

Compression for Multimedia

Providing a thorough theoretical understanding of lossy compression techniques for image, video, speech, and audio compression, this book also covers the key features of each system, as well as practical applications, implementation issues, and design trade-offs. It presents comparisons of multimedia standards in terms of achieving known theoretical limits, whilst common and distinguishing features of the existing standards are explained and related to the background theory. There is detailed coverage of such topics as the H.264 video coding standard, low-complexity code-based vector quantizers, and the Blahut rate-distortion algorithm. Examples based on real multimedia data are also included, together with end-of-chapter problems to test understanding; algorithms that allow the reader to represent speech and audio signals efficiently; and an appendix on the basics of lossless coding. With an excellent balance of theory and practice, this book is ideal for undergraduate and graduate students, and is also a useful reference for practitioners.

Irina Bocharova is an Associate Professor at the Saint Petersburg State University of Information Technologies, Mechanics, and Optics. She has published over 50 technical papers and is the co-inventor of seven US patents in speech, video, and audio coding. Her current research interests include convolutional codes, communication systems, source coding and its applications to speech, audio, and image coding.

Cambridge University Press
978-0-521-11432-5 - Compression for Multimedia
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CAMBRIDGE UNIVERSITY PRESS
Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo, Delhi,
Dubai, Tokyo

Cambridge University Press
The Edinburgh Building, Cambridge CB2 8RU, UK

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org

Information on this title: www.cambridge.org/9780521114325

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First published 2010

Printed in the United Kingdom at the University Press, Cambridge

A catalogue record for this publication is available from the British Library

ISBN 978-0-521-11432-5 Hardback

Additional resources for this publication at www.cambridge.org/9780521114325

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**To
my teachers**

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Preface

Compression for Multimedia was primarily developed as class notes for my course on techniques for compression of data, speech, music, pictures, and video that I have been teaching for more than 10 years at the University of Aerospace Instrumentation, St Petersburg.

During spring 2005 I worked at Lund University as the Lise Meitner Visiting Professor. I have used part of this time to thoroughly revise and substantially extend my previous notes, resulting in the present version.

I would also like to mention that this task could not have been fulfilled without support. Above all, I am indebted to my colleague and husband Boris Kudryashov. Without our collaboration I would not have reached my view of how various compression techniques could be developed and should be taught. Boris' help in solving many TEX problems was invaluable. Special thanks go to Grigory Tenengolts who supported our research and development of practical methods for multimedia compression. Finally, I am grateful to Rolf Johannesson who proposed me as a Lise Meitner Visiting Professor and, needless to say, to the Engineering faculty of Lund University who made his recommendation become true! Rolf also suggested that I should give an undergraduate course on compression for multimedia at Lund University, develop these notes, and eventually publish them as a book. Thanks!

Lund, April 2009

Irina Bocharova