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Study on the Core Technology of New Video Coding Standards H.264/AVC

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Abstract

We introduce briefly the basic principle of the standardized coding/decoding H.264/AVC . We have analyzed and studied in detail the core technology of H.264/AVC standard, including motion estimation and motion compensation, forecasts in a frame and between the frames, integer transform and quantization analysis, entropy coding methods, deblock filter, new photographic image type, aspect-oriented IP and wireless environment, etc. The H.264/AVC standard has solved the contradiction between the image quality and the coding efficiency, its effect is obvious, but many advantages acquired exchange for the sacrifice of computing complexity, therefore, to achieve greater coding efficiency will be the next studying emphasis at the same time of reducing the computing complexity.

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Keywords: H.264/AVC; Video coding; Forecasts in a frame and between the frames; Integer transform of DCT; entropy coding; deblock filter

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1. Introduction

International Telecommunication Union - Telecommunication Standardization Sector (ITU-T) and International Organization for Standardization (ISO)/ International Electrotechnical Commission (IEC) are two different organizations of the current international standards for the video encode. The video encoder standard formulated by ITU-T is called as the video encoder proposal, named as H.26X series, for example, H.261, H.263. The video encoder standard formulated by ISO/IEC is called as MPEG-X, for example, MPEG-1, MPEG-2, MPEG-4. The H.26X series is mostly used for real-time video communication, for example, video conferencing, videophone; The MPEG series is mostly used for video storage (DVD), video broadcast and video streaming media. Except for the joint development of H.262/MPEG-2, in most cases, the two organizations formulate independently the relevant standards. In 1997, ITU-T VCEG cooperated with ISO/IEC MPEG again, they set up the Joint Video Team （JVT）, committed to develop a new generation of the video encoder standard H.264/AVC and published the standard in May 2003. ITU-T named the system as H.264, ISO)/ IEC called it 14496-10/MPEG-4 AVC. The main goal of the standard is to try to design simple and effective coding technology owning the ability that is high compression ratio and easy to be transmitted by internet, to meet the occasion of video application, such as video phone, video conference, video storage, broadcast and video monitoring.

2 Basic principle of encoding/decoding of H.264/AVC

2.1. Working processes of the coder and decoder

The functions of the coder and decoder of H.264/AVC are shown as in figure 1 and 2.

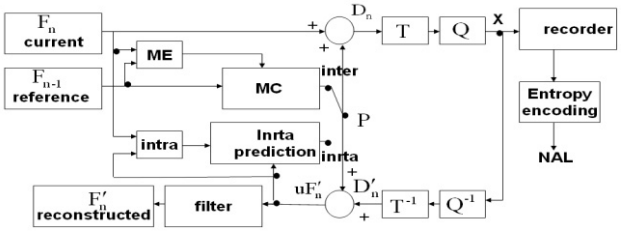

Fig 1 The block diagram of the encoder of H.264/AVC

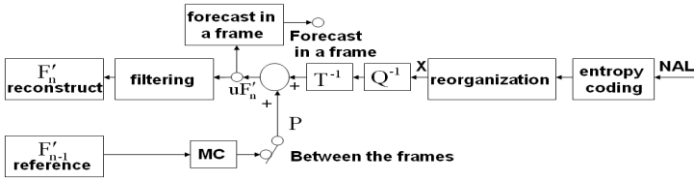

Fig 2 The block diagram of the decoder of H.264/AVC

In Fig 1, the input frame/field F_n is handled by the encoder with the macro block unit of original image 16×16 pixel. Firstly, the input frame/field F_n is handled with the method of forecasting-coding in a frame or between the frames. If the method of forecasting-coding in a frame was adopted, its forecasting value PRED (represented with P in Fig 1) was derived from the encoded reference area for Motion Compensation (MC) in the current image, the reference image is represented with F'_{n-1}. In order to increase the forecasting accuracy

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