

# Preface

Since the first publication of the video coding standard H.264 | AVC in 2003, the video world has changed. Video content has become a major fraction of digital network traffic worldwide and is still growing. The demand for HD and Ultra HD video (with picture resolutions of  $4K \times 2K$  and more) increases, inducing even higher bandwidth needs. The established standard H.264 | AVC is used for HD content while having been developed mainly for resolutions around standard definition television. The standardization effort for “High Efficiency Video Coding” (HEVC) answers the demand for improved compression performance at resolutions of HD and beyond. The design of the included coding tools enables video compression to the desired degree in conjunction with implementation friendliness and options for parallelization at multiple levels. It is expected to be widely adopted for video services at HD and Ultra HD quality, providing Ultra HD video at similar bitrates as used for HD video today. Based on the known concepts of the well-established hybrid coding scheme, new coding structures and better coding tools have been developed and specified for HEVC. The new standard is expected to be taken up easily by established industry as well as new endeavors, answering the needs of today’s connected and ever-evolving online world.

This book presents the standard and strives to explain it in a clear and coherent language. It provides a comprehensive and consistently written description of the applied concepts and coding tools. For synchronization of beginners in the field, a chapter on the fundamentals of video coding is included. It provides a general overview on the elements of video coding systems, the representation of color video, and an introduction of the building blocks of the hybrid coding scheme. Another chapter is dedicated to the topic of specification by itself; it deals with requirements on specification text and with imposed fundamental technological guidelines. The understanding of these principles is utile for assessment of the

algorithmic design at present as well as for future development of extensions and potential additional coding tools. The following chapters follow the structure of the HEVC specification, giving insight to the design and concepts of the coding tools in the specification.

The book shall help readers to understand the state-of-the-art concepts of video coding with HEVC as their latest instantiation. It shall contribute to the promulgation of the HEVC standard and provide support in adopting it for new and fascinating applications.

Examples in the chapters make use of bitstreams and test sequences according to the common testing conditions of the Joint Collaborative Team on Video Coding (JCT-VC). Bitstreams according to these conditions were frequently made public on the JCT-VC experts mailing list by the reference software coordinators. Different versions of these bitstreams have been used as anchors in numerous tests and extensive experiments throughout the HEVC development. Coding examples in this book are given for the test sequence BasketballDrive, provided courtesy of NTT DOCOMO, Inc., Japan, and ParkScene, provided courtesy of Tokyo Institute of Technology, Nakajima Laboratory, Japan. Examples for the sequences of the JCT-VC common testing conditions further include BlowingBubbles and RaceHorses, provided courtesy of NTT DOCOMO, Inc., Japan; ChinaSpeed, provided courtesy of Shanghai Shulong Computer Technology Co., Ltd., China; FourPeople, provided courtesy of Vidyo Inc., USA; and PeopleOnStreet, provided courtesy of Samsung Electronics Co., Ltd., Korea.

Hundreds of experts in the JCT-VC have worked hard, spending time in never-ending meetings with tremendous numbers of input contributions to achieve the goal of a stable high-quality high-performance specification. Their contribution and commitment are highly appreciated. The standardization work has been carried out under the prudent and stimulating lead of the JCT-VC chairs Gary J. Sullivan and Jens-Rainer Ohm. Their thoughtful and precise guidance is specifically appreciated. It formed and coined this collaborative team.

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