

# BOOKSBOOKSBOOKS



## *Handbook of Texture Analysis*

by Majid Mirmehdi, Xianghua Xie, and Jasjit Suri, editors  
Imperial College Press, 2008

Reviewed by  
[Egon L. van den Broek](#) (The Netherlands)

Although handbooks on image processing depict texture as an important characteristic for various applications, handbooks on texture analysis are rare. Two exceptions are the books of Pietikainen (2000) and Petrou and Sevilla (2006). With the *Handbook of Texture Analysis* by Majid Mirmehdi, Xianghua Xie, and Jasjit Suri, a new one is launched, which aims to "bring together a collection of defining works that span the breadth of knowledge in texture analysis" (p. v). This review discusses how far this aim has indeed been achieved.

Before having read the book's content, three concerns should be mentioned:

The publisher has chosen to print the book in a beautiful manner. It is full color print, which is indeed good for a book including various images of colorful textures.

The book is an edited volume. Consequently, it was possible to incorporate contributions of many of the grant names in texture analysis.

Although a compilation of the chapters' references would result in an impressive number of references. Various references are missing; for example, from the Journal of the Optical Society of America (JOSA). Moreover, this illustrates an important limitation of the book: its limited scope.

With this review, we will briefly denote each of the chapters and add a critical note to them. Where applicable, we will cluster the chapters. After this, we

will provide some conclusions, trying to refrain from any bias. Hence, you as reader can decide yourself whether or not the book would be of value to you.

The first chapter provides a gentle introduction to texture analysis. In parallel, it provides a feeling for texture and explores / reviews some fundamental techniques. In this line, Chapter 2 provides a compact overview of texture synthesis, through discussing 18 milestone papers.

Chapters 3, 4, and 5 describe methods for texture classification, representation, and analysis. In Chapter 3, Varma and Zimmerman describe work that followed their 2005 paper. Chapter 4 is an adapted reprint of the authors' IEEE PAMI (2007) paper, as they also indicate. Chapter 5 is an extension of one of the author's 2006 paper; see their ref. [41].

Chapters 6, 7, and 8 concern 3D Texture analysis. The first two of these chapters provide an excellent introduction on the topic. Moreover, both chapters are complementary, as they should be being a part of a handbook. The third of this triple discusses the same topic but approaches it from another angle.

Chapter 9 provides an introduction to the work of Doretto and Soatto on dynamic textures. With this they depict "certain temporal regularity properties" and discuss these in the context of time series analysis. This work is of use for video analysis.

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With Chapter 10, we get back to texture synthesis, with the introduction of an alternative approach; cf. Chapter 2. A method for a hierarchical description of textures is introduced. Regrettably, this chapter lacks the references to similar approaches. Nevertheless, it describes a convincing alternative method.

Chapter 11 provides an extensive tutorial on the Trace transform (i.e., a generalized Radon transform), as introduced in 2001. Since then, it has been often applied.

Chapter 12 is again a reprint of one of the authors' papers; see ref [12] of this chapter. It is the only chapter of the handbook on a specific application domain: face recognition. Hence, it presents a good illustration of the complications in a well-known application domain.

The book ends with Chapter 13: "A galaxy of texture features". This chapter provides a nice overview of texture features, although inevitably incomplete. Moreover it presents a taxonomy of texture analysis and a reference list, which contains many "must have read" articles. As such, it is one of the highlights of the book.

We have gone through the handbook, chapter by chapter. More than anything else, this illustrated the complexity of textures. For each element of texture research, as denoted in the handbook, it would be worth to compile a separate handbook. This is well illustrated through color-induced texture analysis, which is only briefly touched throughout the book, from time to time. Regrettably but not surprisingly since it should focus on the interaction between texture (features) and color, already a challenge on its own (Wyszecki & Stiles, 2000). Moreover, for various applications, still only gray scale images are processed. Nevertheless, if anything, I missed a more in depth discussion of this aspect of texture analysis.

Much more can be said on this handbook. However, this would go beyond the scope of a review such as this. Therefore, let us draw some final conclusions:

The handbook is biased toward the image processing/ computer vision community. Findings from other fields (e.g., psychology and optics) are addressed only to a limited extent.

Although not stated as such, roughly half of the handbook consists of reprints of papers. The other half of the chapters, are in a format one expects with a handbook. This is indisputably, a downside of the book.

Despite the critical notes made, this handbook is of value. Especially for those who want to get introduced to the topic of texture. For experts, it provides a nice overview of various aspects of texture.

The book's value is determined by the quality of the contributions, which are all of an excellent level.

However, possibly most important: there are few alternatives for this handbook. Hence, the book fills a hole in the market.

In a nutshell, we can conclude that the handbook satisfies the editors' claim (p. v). But more than anything else, one thing again becomes clear. Regrettably, as is frequently stated in this handbook, we still have to conclude: "Texture is not fully understood ..." (p. 37) So, the quest continues ...

## References

Petrou, M. & Sevilla, P.G. (2006). *Image Processing: Dealing With Texture*. West Sussex, England: John Wiley & Sons Ltd. ISBN: 978-0470026281

Pietikainen, M.K. (2000). *Texture Analysis in Machine Vision*. Singapore, Singapore: World Scientific Publishing Co. Pte. Ltd. ISBN: 978-9810243739

Wyszecki, G. & Stiles, W.S. (2000). *Color science: Concepts and methods, quantitative data and formulae* (2<sup>nd</sup> edition). New York, NY, USA: John Wiley & Sons, Inc. ISBN: 0-471-39918-3