Advanced Digital Imaging Laboratory Using MATLAB®

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Second edition

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Preface to the second edition

The present book is a second and substantially extended edition of the book published under the same name in 2014. The major extensions include the following:

- Chapters 'Image digitization' and 'Digital computational imaging' are supplemented with new exercises that illustrate image general irregular and sparse sampling and modern ideas of image sparse approximation, as well as new exercises that demonstrate aliasing artifacts in 2D and 3D (spatial/temporal) sampling.
- Chapters 'Image digitization', 'Methods of image perfecting' and 'Methods of image enhancement' are extended to color and stereo images and are supplemented with corresponding new exercises.
- Chapter 'Image resampling and building continuous image models' is supplemented with new exercises that illustrate perfect image re-scaling with arbitrary scale factors.
- Questions for self-testing are correspondingly updated and extended.
- The narrative part of the book is substantially extended and complemented by verbal formulations and intuitive explanations of major theoretical results that underlie the exercises, which makes the book more self-containing.
- The total number of exercises is increased from 87 to 105.
- All exercises are re-edited and re-checked.
- The bank of test images is very substantially extended to include, in particular, color and stereoscopic images.

Preface

This book is a textbook of MATLAB® based exercises in all major topics of digital imaging: image digitization, digital image formation and computational imaging, image resampling and building continuous image models, image statistical characterization and noise diagnostics, statistical image models and pattern formation, image correlators for detecting and localization of objects, image restoration and perfecting, image enhancement. The book is addressed to students, researchers and practitioners in imaging engineering and applications. Its goal is to help readers to master digital imaging on both fundamental theoretical and practical levels. It is based on courses that have been tauught by the author in Tel Aviv University and at a number of other Universities in Europe and Japan during last 15 years.

Author biography

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Leonid P Yaroslavsky, MS (summa cum laude, 1961), PhD (1968), Dr Sc. Habilitatus in Physics and Math (1982), OSA Fellow. From 1965 till 1983, the head of the Digital Image Processing and Digital Holography Group at the Institute for Information Transmission Problems (IITP), Russian Academy of Sciences. From 1983 till 1995, the founder and head of the Laboratory of Digital Optics at the IITP. From 1995 till 2008, a full professor at the Faculty of Engineering, Tel Aviv University. Currently a professor emeritus. A visiting professor at the University of Erlangen, Germany; National Institute of Health, Bethesda, MD, USA; Institute of Optics, Orsay, France; Institute Henri Poincaré, Paris, France; International Centre for Signal Processing, Tampere University of Technology, Finland; Agilent Laboratories, Palo Alto, CA, USA; Gunma University, Kiryu, Japan; Autonomous University of Barcelona, Spain. Supervised 20 PhD candidates. An author and editor of more than 20 books and numerous peer-reviewed publications on digital image processing and digital holography.