

Generating functions/trees for evaluating optimal binarizations

MPS Team Project

1 st Asmaa Alaghbari	2 nd Mihai Ilinca	3 rd Ioana Rusu	4 th Andreea-Maria Piciu	5 th Cerasela Enus
<i>Team Leader</i>	<i>Developer</i>	<i>Developer</i>	<i>Project Manager</i>	<i>Tester</i>
343C5	343C5	342C3	341C5	343C5

Abstract—This project proposes a new image binarization method that combines global and local thresholding. The proposed method was evaluated on a variety of benchmark datasets and outperformed existing methods in terms of accuracy, recall, and F-measure.

Index Terms—Image binarization, Global thresholding, Local thresholding.

I. INTRODUCTION

Image binarization is the process of converting a grayscale image to a binary image, where each pixel is assigned a value of either black or white. Binarization is a fundamental image processing task that is used in a variety of applications, such as text recognition, document analysis, and medical imaging. There are a variety of different binarization methods available, each with its own advantages and disadvantages. Global thresholding methods use a single threshold value to binarize the entire image. This approach is simple and efficient, but it can be sensitive to noise in the image.

Local thresholding methods use different threshold values for different parts of the image. This approach is more robust to noise than global thresholding, but it is more complex and computationally expensive.

II. SOLUTION

The solution implemented for the image binarization challenge encompasses both global and local thresholding techniques. The ‘main.py’ script serves as the entry point, orchestrating the overall process and calling the appropriate functions. Our method iteratively computes the optimal thresholding parameters that best segment the foreground text from the background, balancing the contrast between the two.

III. ARCHITECTURE

The architecture of our solution is modular, with each component responsible for a particular aspect of the binarization process. The ‘tree.py’ script embodies the core algorithm, which constructs a decision tree to evaluate different binarization thresholds. Each node in the tree represents a computation step, employing either a global or a local thresholding operation, derived from the project’s extensive research and experimentation phase.

IV. INTERMEDIATE RESULTS

The intermediate results have been promising. The application of our hybrid thresholding method to benchmark datasets showed a significant improvement in segmentation quality. Histograms generated from the images revealed a better distinction between text and background, affirming the effectiveness of our approach.

V. INTERMEDIATE CONCLUSIONS

Our intermediate conclusions suggest that the integration of global and local thresholding, guided by a decision tree mechanism, is superior to traditional methods. The adaptability of local thresholding, combined with the simplicity of global thresholding, yields a robust binarization process. The next steps involve refining our algorithms and conducting further tests to validate these findings.

REFERENCES

- [1] CS Open CourseWare. (2023). Proiect [CS Open CourseWare]. Retrieved from <https://ocw.cs.pub.ro/courses/mps/proiect>
- [2] Gonzalez, R.C., & Woods, R.E. (2008). Digital Image Processing (3rd Edition).
- [3] Otsu, N. (1979). A Threshold Selection Method from Gray-Level Histograms. IEEE Transactions on Systems, Man, and Cybernetics, 9(1), 62-66.
- [4] Niblack, W. (1985). An introduction to Digital Image Processing.