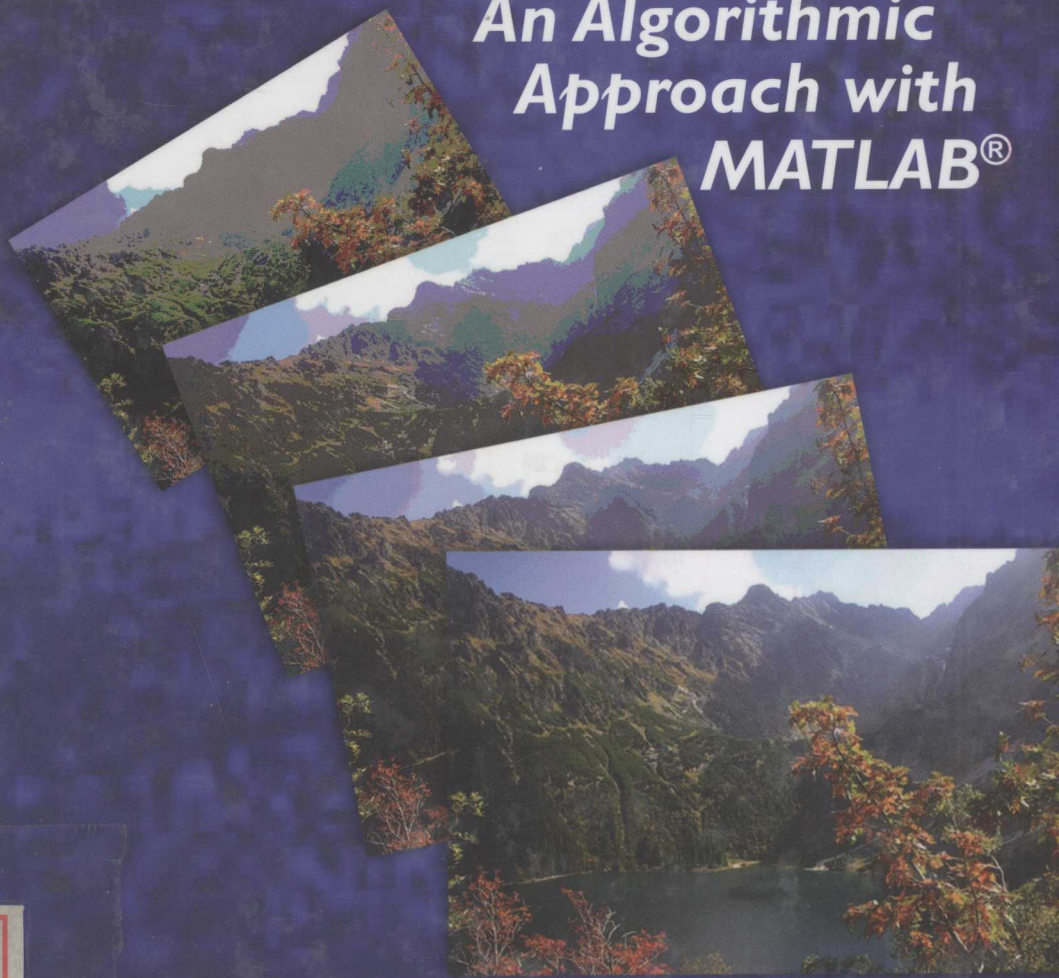


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TEXTBOOKS IN COMPUTING

DIGITAL IMAGE PROCESSING

*An Algorithmic
Approach with
MATLAB®*



Uvais Qidwai and C. H. Chen



CRC Press

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DIGITAL IMAGE PROCESSING

*An Algorithmic Approach
with MATLAB®*

Published Titles

Pascal Hitzler, Markus Klotzsch, and Sebastian Rudolph
Foundations of Semantic Web Technologies

Uvais Qidwai and C.H. Chen, Digital Image Processing: An Algorithmic
Approach with MATLAB®

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Aims and Scope

This series covers traditional areas of computing, as well as related technical areas, such as software engineering, artificial intelligence, computer engineering, information systems, and information technology. The series will accommodate textbooks for undergraduate and graduate students, generally adhering to worldwide curriculum standards from professional societies. The editors wish to encourage new and imaginative ideas and proposals, and are keen to help and encourage new authors. The editors welcome proposals that: provide groundbreaking and imaginative perspectives on aspects of computing; present topics in a new and exciting context; open up opportunities for emerging areas, such as multi-media, security, and mobile systems; capture new developments and applications in emerging fields of computing; and address topics that provide support for computing, such as mathematics, statistics, life and physical sciences, and business.

Published Titles

Pascal Hitzler, Markus Krötzsch, and Sebastian Rudolph,
Foundations of Semantic Web Technologies

Uvais Qidwai and C.H. Chen, Digital Image Processing: An Algorithmic
Approach with MATLAB®

Preface

Why another book on image processing? One might wonder, especially when almost all of the books available in the market are written by very well-versed and experienced academicians. Even more intriguing is the fact that I am a lot younger compared to all of them when they wrote those books! However, I think this is the main driving force behind this effort. Over the past few years when I have been involved teaching the subject in various countries around the world, I have felt that the available textbooks are not very “student friendly.” Not too long ago, I shared similar feelings when I was on the student benches myself. In today’s ultra-fast-paced life, the definition of “student friendly” is predominantly related to how fast the information can be disseminated to the students in as easy (and fun) way as possible. This definition, essentially, depicts the whole intent of writing this book.

This book covers topics that I believe are essential for undergraduate students in the areas of engineering and sciences in order to obtain a minimum understanding of the subject of digital image processing. At the same time, the book is written keeping in mind “average” students not only in the United States but elsewhere in the world as well. This is also the reason that the book has been proposed as a textbook for the subject since I believe that a textbook must be completely (or at least 90%) comprehensible by the students. However, students who want to delve deeper into the topics of the book can refer to some of the references in the bibliography section including several Web links. The book can also be a very good starting point for student projects as well as for start-up research in the field of image processing because it will give an encouraging jump-start to students without bogging them down with syntactical and debugging issues that they might encounter when using a programming environment other

than MATLAB®, or even trying out MATLAB for the first time for imaging applications.

The magic number of 15 chapters is based on a typical 15-week semester (plus or minus two more for the exams, etc.). Hence, typically one chapter can be completed per week, although in some cases, it may spill over to the next week as well. Each chapter is divided into three distinct sections. Their content varies in length relative to the topic being covered. The first of these sections is related to the actual theoretical contents to be covered under the chapter title. These theoretical topics are also presented in a very simple and basic style with generic language and mathematics. In several places, only a final result has been presented rather than the complex mathematical derivation of that result. The intent of this section is to equip the student with general understanding of the topic and any mathematical tool they will be using.

The second section (explicitly titled “Algorithmic Account”) explains the theoretical concepts from the theoretical section in the form of a flowchart to streamline the concepts and to lay a foundation for students to get ready for coding in any programming language. The language used in the flowchart is purposely kept simple and generic, and standard symbols for flowcharts are used. The third section (“MATLAB Code”) will complete this understanding by providing the actual MATLAB code for realizing the concepts and their applications. Specific emphasis is given on reproducing the figures presented in the chapter through the listed code in this section. At the end of each chapter, a bulleted summary of the chapter is provided. This gives a bird’s-eye view to the students as well as the instructors of the topics covered in the chapter. The exercises at the end of the chapter are mostly programming based so that students learn the underlying concepts through practice.

By no means can I claim that this is sufficient for students to become well-versed in the area of image processing. It will, however, open the door to a fundamental understanding, and make it very easy for them afterward to comprehend the advanced topics in the field, as well as other mathematical details.

The book has some additional support material that can be found on the following Web site:

<http://faculty.qu.edu.qa/qidwai/DIP>

It contains the following items:

- PowerPoint slides that can be used for chapterwise lectures
- A GUI tool infrastructure in MATLAB that can be developed by the student into a full-functionality image processing GUI tool as a course project
- A folder containing all the images used in the book with MATLAB codes

In order to gain full benefit from the book, one must have MATLAB 6.5 or higher with toolboxes on image processing, image acquisition, statistics, signal processing, and fuzzy logic.

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and also a fellow of the International Association of Pattern Recognition
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