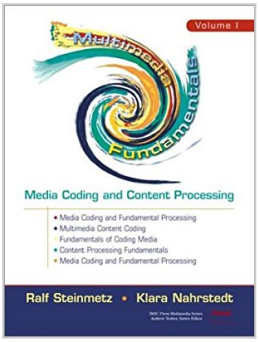


# Multimedia Fundamentals, Volume 1: Media Coding and Content Processing (2nd Edition)

*By Ralf Steinmetz, Klara Nahrstedt*



**Multimedia Fundamentals, Volume 1: Media Coding and Content Processing (2nd Edition)** By Ralf Steinmetz, Klara Nahrstedt

- The state-of-the-art in multimedia content analysis, media foundations, and compression
- Covers digital audio, images, video, graphics, and animation
- Includes real-world project sets that help you build and test your expertise
- By two of the world's leading experts in advanced multimedia systems development

The practical, example-rich guide to media coding and content processing for every multimedia developer.
From DVDs to the Internet, media coding and content processing are central to the effective delivery of high-quality multimedia. In this book, two of the field's leading experts introduce today's state-of-the-art, presenting realistic examples and projects designed to help implementers create multimedia systems with unprecedented performance. Ralf Steinmetz and Klara Nahrstedt introduce the fundamental characteristics of digital audio, images, video, graphics, and animation; demonstrate powerful new approaches to content analysis and compression; and share expert insights into system and end-user issues every advanced multimedia professional must understand. Coverage includes:

- Generic characteristics of multimedia and data streams, and their impact on multimedia system design
- Essential audio concepts and representation techniques: sound perception, psychoacoustics, music, MIDI, Speech signals, and related I/O and transmission issues
- Graphics and image characteristics: image formats, analysis, synthesis, reconstruction, and output
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- Optical storage technologies and techniques: CD-DA, CD-ROM, DVD, and beyond

- Content processing techniques: Image analysis, video processing, cut detection, and audio analysis

First in an authoritative 3-volume set on tomorrow's robust multimedia desktop: real-time audio, video, and streaming media.
*Multimedia Fundamentals* offers a single, authoritative source for the knowledge and techniques you need to succeed with any advanced multimedia development project. Look for Volume 2 focusing on networking and operating system-related issues, and Volume 3 focusing on service and application issues.

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## Editorial Review

From the Publisher
Providing an overview of the most current research and development areas in multimedia, as well as current ongoing project applications, this book takes a world view of the technology, discussing developments in the U.S., the Far East, as well as Europe.

From the Inside Flap
There has been an explosive growth of multimedia computing, communication and applications during the last decade. Computers and networks process and transmit currently more than just text and images. Video, audio and other continuous media data, as well as additional discrete media such as graphics became part of integrated computer applications. In the future, all computers and networks will support multimedia computing and communication to provide appropriate services for multimedia applications.

This book aims to achieve a complete and balanced view on the multimedia field covering three main domains: devices, systems and applications. In the device domain, basic concepts for processing of video, audio, graphics and images are presented (Chapters 2 through 5). Because of the currently available technology and quality requirements, the original data rates of these media demand compression methods. The corresponding approaches are described in Chapter 6. Chapter 7 presents the optical storage media which have contributed significantly to the current development of computer-based multimedia systems. On the other hand, the high-speed networks, described in Chapter 10, with their higher bandwidth and transmission possibilities of all media kinds, have led to networked multimedia systems. In the system domain, Chapters 8 through 12 provide information on computer technology as an interface between the device and the system domain, operating system, communication system and database system. The application domain includes topics such as programming abstractions (Chapter 16), which represent the interface between the application and the system domain, document handling (Chapter 13), tools and applications (Chapter 17), and user interfaces through which the document handling, tools and applications are made accessible to humans. To all three domains, one area is common: the synchronization of multimedia. This topic is covered separately in Chapter 15.

This book has the character of a reference book, covering a wide scope. It has evolved from the first multimedia technology book, published in German in 1993. (Figures from this book were reused with permission of the Springer Verlag). However, substantial areas have changed and enhancements have been made. The results, presented in this book, serve as groundwork for the development of individual components of a multimedia system.

The book can be used by computer professionals who are interested in multimedia systems and applications. The book can also be used as a text for beginning or advanced graduate students in computer science, and related disciplines, although the absence of exercises for each chapter may put more load on the instructor. All discussions present the handling of multimedia in the corresponding domains and assume that the reader is familiar with the basic concepts of the systems: for example, scheduling in operating systems, layering in communication systems, etc.

Since the amount of material in the book is too much for a one-semester course, it can be taught during two or more semesters. For example, the instructor could choose to emphasize the multimedia computing or communication aspect, including synchronization and application issues.

Many people have helped us with the preparation of this book. We would especially like to thank David Farber, Jonathan Smith, Ruzena Bajcsy, Craig Reynolds, Gerold Blakowski, Andreas Mauthe and Doris Meschzan. We would also like to thank Klara's colleagues from the Distributed System Laboratory for their comments and discussions during the writing process. Special thanks go to John Shaffer, Brendan Traw, Jean McManus and Anshul Kantawala. Acknowledgment is also due the National Science Foundation and the Defense Advanced Research Projects Agency (#NCR-8919038) for supporting Klara's research reported here. Last but not least, we would like to thank our families for their support and patience.

Foreword:

Multimedia computing and communications are areas of intense current interest, software and hardware development, and future promise. Residential, institutional and business applications are emerging at a fast pace. Multimedia standards organizations are actively producing new standards for the field. Yet, the term "multimedia" and the subject areas it covers remain, to many people who hear, read and even use the term, clouded in mystery. Some recent books have attempted to define the essential elements of this fascinating area with various degrees of success. This book is fully successful in its enterprise; it will certainly fill a void in the emerging field of multimedia.

The book covers all the important topics involved in the new area, from the operating system and hardware aspects to the user interface, the applications and the programming abstractions. Such a wealth of information is not found in any of the few other books published thus far in the field.

The book is organized in 18 chapters, all of which are very informative and essential. The first five chapters define multimedia terminology and review the fundamentals of sound/audio, images and graphics, video and animation. An excellent treatise on image and video data compression follows, introducing and describing in detail such important standards as H.261, JPEG, MPEG-1 and MPEG-2.

Chapters in optical storage media and computer technology give the reader up-to-date information about CD standards and pertinent hardware technology. The chapter on operating system issues really makes this book unique. Resource and process management are covered in detail. All the important algorithms for real-time scheduling (rate monotonic, earliest-deadline-first and so on) are given. File systems management is discussed in detail, and future aspects of multimedia operating systems are also covered. Networking systems are the subject of another chapter. All the technologies relevant to multimedia networking are described. A chapter on protocols and quality of service issues follows, giving an overview of important multimedia protocols. A brief description of multimedia databases is followed by a complete treatment of document architectures and standards such as ODA, SGML, hypertext and MHEG. Important design issues concerning multimedia interfaces are then presented. A very rich chapter on multimedia synchronization describes the heart of a multimedia system. This treatment is another major contribution of the authors that cannot be found in other books. A discussion of important programming abstractions follows, and the book concludes with an interesting chapter on multimedia applications and one on future directions.

We expect that this book will become a standard text in multimedia courses as well as a standard reference for all people working in the field. We congratulate the authors for their laborious but worthwhile and successful endeavor, and wish the readers a most pleasant journey into the field of multimedia!

From the Back Cover

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## Users Review

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**Rodney Mitchell:**

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