



Image analysis  
Laboratory exercise manual

**Application of Vision Assistant for  
metallographic analysis.**

*Roland Pawliczek, PhD.*

---

Opole 2019

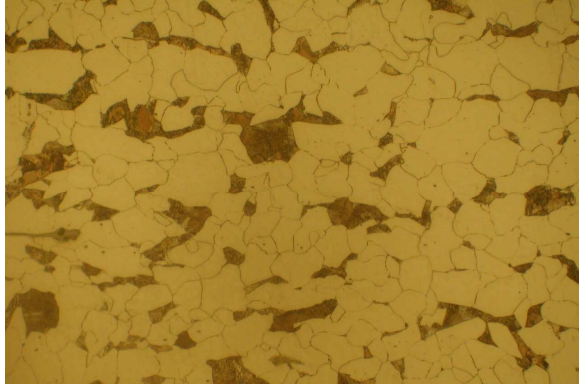
*Publication on the manuscript rights*

### 1. The purpose of the exercise

The aim of the exercise is to analyze the percentage of crystal phase of metallographic specimen using Vision Assistant.

### 2. Preliminary information.

The subject of the analysis is the metallographic photo of steel shown below. The photo shows bright ferrite grains and dark pearlite grains. The picture was taken using a digital camera coupled with a metallographic microscope.



### 3. The course of the exercise.

One should create a script that will allow to analyze the percentage of pearlite grains in the area of the analyzed image. It is necessary to separate the seeds.

#### 3.1 Loading the image

From the Processing Function: Image palette, select the Get Image function.

In the configuration window of the function, locate the file metal.jpg. Confirm the selection.

#### 3.2. Extracting a grayscale image

From the Processing Function: Color palette, select the Color Plane Extraction function. The function enables the extraction of certain features defining color, saturation, intensity, depending on the adopted color recording format.



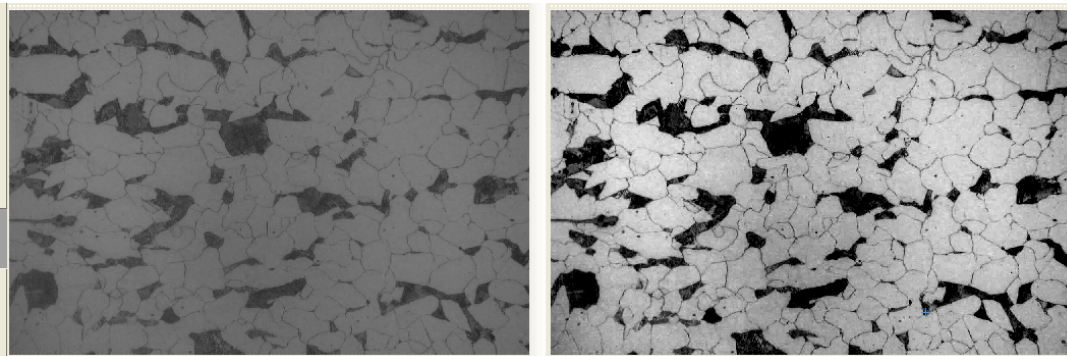
**Color Plane Extraction:** Extracts the three color planes (RGB, HSV, or HSL) from an image.

In the configuration window, select the HSI Intensity Plane option.

Confirm the selection with the OK button. The result will be a grayscale image. The level of gray corresponds to the intensity of the color.

#### 3.3. Correction of brightness and contrast

From the Processing Function: Image palette, select the Brightness function. In the configuration window, lighten and sharpen the image:



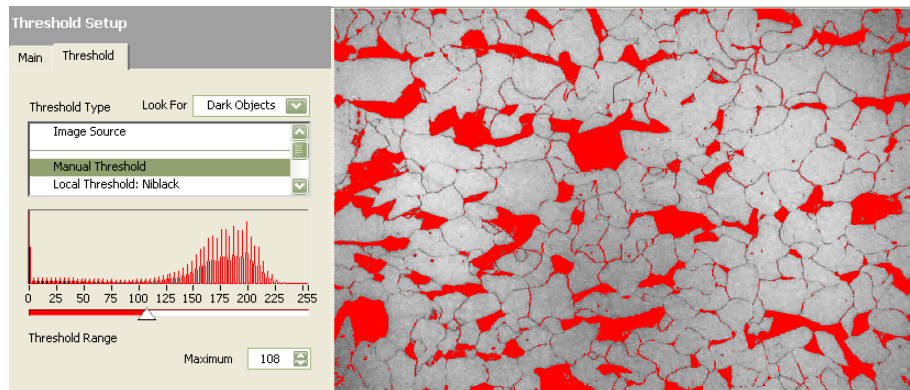
### 3.4 Detecting objects for analysis

From the Processing Function: Grayscale palette, select the Threshold function.



**Threshold:** Selects ranges of pixel values in grayscale images.

In the configuration window, select the Manual Threshold option and specify the level of intensity to distinguish perlite grains.



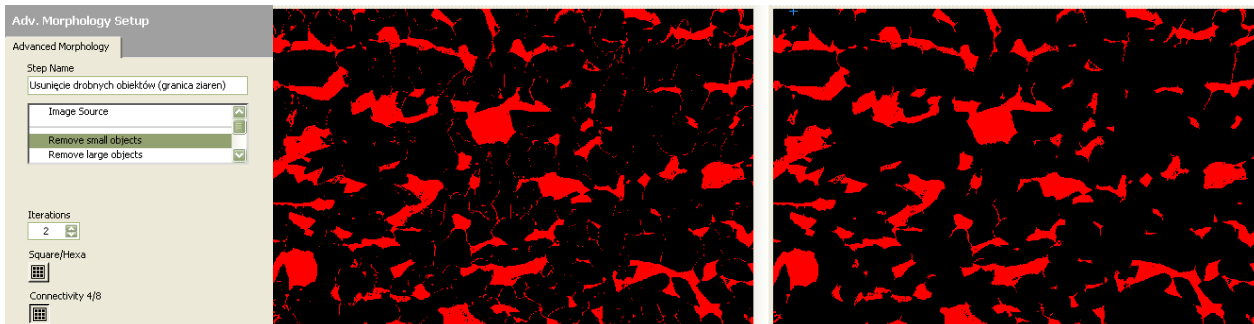
### 3.5. Removing small elements, e.g. grain boundaries

From the Processing Function: Binary palette, select the Adv function. Morphology.



**Adv. Morphology:** Performs high-level operations on blobs in binary images.

In the configuration window, set the Remove Small Object, and by using the number of iterations, you can increase the precision of the removed items.



### 3.6. Filling the areas, replenishing the grain losses.

From the Processing Function: Binary palette, select the Adv function. Morphology.



**Adv. Morphology:** Performs high-level operations on blobs in binary images.

In the configuration window, set Fill Holes, some grains in which holes appeared due to the errors of sharpness and contrast - they will be filled.

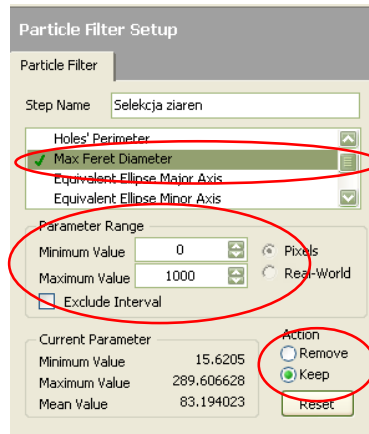
### 3.7 Additional corrections highlighted elements

From the Processing Function: Binary palette, select the Particle Filter function.



Particle Filter: Removes or keeps particles in an image as specified by the filter criteria.

In the configuration window it is possible to define various parameters that allow you to filter and leave (Keep) or delete (Remove) grains that meet the given criterion. It can be, for example, the grain size (Max Feret Diameter).



### 3.8 Determining the percentage share

From the Processing Function: Binary palette, select the Particle Analysis function.



Particle Analysis: Displays measurement results for selected particle measurements performed on the image.

By using the Select Measurements key, a number of parameters are available that can be determined for selected areas. Elements are treated as figures with a specific surface and shape. It is thus possible to determine e.g. the center of mass of such a figure. The percentage specifies the %Area / Image Area parameter.

At the bottom, a table will appear with information on the percentage of each grain separately. By indicating the grain in the figure, the result of the analysis for this grain is highlighted or the position in the table is identified by the green frame.

Results ...	28	29	30	31
% Area/Image Area	0.62927	0.05098	0.12873	0.

**4. Task to do.**

Specify the percentage of grain area for which the *Max Feret Diameter* parameter is greater than 100, relative to the image area:

- Activate the *Particle Filter* function and set the *Max Feret Diameter* Minimum Value = 100 and Maximum Value = 500. Confirm operation with OK button.
- Activate the Particle Analysis function. Using the Select Measurement button set the % Area / Image Area option. The result table will show the results of measurements for each highlighted grain separately. To determine the proportion of all grains, you must sum up the results.
- Use *Save Results* button to save results in text file (e.g. results.txt).
- Use *Spreadsheet type* program to sum (e.g. Gnumeric Spreadsheet, other online www)