

## Algorithm for Visual Fiber Detection from Composite Cross–Section

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This work is focused on analyzing fiber distribution in composite material cross–section. First, an application for obtaining the so-called ground truth data is proposed in Python with the use of OpenCV, Open source computer vision [1]. The application enables the user to see a digital photograph of composite cross–section obtained using Scanning Electron Microscopy (SEM) in different modes and to determine the fiber circular area by defining three bounding points at minimum. The fiber center position and radius is calculated by least square method.

Second, an algorithm for automatic fiber detection is proposed using OpenCV and Python. The image of composite cross–section is subjected to image preprocessing, binarization and segmentation as well as many other digital image processing methods [2].

Results of the application for ground truth data and of the algorithm for fiber detection are compared by histograms depicting the fiber radii distribution. These results are required for modelling unidirectional long-fiber composite materials on microscopic scale and determining material properties of substituents of unit cell representing the representative volume of the material [3].

1. OpenCV-Python Tutorials, <http://opencv-python-tutroals.readthedocs.io/en/latest/index.html>. **2013**
2. Železný M. Digital Image Processing (in Czech), *Lectures*, Department of Cybernetics, Faculty of Applied Sciences, University of West Bohemia.
3. Srbová, H., Kroupa, T., Zemčík, R.: Identification of the initial failure and damage of substituents of a unidirectional fiber-reinforced composite using a micromodel. **2014**, *Materials and Technology*, 48 (4), pp. 549-553., ISSN 1580-2949.