MSc Project in Applied Mathematics

Automated analysis of microscopic images of cellular tissues

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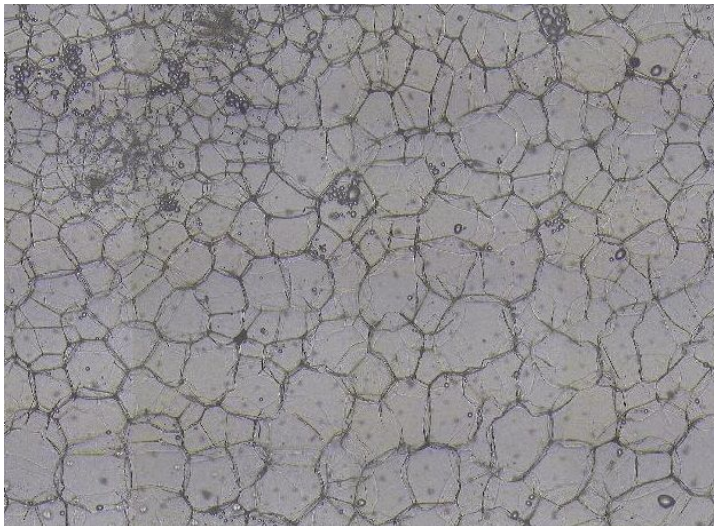

At some stage during the analysis of potato plants a visual inspection of microscopic images of cellular tissues is performed with the goal to determine the distribution of cells' parameters. This is a very time consuming task and the HZPC company is seeking an algorithm to automate this work. Due to the presence of many broken cells and other image-contaminating factors, standard image processing tools, e.g., boundary detection, fail to produce desirable results. Two-dimensional Fourier transform, although provides an indication of the average cell size, does not give the finer details of the distribution.

The challenge of this Master Project is to find a suitable method that would automatically deduce the distribution of geometrical parameters of cells from a given microscopic image. The method may include an initial preprocessing stage, a dedicated cell-detection algorithm, or a global technique such as the Fourier transform. The goal is to recover as many geometrical cell characteristics as possible, e.g., cell area, orientation, sphericity/eccentricity, etc., with their distributions presented in the form of histograms.

Microscopic tissue images will be provided by the HZPC company. This work is subject to confidentiality/nondisclosure agreement between HZPC and TU Delft.

Recommended literature:

[1] P.J.W. Iles, Average Cell Orientation, Eccentricity and Size Estimated from Tissue Images, MSc Thesis, University of Waterloo, Ontario, Canada, 2005
[2] F. Xing and L. Yang, Robust Nucleus/Cell Detection and Segmentation in Digital Pathology and Microscopy Images: A Comprehensive Review, IEEE Rev Biomed Eng. 9: 234-263, 2016.