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### Research on H.264 Video Coding

**Seung-Hwan Kim and Yo-Sung Ho**

*School of Information and Mechatronics,  
Department of Information and Communications,  
Gwangju Institute of Science & Technology (GIST)  
1 Oryong-dong, Buk-gu, Gwangju 500-712, Korea  
kshkim, hoyo}@gist.ac.kr*

The latest international video coding standard H.264/AVC was developed by the Joint Video Team (JVT) from the ITU-T Video Coding Experts Group (VCEG) and the ISO/IEC Moving Picture Experts Group (MPEG). The H.264/AVC codec improves the rate distortion performance by employing advanced video coding tools for variable block-size motion estimation, multiple reference prediction, spatial prediction in intra coding, and context-based entropy coding. Testing results of H.264/AVC show that it significantly outperforms the existing video coding standards in terms of the peak signal-to-noise ratio (PSNR) and visual quality. However, the outstanding coding performance of H.264 is achieved at the cost of significantly high complexity. Therefore, complexity reduction techniques are very important to perform real-time software encoding on a personal computer. The overall coding structure of the H.264 encoder is shown in Fig.1.

In this paper, we present algorithm-level optimization methods, including input parameter selection, fast inter-mode decision, and efficient combination of motion estimation and mode decision. We also apply code-level optimization techniques: frame-memory management and single-instruction-multiple-data (SIMD) implementation based on the Intel MMX/SSE2 instruction sets. Experimental results show that our proposed H.264 encoder achieves not only Video Graphics Array (VGA: 640×480) but also eXtended Graphics Array (XGA: 1024×768) real-time encoding on a personal computer without serious quality degradations.

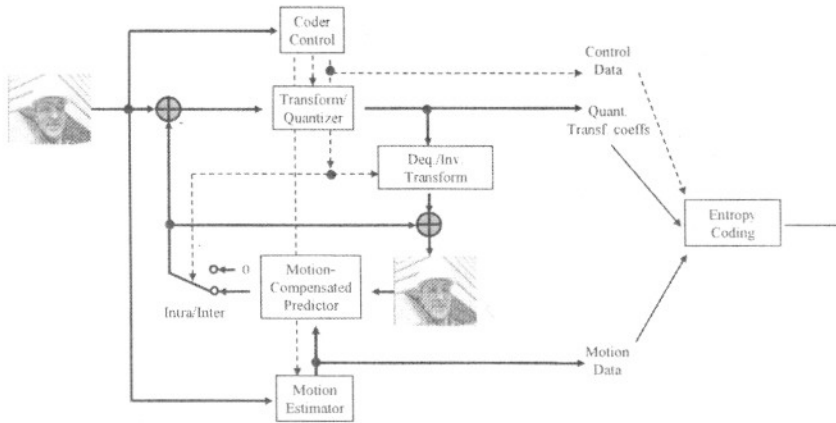


Fig. 1: The Structure of H.264 Encoder

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