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Exploring Image Binarization Techniques

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To my parents Md. Golam Hossain Shaikh and Mrs. Krishna Shaikh for their warm affection, loving indulgence, occasional forgiveness, unconditional support and invaluable contributions leading my life towards a better tomorrow

—Soharab Hossain Shaikh

To my Grandson Gabriel Jan who had opened a new chapter in my life

—Khalid Saeed

To my father Late Mugdhendu Sekhar Chaki for always being there with all his support in whatever I wanted to do in my life

—Nabendu Chaki

Preface

It is a great pleasure to introduce this book on Image Binarization. The book is aimed to ease the job of future researchers who work in the field of image processing, especially one that requires segmentation of grayscale images. A grayscale image can be segmented into two groups as object and background by using a binarization technique. A threshold is calculated and all pixels with gray-level values above the threshold are set to build the background while pixels below the threshold are set to form the object. This bi-level segmentation is known as image binarization. It is an important step in the preprocessing stage performed in many image processing applications.

This book provides a comprehensive survey of existing binarization techniques for both document and graphic images. A number of evaluation techniques are presented for quantitative comparison of different binarization methods. It provides the results obtained comparing a number of standard and widely used binarization algorithms using standard evaluation metrics. The comparative results presented in tables and charts in this book facilitates to understand the process.

In addition to this, the book presents techniques for preparing a reference image, which is important for quantitative evaluation of the binarization techniques. The results are produced taking image samples from standard image databases.

It has been organized in the form of six chapters starting with an introduction and followed by a comprehensive review in the first two chapters. The most important contribution of the book is in Chap. 3 where an iterative partitioning-based image binarization technique is introduced. In Chap. 4, a method is proposed towards creation of reference image for degraded document images in the presence of various types of noises. We thank and appreciate Asis Kumar Maity and Ayan Dey for their contributions in implementing the proposed methodologies and experimental verification.

We express our sincere thanks to Aninda Bose, Publishing Editor from Springer India for his continual support and positive influence right from the point of offering us to work for a book on this topic.

Lastly, we thank all of our family members who spared us and sacrificed their valuable time to let us concentrate on the book. We will consider our effort to be successful if this book helps the budding scholars to explore the area of image processing and inspire them for greater contribution.

Kolkata, India, February 2014

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Nabendu Chaki is a Senior Member of IEEE and an Associate Professor in the Department of Computer Science and Engineering, University of Calcutta, India. Besides editing several volumes in LNCS, Springer and other series, Nabendu has authored three textbooks with reputed publishers like Taylor and Francis (CRC Press), Pearson Education, etc. Dr. Chaki has published more than 100 refereed research papers in Journals and International conferences. His areas of research interests include image processing, distributed systems, and network security. Dr. Chaki has also served as a Research Assistant Professor in the Ph.D. program (Software Engineering) at the U.S. Naval Postgraduate School, Monterey, CA. He is a visiting faculty member for many universities including the University of Ca' Foscari, Venice, Italy. Dr. Chaki has contributed in SWEBOK v3 of the IEEE Computer Society as a Knowledge Area Editor for Mathematical Foundations. Besides, being an editorial board member of many international journals, he has also served in the committees of more than 50 international conferences. He is the founding Chapter Chair of ACM Professional Chapter in Kolkata, India, since January 2014.

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