Announcing the Final Examination of Rakan Khraisha for the degree of Master of Science

Time & Location: June 28, 2010 at 11:00 AM in HEC 438
Title: Bit-Rate Aware Reconfigurable Architecture for H.264/AVC Deblocking Filter

In H.264/AVC, DeBlocking Filter (DBF) achieves bit rate savings and it is used to improve visual quality by reducing the presence of blocking artifacts. However, these advantages come at the expense of increasing computational complexity of the DBF due to highly adaptive mode decision and small 4x4 block size. The DBF easily accounts for one third of the computational complexity of the decoder. The computational complexity required for various target applications from mobile to high definition video applications varies significantly. Therefore, it becomes apparent to design efficient architecture to adapt to different requirements.

In this work, we exploit the scalability on both the hardware level and the algorithmic level to synergize the performance and to reduce computational complexity. First, we propose a modular DBF architecture which can be scaled to adapt to the required computing capability for various bit-rates, resolutions, and frame rates of video sequences. The scalable architecture is based on FPGA using dynamic partial reconfiguration. This desirable feature of FPGAs makes it possible for different hardware configurations to be implemented during run-time. The proposed design can be scaled to filter up to four different edges simultaneously, resulting in significant reduction of total processing time. Secondly, our experiments show by lowering the bit rate of video sequences, significant reduction in computational complexity can be achieved by the increased presence of skipped macroblocks, thus, avoiding redundant filtering operations. The implemented architecture has been evaluated using Xilinx Virtex-4 ML410 FPGA board. The design can operate at a maximum frequency of 103 MHz.

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Approved for distribution by Dr. Jooheung Lee, Committee Chair, on June 11, 2010.

The public is welcome to attend.