Overview of VCEG Activities

Gary J. Sullivan
Rapporteur ITU-T VCEG, co-chair ISO/IEC MPEG, JCT-VC, JVET
AI & Research NExt @ Microsoft

VCEG background

- VCEG is Question 6 of ITU-T Study Group 16
- Traces its roots to H.120 (1984/1988) and H.261 (1988/1990)
- Next after that
  - Joint development of H.262 / MPEG-2 video
  - H.263, initially for videotelephony, later extensions H.263+, H.263++
  - Exploration and joint development of AVC (H.264 / MPEG-4 part 10)
    - Several major extensions: FRext, SVC, MV, 3D
    - Supplemental enhancement information (SEI)
  - Exploration and joint development of HEVC
    - Similar major extensions, screen content coding, & SEI
  - Exploration beyond HEVC
- Became a separate "Question" in 1996

VCEG domain

- Video coding
- Still-image coding (most jointly through JPEG)
- Related data
  - Video back-channel messages
  - Coding-independent code point video/image signal type identifiers
- Coordination with related organizations
- Recent work: Mostly requirements, exploration and oversight of joint work
- Also maintenance and extension of prior standards

VCEG AHG on requirements for future applications, devices, and formats

- Chairs: Thomas Wiegand, Kei Kawamura and Rickard Sjöberg
- Mandates
  - Review and update requirements for next-gen video coding beyond HEVC
  - Work towards developing a draft call for evidence / call for proposals for such work
  - Identify trends in the evolution of formats
  - Identify new applications for digital video and their requirements
  - Estimate development of devices and computing evolution
  - Study network transport issues
  - Identify other application requirements related to video coding standardization in Q6/16

VCEG & JPEG joint AHG on potential future collaboration between JPEG and Q6/16

- Chairs: Justin Ridge and Fernando Pereira
- Mandates
  - Survey areas of potential collaboration between WG 1 and Q6/16
  - Identify a small number specific topics of greatest potential for such future collaboration
  - Prepare and submit a report on the above for review at the July interim meetings

Oversight of JVET and beyond-HEVC compression

- Became an informal collaboration with MPEG in October 2015
- Now the "Joint Video Exploration Team" (JVET)
  - Compression of conventional 2D video
  - HDR/WCG video
  - Omnidirectional 360-degree projection-mapped video
- Current status: Preliminary "Call for Evidence"
- Potential new standard 2020

JEM 5 Compression Gain over HEVC (Main 10 Profile, HM 16.14, luma PSNR)

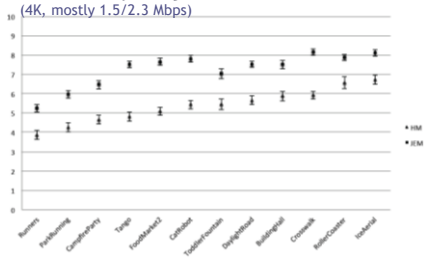
Class	Resolution	Random Access	All Intra	Low Delay B
A1 (People)	3840×2160	28%	22%	–
A2 (Other)	3840×2160	36%	24%	–
B	1920×1080	27%	18%	21%
C	832×480	26%	19%	21%
D	416×240	26%	15%	22%
E (Videoconf)	1280x720	–	22%	25%
Overall		**29%**	**20%**	**22%**

JEM 5 Compression Gain over HEVC (Main 10 Profile, HM 16.14, luma PSNR)

Class	Resolution	Random Access	All Intra	Low Delay B
A1 (People)	3840×2160	28%	22%	–
A2 (Other)	3840×2160	36%	24%	–
B	1920×1080	27%	18%	21%
C	832×480	26%	19%	21%
D	416×240	26%	15%	22%
E (Videoconf)	1280x720	–	22%	25%
Overall		**29%**	**20%**	**22%**
Encode time		**12×**	**63×**	**10×**
Decode time		**10×**	**2×**	**8×**

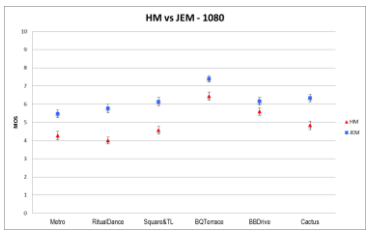
JEM 4 Compression Gain over HEVC Preliminary ***Subjective*** Test Results

(4K, mostly 1.5/2.3 Mbps)



JEM 4 Compression Gain over HEVC Preliminary ***Subjective*** Test Results

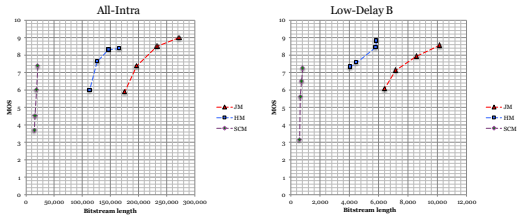
(1080p, 900 kbps and lower)



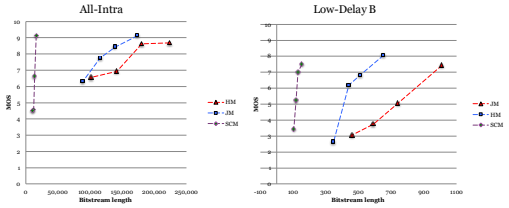
Oversight of JCT-VC collaboration on HEVC: Recent activity

- Screen content coding follow-up
  - Conformance
  - Reference software
  - Verification testing
- HDR/WCG video handling
  - Paper on "PQ10" HDR/WCG video coding
  - Paper on HDR/WCG signalling, backward compatibility, and display adaptation
- SEI & VUI & CICP signal type identifiers (esp. HDR & colour)
  - New Rec. H.273 for CICP (corresponds to part of ISO/IEC 23001-8)

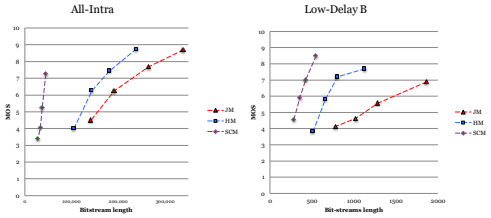
SCC example subjective test: for RGB "ClearType Spreadsheet" 4:4:4



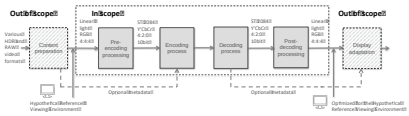
SCC example subjective test: for YUV "ClearType Spreadsheet" 4:4:4



SCC example subjective test: for YUV "Chinese Document Editing" 4:4:4



Coding practices for HDR/WCG coding



- "Conversion and Coding Practices for HDR/WCG $Y'C_BC_R$ 4:2:0 Video with PQ Transfer Characteristics" –report completed January 2017 (ITU-T H.Sup15 | ISO/IEC 23008-14)
  - Collection of "good practices"
  - Adaptive quantization step size control (smaller luma QP & even smaller chroma QP for bright areas)
  - Linear-light *RGB* 4:4:4 → $Y'C_BC_R$ PQ 4:2:0 10 bit → back to 4:4:4
  - SEI/VUI metadata
  - Metadata (e.g., mastering display colour volume & content light level)
- "Signalling, Backward Compatibility, and Display Adaptation for HDR/WCG Video" second report being drafted – planned to be completed October 2017