SOFTWARE FOR THE SEGMENTATION AND CHARACTERIZATION OF IMAGES OF CELLS TAKEN BY MICROSCOPE

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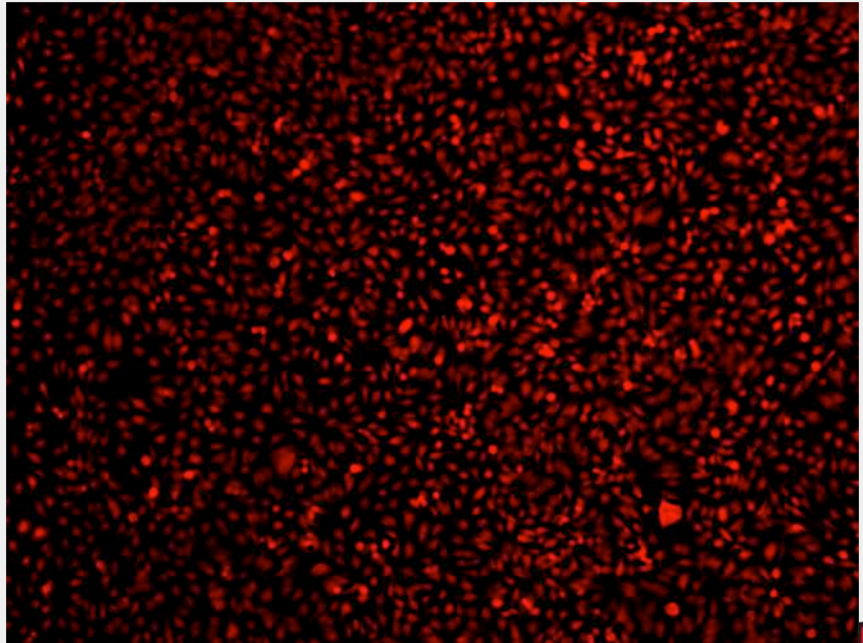
PROBLEM DESCRIPTION

The shortage of relevant information for a study on a sample of cells that is fast and accurate.

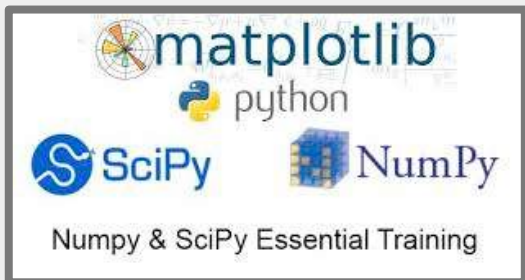Slow and manual processes that can generate a wide error margin.

METHODOLOGY

Basic concepts

Some basic concepts before we start:

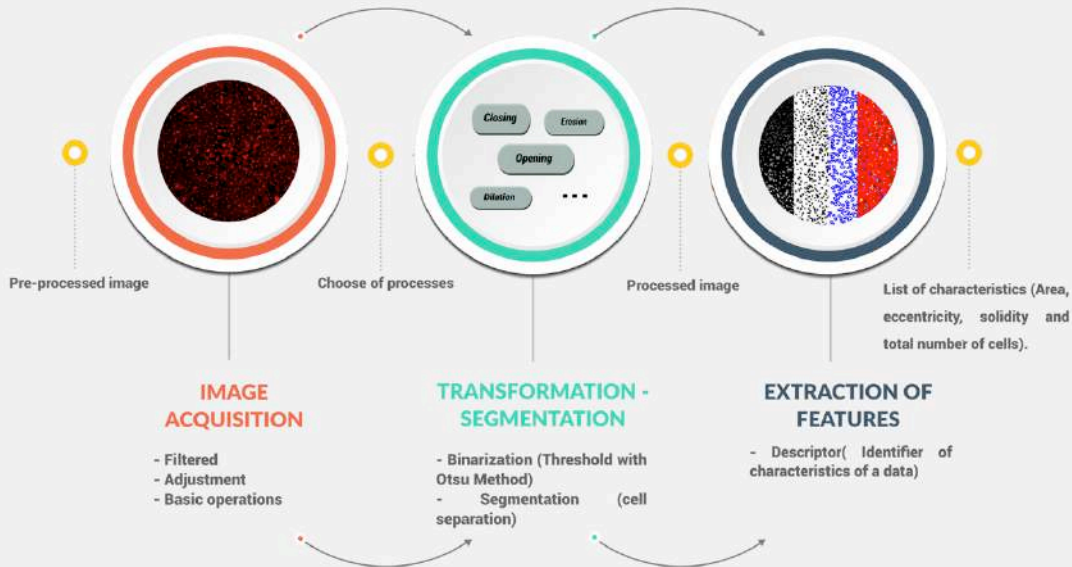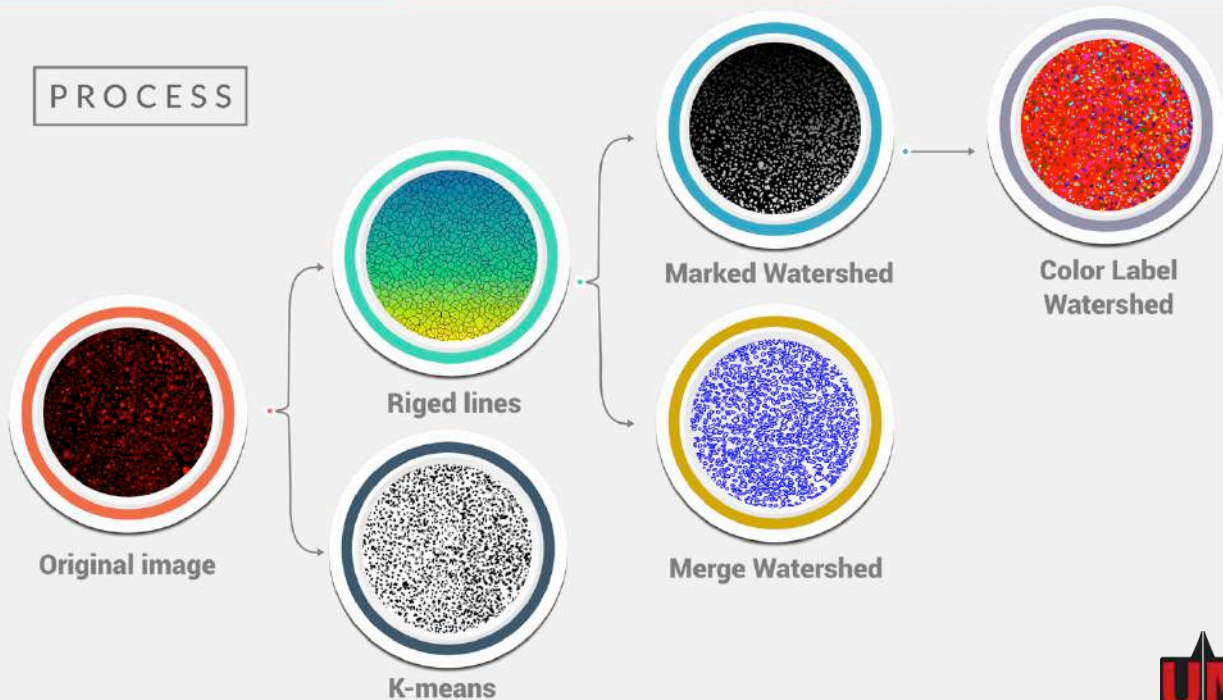- Erosion
- Dilation
- Opening
- Closing

Libraries

scikit-image
image processing in python

matplotlib
python

SciPy   NumPy

Numpy & SciPy Essential Training

OpenCV

Mahotas

SCHEME OF MODULES

IMAGE ACQUISITION

Pre-processed image

- Filtered
- Adjustment
- Basic operations

TRANSFORMATION - SEGMENTATION

Choose of processes

Processed image

Closing Erosion

Opening

Dilation ...

- Binarization (Threshold with Otsu Method)
- Segmentation (cell separation)

EXTRACTION OF FEATURES

List of characteristics (Area, eccentricity, solidity and total number of cells).

- Descriptor(Identifier of characteristics of a data)

PROCESS

Original image

Riged lines

K-means

Marked Watershed

Merge Watershed

Color Label Watershed

RESULTS

Watershed by controlled markers.

Watershed by markers is one of the oldest and most important segmentation algorithms in digital image processing, for this reason as well as precision it was analyzed the execution time and found that this project despite being the slowest of the three evaluated has a better precision than CellProfiler and only two percent less than MATLAB.

	Precision (%)	Execution time (seg)
MATLAB	93.12	3.5
CellProfiler	90.53	3.9
This project	91.02	4.12

Merge watershed

This algorithm was proposed by Ph.D candidate Margarita Gamarra, for this reason the tests were only made between MATLAB and the implementation made in this project.

	Precision (%)
MATLAB	94.26
This project	93.02

K-means

K-means being a heuristic algorithm that works initializing centroids in a random way and using the Euclidean distance metric in the entire sample tends to give a different result every time its executed, as a result accuracy is affected negatively, but even so the algorithm implemented in this project shows a result very close to the one implemented in MatLab.

	Precision (%)
MATLAB	90.2
This project	89

DEMO TIME

FUTURE WORK

As work to future analysis of the information modules can be deployed based on the proposed project; an example would be the analysis of the characteristics of cells in order to determine which ones present some specific pathogen. In addition, there is the possibility of improving the percentage of effectiveness of the process implemented through certain automated process on the image.

Acknowledgement

print("THANKS")

REFERENCIAS

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¿PREGUNTAS?

QUESTIONS?