

# Recent Trends and Future Prospects for Video Coding Technology

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**M**PEG-2, which is currently employed in digital broadcasting and DVD systems, was standardized at the international standardization organization ISO/IEC<sup>1</sup> in 1994. By addressing the recent trend of video coding schemes, MPEG-4, H.264, and the coding schemes for still/motion pictures, JPEG2000/Motion-JPEG2000, I will present some future prospects for video coding technology.

## "MPEG-4" and "JPEG2000/Motion-JPEG2000"

MPEG-4 is a coding scheme based on a discrete cosine transform (DCT), for which the joint working group of ISO and IEC, MPEG<sup>2</sup>, started a standardization process in 1993. Although the initial focus was on very low bit rate coding and error resilience in mobile applications, the group's goal eventually became general purpose coding scheme that can be used in various applications, including the Internet, cable TV, and broadcasting. The concept of object coding was also incorporated into MPEG, which enables video manipulation by object unit in a video frame and improves in coding efficiency. MPEG-4 comprises a large number of profile categorizing functions, handling the coding of computer graphics (CGs).

A Studio Profile for program production can take advantage of the object coding to perform video composition by object unit. The object coding includes, for example, an application for a virtual studio that combines actual video images with CG images. For the mobile reception of digital terrestrial broadcasting, which will require low-rate transmission and high error resilience, MPEG-4 is considered to be one of the candidates for the video coding scheme of data broadcasting. Under consideration is the use of a Simple Profile without an object-coding function.

The JPEG2000/Motion-JPEG2000 coding schemes, which the ISO/IEC joint working group for still picture coding have promoted, were recognized as international standards in 2000 and 2001, respectively. These schemes have adopted a technology called a wavelet transform, and they are capable of extracting data with various resolutions from the coded signal. Making use of this hierarchical characteristic is expected to realize

a "multiple use of single source" application using a single piece of video material to produce images of Hi-Vision (HDTV) quality as well as images for low-rate transmissions over the Internet.

## Future Prospects

A new highly efficient coding scheme called AVC<sup>3</sup> is to be standardized this year. The coding scheme called H.26L, which is aimed at a coding efficiency higher than that of MPEG-4, was originally proposed by VCEG<sup>4</sup>, a study group at the International Telecommunication Union (ITU). VCEG and MPEG later established a joint working group, JVT<sup>5</sup>, to carry out the standardization for AVC. AVC is a coding scheme known as ISO MPEG-4 Part10 Advanced Video Coding, or ITU-T H.264. This scheme makes feasible motion compensation and DCT block sizes, even at the size of 4×4 pixels. It also enhances the coding efficiency by using various techniques, such as one to select an image for motion estimation among multiple options. Refinements to AVC are rapidly turning it into a highly functional coding scheme, which incorporates numerous technologies developed in the past. It is required to optimize the scheme to adapt it to specific purposes, so that its high potential can be exploited.

Object-based coding for MPEG-4 requires an object extraction technique and an easy-to-use description method to express a program with a combination of objects.

To realize a seamless service among media, it is desirable for coding systems to be open. Advancements in software technology and down-sizing of semiconductor devices with higher functionalities, will make them capable of selecting a scheme optimized for a specific application. That will realize the dream of transmitting broadcast-quality HDTV images at a rate of 10 Mbps or less.

<sup>1</sup> ISO/IEC (International Organization for Standardization/International Electrotechnical Commission)

<sup>2</sup> MPEG (Moving Picture Experts Group)

<sup>3</sup> AVC (Advanced Video Coding)

<sup>4</sup> VCEG (Video Coding Experts Group)

<sup>5</sup> JVT (Joint Video Team)