

# Dissertation Abstract

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„Improvement of the effectiveness of the early image processing methods used in automatic alphanumeric character recognition purposes“

The aim of the study is to propose new or improve the currently known, methods for image pre-processing (mainly binarization) aimed at improving the efficiency of Optical Character Recognition (OCR) algorithms. An additional issue discussed in the thesis is the reduction of the image processing time so that the proposed methods would binarize images in a shorter time.

Several proposals for new image processing methods are presented, divided into categories: region based methods (with their variants), multi-layer region based methods, methods based on background estimation, methods using local entropy and hybrid methods using the *voting* mechanism. For each of these methods, an assessment of their effectiveness was carried out, understood as the correct classification of pixels into groups of black and white or the correctness of recognizing alphanumeric characters in a given image. Additionally, computation execution times were tested.

The proposed methods have been verified with the use of commonly known image databases (DIBCO, Bickley Diary, Nabuco, LiveMemory) and two newly created image databases (*WEZUT OCR Dataset* and the *author's database of images of industrial plates*). The proposed methods have been compared by determining various qualitative coefficients (F-Measure, classification accuracy, Levenshtein distance, and others) and an additional visual assessment of the obtained results (subjective assessment).

It has been shown that for each of the proposed methods better results may be obtained than for the methods known so far. Depending on the performed analyses, the values of the F-Measure coefficients, classification accuracy or PSNR increase, whereas the DRD metric and the Levenshtein editing distance have been lowered. Additionally, the performed visual (subjective) verification confirms the effectiveness of the proposed methods, even for the most demanding image databases. The appendix of the thesis includes illustrations showing the effects of processing obtained by various methods, including the proposed ones.

The solutions described in the thesis may be used in practical applications, increasing the efficiency of programs that recognize alphanumeric characters and reducing the time necessary to perform the pre-processing of images.