workstation by increasing your applications speed (up to 10x compared to other image processing softwares).

User-friendly and OpenSource Python Graphical User interface

All IPSDK features can also be used through an interactive and user-friendly GUI : **IPSDK Explorer**.
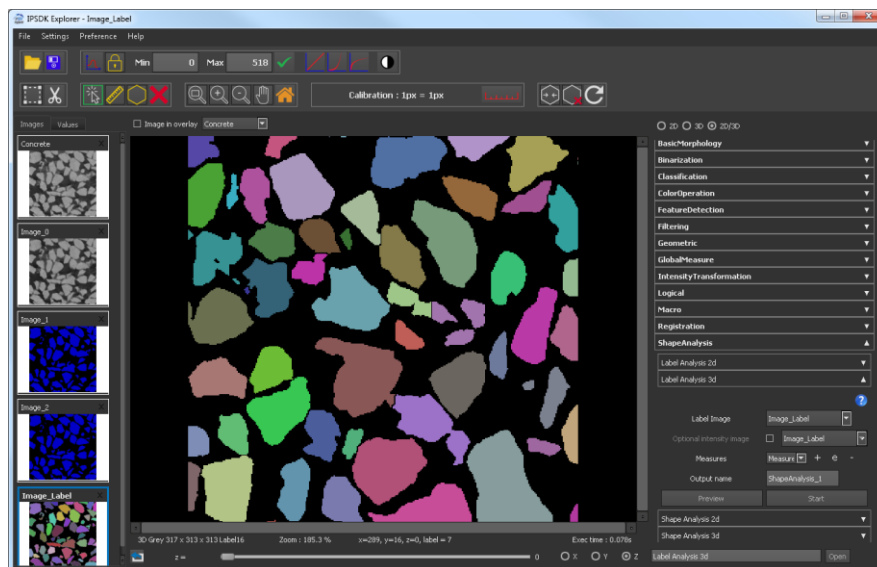
IPSDK Explorer offers the following features:

- Instant visualization of each treatment results,
- Ability to fine-tune each treatment,
- Direct access to the documentation,
- Automatic Python scripts generation,
- Manual retouching,
- All functions available in 2D and 3D.

Exhaustive documentation

IPSDK offers an exhaustive and rigorous documentation of all image processing functions. In addition, all the commands are accompanied by a visual to understand the function interest and an example in Python and C ++ usage.

Technical support and training sessions

Reactiv'IP, human-size company, supports you effectively in your daily use of IPSDK, including technical support to solve to your issues and training sessions tailored to your needs.

Example of use

IPSDK development kit allows you to go further in 3D volumes exploitation. The most common use case is related to segment objects present in images. Indeed, it is essential to separate these objects to be able to compute a grain size. Due to the huge size of nowadays images, it is not reasonably possible anymore to manually perform these separations.
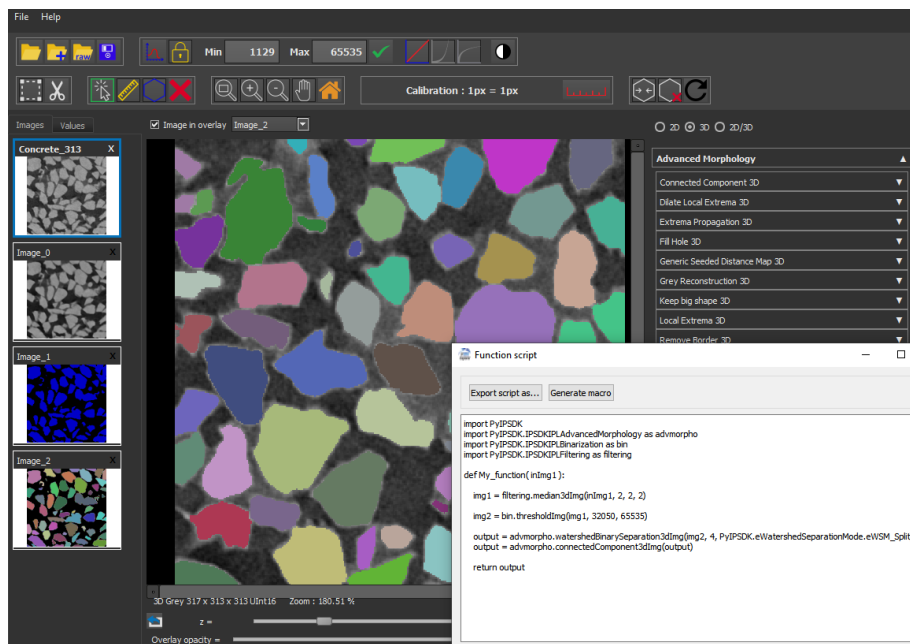

Figure 1: 3D grain segmentation example (Slice view) with automatic segmentation Python script generation prompted in its window.

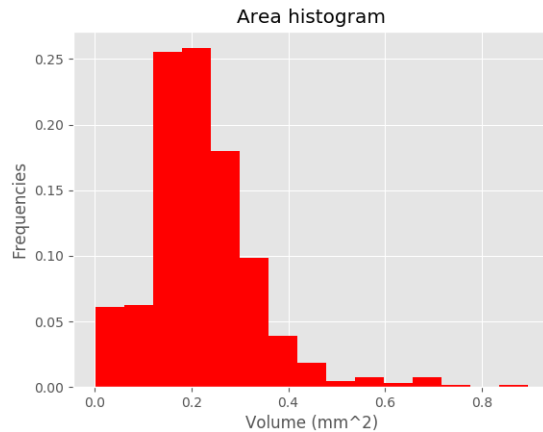**Figure 2: Individual measurements computed for each grain.**

Figure 3: Grain histogram based on equivalent diameters.

List of available processing features

Here is a non-exhaustive list of available features:

- Image edition: Creatio, conversion, random image, crop, ...
- Binarization: Manual, automatic (otsu, kapur, iso, ...), tophat,
- Arithmetic: Addition, subtraction, standardization, background correction, ...
- Equalization of histograms,
- Logical operations: OR, AND, NOT, ...
- Image stack combination: Min, max, mean, stddev, max gradient,...
- Morphology: Erosion, dilation, opening, closing, reconstruction, filling holes, removing objects at the edge, ...
- Global statistical measurement: Entropy, variance, tortuosity, inertia,...
- Morphological filtering,
- Exact distance map, labeling,
- Separation (watershed),
- Linear filters: medium, Gaussian, Gaussian gradient, convolution with any type of kernel,
- Adaptive filters: Bilateral, unsharp mask, ...
- Non-linear filters: Median, delieneate, deblur, anisotropy diffusion, Non local Means, bilateral,
- Fourier's Transformed,
- Filtering periodic noises,
- Border detection: Gradient, Laplacian, isosurface, ...
- Extracting polygonal contours for 2D objects,
- Extracting mesh-type contours for 3D objects,
- Correlation, transformed from Hough, ...
- Classification: K-means, Masked K-means, Karhunen Loeve,...
- Registration, extraction of point of interest, similarity, homography, ...
- Individual analysis (object by object)
    - Volume, surface, Feret diameters, length, thickness,

- o Moments of inertia,
- o Encompassing rectangle (oriented or not),
- o Contact surface, distance to nearest neighbor, ...
- o Orientation
- o Measure of form, sphericity, eccentricity, convex hull, ...
- o Intensity measurements: min, max, average, standard deviation, ...
- o Filtering from mathematical formulas on these measurements,
- o Histogram.

IPSDK: a very fast image processing product

The implementation **IPSDK** features is compliant to state of the art. All functions are parallelized to make the best use of all the cores of workstations. On the other hand, **IPSDK** automatically adapts itself to your processors architecture and capabilities. As a result, **IPSDK** supports SSE2, AVX, AVX2 and even AVX512 accelerators (if available).

IPSDK reduces significantly computational time : some treatments will take down to few minutes when it could take several hours with other software in the market.

Hereafter is a comparative graph of processing times for a median filter used on a 512x512x512 image coded on 8 bits. In X-axis, the evolution of the kernel size and in Y-axis, processing time. This graph highlights the significant **IPSDK** time saving performances compared to other software.
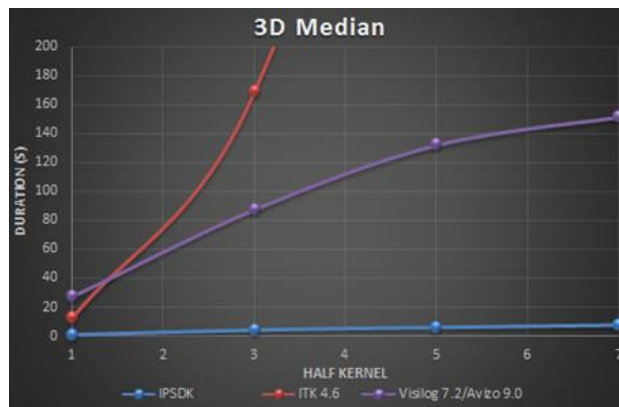

Figure 4: Comparison of computational time for a median filter between IPSDK and other software offering this feature.

Add-on for 3D visualization

IPSDK Explorer offers an optional, powerful 3D visualization tool. The proposed visualization quality allows to highlight all the optimized treatments of **IPSDK**. This module also offers the possibility of making presentation video clips by organizing the different obtained volumes through processes in a scenario.
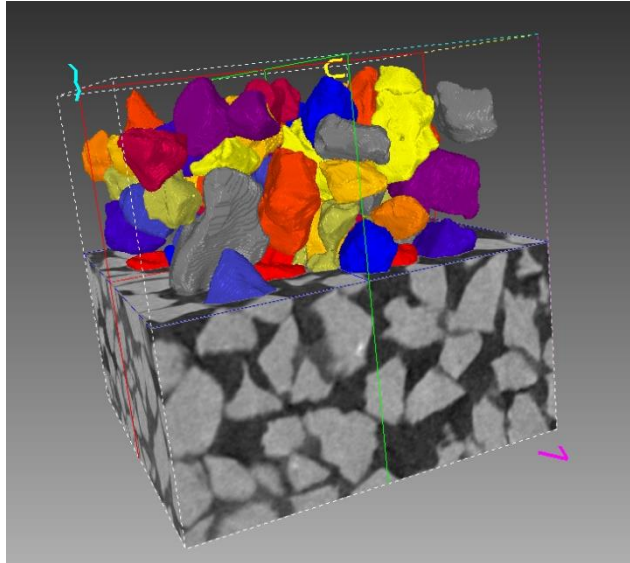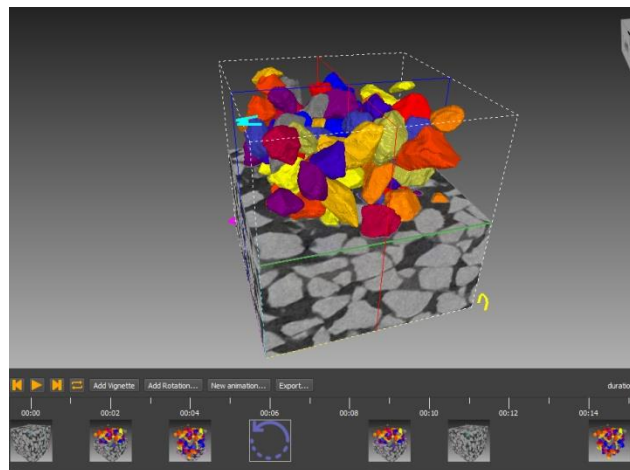
Figure 5: 3D visualization example

Figure 6: Video maker tool

The video clip is available using
http://www.reactivip.com/download/videos/video_grains.mp4

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