Biomedical Engineering Seminar Series

1st Semester, Academic Year 2015

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Time: 1.00 – 2.00 PM
Room 6373, 3rd level, Building 3,
Department of Biomedical Engineering,
Faculty of Engineering;
Mahidol University

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"Design and Implementation of Next Generation Video Coding Systems (H.265/HEVC Tutorial)"

In the family of video coding standards, HEVC has the promise and potential to replace/supplement all the existing standards (MPEG and H.26x series including H.264/AVC). While the complexity of the HEVC encoder is several times that of the H.264/AVC, the decoder complexity is within the range of the latter. Researchers are exploring about reducing the HEVC encoder complexity . Kim et al have shown that motion estimation (ME) occupies 77-81% of HEVC encoder implementation. Hence the focus has been in reducing the ME complexity. Several researchers have implemented performance comparison of HEVC with other standards such as H.264/AVC , MPEG-4 Part 2 visual, H.262/PEG-2 Video , H.263, and VP9 and also with image coding standards such as JPEG2000, JPEG-LS, and JPEG-XR. Several tests have shown that HEVC provides improved compression efficiency up to 50% bit rate reduction for the same subjective video quality compared to H.264/AVC . Besides addressing all current applications, HEVC is designed and developed to focus on two key issues: increased video resolution - up to 8kx4k – and increased use of parallel processing architecture. Brief description of the HEVC is provided. However for details and implementation, the reader is referred to the JCT-VC documents , overview papers , keynote speeches , tutorials , panel discussion , poster sessions , special issues , test models (TM/HM) , web/ftp site, open source software , test sequences, anchor bit streams and the latest book on HEVC by Sze, Budagavi and Sullivan. Also researchers are exploring transcoding between HEVC and other standards such as MPEG-2. Further extensions to HEVC are scalable video coding (SVC), 3D video/multiview video coding and range extensions which include screen content coding (SCC), bit depths larger than 10 bits and color sampling of 4:2:2 and 4:4:4. SCC in general refers to computer generated objects and screen shots from computer applications (both images and videos) and may require lossless coding. Some of these extensions have been finalized by the end of 2014 (time frame for SCC is late 2015 or early 2016). They also provide fertile ground for R & D. Iguchi et al have already developed a hardware encoder for super hi-vision (SHV) i.e., ultra HDTV at 7680x4320 pixel resolution. Also real-time hardware implementation of HEVC encoder for 1080p HD video has been done. NHK is planning SHV experimental broadcasting in 2016. A 249-Mpixel/s HEVC video decoder chip for 4k Ultra-HD applications has already been developed . Bross et al have shown that real time software decoding of 4K (3840x2160) video with HEVC is feasible on current desktop CPUs using four CPU cores. They also state that encoding 4K video in real time on the other hand is a challenge. Multimedia research group (MRC) predicts 2 billion HEVC based devices by 2016.

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