

# DIGITAL IMAGE PROCESSING TECHNIQUES IN MEDICAL IMAGING

Cătălin A. PARASCHIV, Florentina A. PINTEA

Computers Science and Applied Computers Science Faculty, "Tibiscus" University of Timișoara

## INTRODUCTION

The digital image is a numeric replica of its optical counterpart. The process of capturing the image is quite laborious, with millions of optical sensors converting light into electrical impulses, which are further converted into bits. All this plus the optics of the camera lead to image distortions, and the introduction of artifacts such as digital noise. To fix these issues the images are modified in diverse ways, getting them ready for further image processing techniques.

In this paper we will present a few techniques for processing medical digital images using an open sourced software program for processing and analyzing images – *ImageJ*.

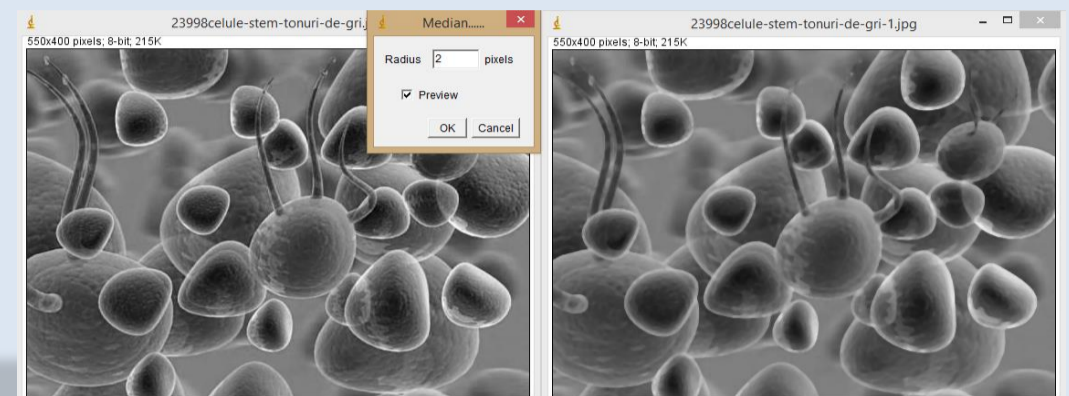
## IMAGE PROCESSING OPERATION

- Making a greyscale image, - Adjusting the tonal distribution,
- Image Histogram, - Image filtering, - Morphologic operations,
- Image segmentation, - Statistic measurements

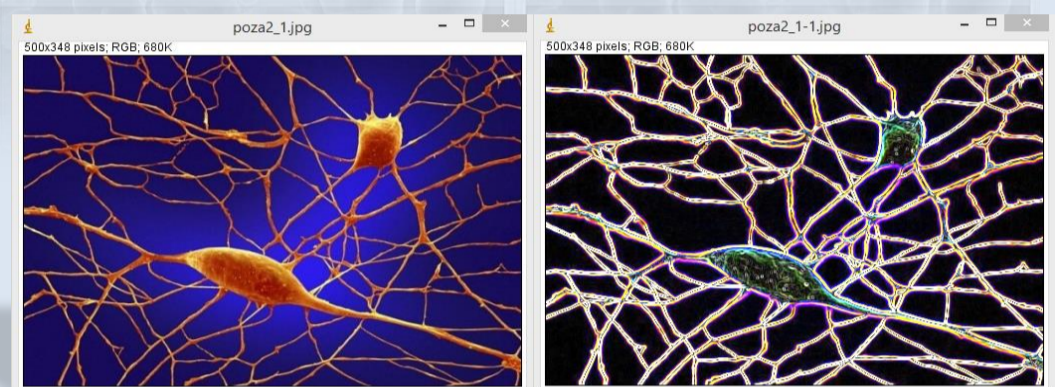
## IMAGEJ

ImageJ is an open sourced image processing program, developed in Java by the National Institute of Health [SCH12]. ImageJ was conceived as open sourced software, thus offering numerous ways of extending its functionality using Java plugins and registered macros [GIR04].

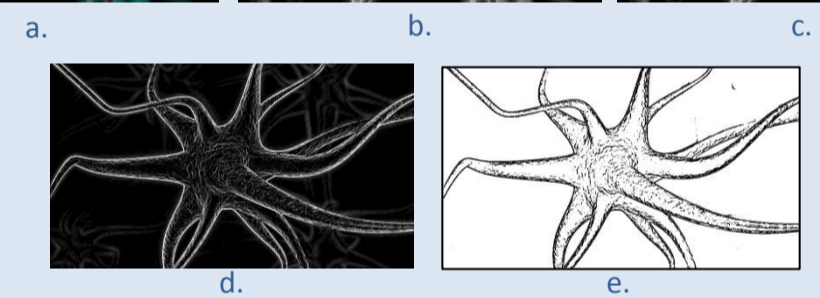
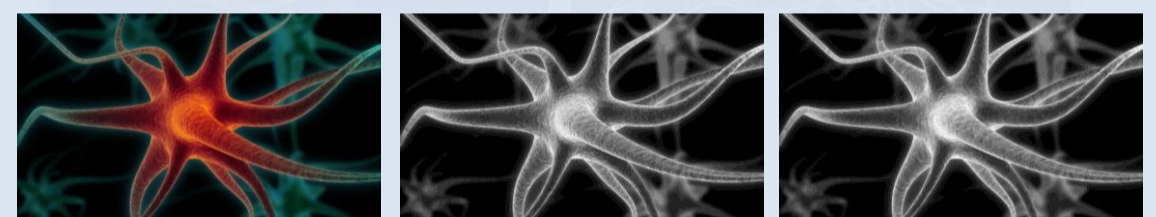
ImageJ can be used online in the form of an applet, or as a standalone application, only requiring that a Java virtual machine version 5 or later to be installed on the computer.



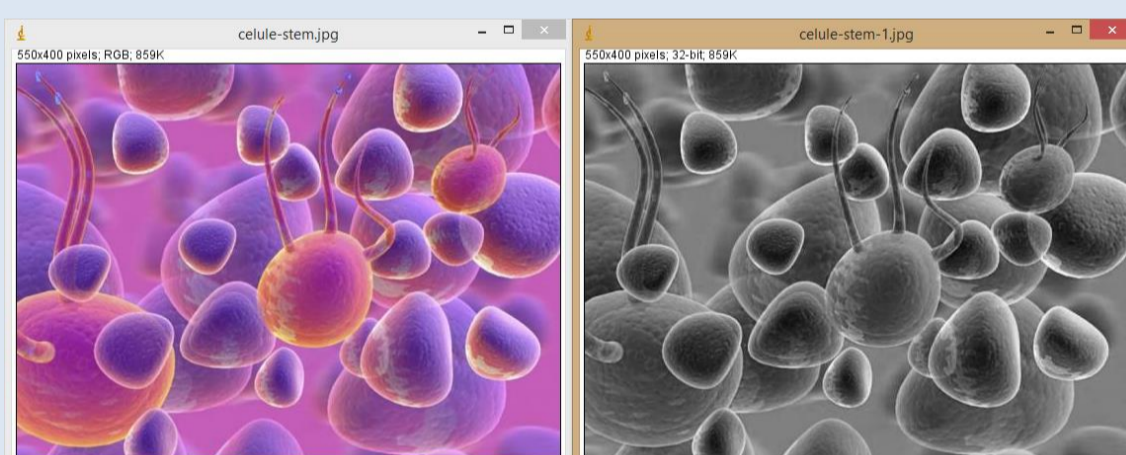
Applying a median filter with a radius of 2px



Finding contours in a color image



a. Original Image, b. Greyscale, c. Morphologic closing, d. Finding contour, e. Binarization



Transforming a color image into greyscale

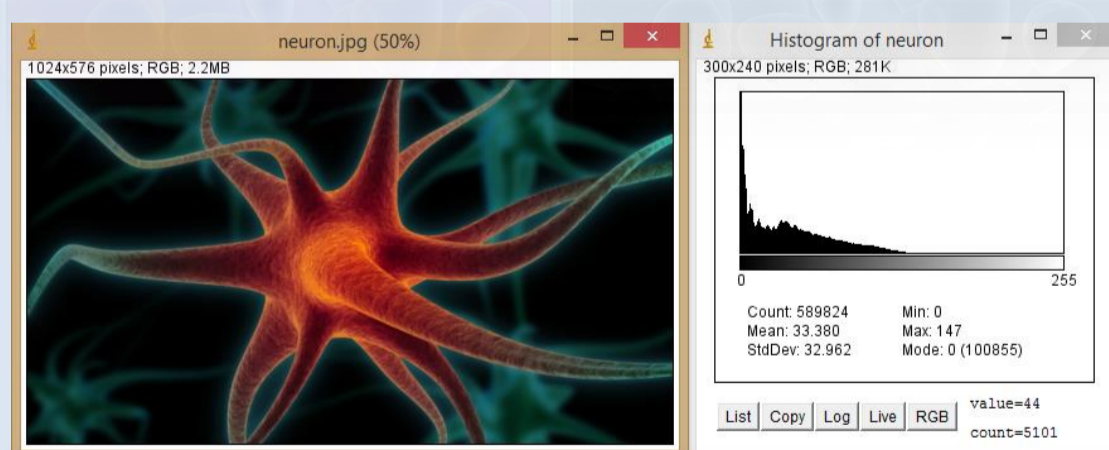
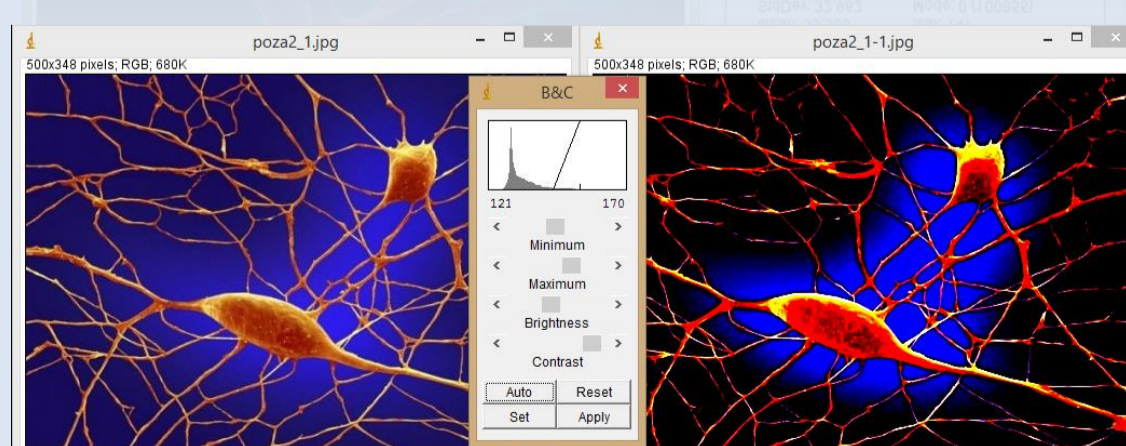


Image Histogram



Adjusting the tonal distribution

## CONCLUSIONS

ImageJ is a tool used with success both in the academic and research spheres, for processing (the segmentation and the binarization) biological as well as medical images.

ImageJ has a unique position, not only because it is public domain (the source code is available for anyone and it is free), but it can also run on any operating system.

What makes it attractive is its ease of use, it can perform a complete set of image processing operations and it has a large community of users. Thus it can be easily used in schools, high schools, universities, with very little financial cost.

The evolution of program development will be a very interesting experience and full of satisfaction for both users and developers.

## REFERENCES

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