

Preface

The purpose of this book is to provide an accessible and compressive overview of the fundamental concepts and latest techniques of the second generation of Advance Video coding System (AVS2) needed by researchers, engineers, and students. AVS2 is a tools set on multimedia coding and analysis, for efficient video transmission, storage, and content understanding.

With the rapid development of the Internet and smart phone, the amounts of images and videos are now growing explosively, leading to many new challenges on image and video compression and analysis. On one hand, traditional TV product industry is still moving on promoting their higher performance new products, like $4K \times 2K$ or even $8K \times 4K$ resolution TV, in 60 frames per second or 120 frames per second or even more higher frame rate, which obviously requires higher performance codec by new video coding standard than any codecs in use today, otherwise the cost of video content delivery and storage will be unacceptable by both cable company and telecommunication company. So the first challenge is to make the higher performance video codec for new TV service, like what HEVC/H.265 doing. On the other hand, Internet and surveillance video industries require powerful codecs on better performance at higher compression ratio, object tracking and recognition capability, low delay, low cost, easy to update, and so on. The emergent requirements have led the video codec production for new media into mass providers in many different formats, which might not be healthy for industry. So the second challenge is to provide an efficient multimedia coding standard for new media, including Internet video, mobile video, broadcasting video, and surveillance video.

For answering the second challenge, this book gives our solution to both new media and traditional media applications, through AVS2. The basic coding framework of AVS2 is similar to HEVC/H.265, but AVS2 can provide more efficient compression for certain applications, in particular surveillance as well as low delay communication type applications such as videoconferencing. By adopting smarter coding tools that not only improve coding efficiency, but also help with video analysis such as object detection and tracking, AVS2 is making video coding a lot smarter. Combining the object representation function with video coding framework is a long time research we executed, since 2002. By this function

the video contents can be efficiently detected and analyzed onsite or offsite. The advantage of this new framework is to code the video content in more efficient way, in terms of bit consumption and object recognition accuracy. This research has been taken at a society called AVS, which is a working group for standardization, and the standards created by this group are also called AVS standard family; even their official names are IEEE std. 1857.4 in IEEE 1857 and a national standard project is also undergoing (No. 20110149-T-469).

One of the most unique tools in AVS2 is the scene video coding technique. Scene videos are defined as the kinds of video captured from a scene for a long while, e.g., surveillance videos. Compared to the conventional video scene, videos have more redundancy, characterized as background redundancy. The background redundancy is one kind of knowledge redundancy. For example, unchanged objects like buildings, the regularity of light changes with time in the surveillance videos can be detected by people's experiences and knowledge. AVS2 proposed a background picture model-based coding method, which can reduce the background redundancy significantly and achieve about 50 % bits saving for scene video coding.

In summary, this book gives an overview of the state-of-art video coding technology by introducing the tools of the AVS2 standard which achieves significant coding efficient improvement than any other standards in use. By incorporating smarter coding tools, e.g., scene video coding, AVS2 makes video coding system intelligent and efficient for future video network and applications. We believe this book will help engineers and students to understand the techniques in AVS2 standard for implementation purpose; the book will also give a hint to researchers on how to make a smart video coding and processing framework for target problem.

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