Opening remarks

Coffee breaks 10:30 and 4:00

IPR policy reminder

Doc alloc.

Attendance & qualification

The agenda approved in April by SG 16 is listed as follows:

- Consideration of proposals for new enhancements of Recs. H.264, H.264.1, H.264.2, H.271, and T.8x.
- Consideration of proposals and organizational work toward eventual development of an "H.265".
- Maintenance of H.26x, H.271, and T.8x video and image coding standards.
- Collection of non-normative content to aid in the study and implementation of H.264.
- Study and coordination relating to use of video and image coding in systems.
- Review, planning and coordination for work of Q.6 and JVT.
- Coordination and communication with other organizations on video and image coding related topics, particularly including ISO/IEC MPEG and JPEG / JBIG
- Other business as necessary for Q.6/16 consideration.

The 36th (San Diego) VCEG meeting is planned for Wednesday the 8th to Friday the 10th of October 2008. The current document registration list is below.

I have suggested a deadline of Saturday the 4th for registrations and uploads. That was a couple of days ago.

Two more (administrative category) documents have been added below (VCEG-AJ04 and VCEG-AJ05) -- based on new information arriving through the SG 16 secretariat.

No docs missing since Monday, except VCEG-AJ30, which was uploaded but inadvertently not made available until Tuesday.

Please send any additional document registration requests to me.

Meeting logistics information was previously sent to this reflector. If you did not get it, please send me or Ajay Luthra a request for a copy.

A document template is now available at http://ftp3.itu.int/av-arch/video-site/0810_San/VCEG-AJxx.dot. It is also attached. It contains important instructions and policy information. Please read it (and use it if drafting a contribution).

InterDigital EX2014
Amazon v. InterDigital
IPR2026-00193

For uploading, please use ftp with user ID avguest and password Avguest to site ftp3.itu.int and put the document in the video-site/dropbox directory.

VCEG-AJ00 [G. Sullivan] List of Documents (this list)
VCEG-AJ01 [G. Sullivan] <reserved for> Report of San Diego VCEG meeting

VCEG-AJ02 [M. Horowitz] AHG computational efficiency
VCEG-AJ03 [T. Wedi & T. K. Tan] AHG coding efficiency

VCEG-AJ04 [TSB] Decision taken at WP 3/16 meeting (Geneva, 3 October 2008) concerning the media coding toolbox
VCEG-AJ05 [AVS China WG] Reply LS on IPTV video coding

VCEG-AJ11 [D.-Y. Kim, K.-H. Han, Y.-L. Lee (Sejong Univ), H.Y. Kim (SK Telecom)] Adaptive intra mode bit skip in intra coding
VCEG-AJ12 [S.C. Lim, H.C. Choi, S.Y. Jeong, J.S. Choi (ETRI)] Integer Sine Transform for Inter Frame
VCEG-AJ13 [T. Chujoh, G. Yasuda, N. Wada, T. Watanabe, T. Yamakage (Toshiba)] Improvement of Block-based Adaptive Loop Filter
VCEG-AJ14 [M. Takahashi, M. Yamaguchi (Hitachi)] A new method for improving motion vector coding
VCEG-AJ15 [K. Nakamura, M. Takahashi, T. Yokoyama (Hitachi), K. Akie, S. Mochizuki, K. Iwata (Renesas Tech)] An Extended VLC for Coding Modes
VCEG-AJ16 [D. Sim et al (ETRI, Kwangwoon Univ., and Kyunghee Univ.)] Unidirectional 4x4 intra prediction
VCEG-AJ17 [D. Sim et al (ETRI, Kwangwoon Univ.)] Modification of Deblocking Filter for Improvement of Coding Efficiency
VCEG-AJ18 [Steffen Kamp, Benjamin Bross, Mathias Wien (RWTH Aachen Univ.)] Fast Decoder Side Motion Vector Derivation
VCEG-AJ19 [B. Lee, M. Kim (ICU), C. Park, S. Hahm, I. Cho (KBS)] RDO based controls of rounding and reconstruction level offsets for quantization <<withdrawn>>
VCEG-AJ20 [S. De Cock, S. Notebaert (Ghent Univ.)] Extended Partitioning with Shape-Adapted Transform
VCEG-AJ21 [J. Kim, T. Na, C. Kim, B. Lee, M. Kim (ICU), C. Park, S. Hahm, I. Cho (KBS)] Enlarging MB size for high fidelity video coding beyond HD
VCEG-AJ22 [B. Haskell, X. Shi (Apple)] Quality Metrics for Coded Video Using JND Models
VCEG-AJ23 [P. Chen, Y. Ye, M. Karczewicz (Qualcomm)] Video coding using extended block sizes
VCEG-AJ24 [Y. Ye, H. Wang, M. Karczewicz (Qualcomm)] Simulation results on MDDT and comments on intra coding
VCEG-AJ25 [R. Panchal, M. Karczewicz (Qualcomm)] Simulation results and comments on Cleaned up KTA2.0 software
VCEG-AJ26 [T. K. Tan, C.S. Boon, A. Fujibayashi (NTT DoCoMo, Inc)] New video coding test sequences

VCEG-AJ27 [L. Shangwen, L. Yu (Zhejiang Univ.)] Additional Results of Second Order Prediction (SOP) in P Slice
VCEG-AJ28 [S. Seo (Konkuk Univ.), Y. Choe, Y.-G. Kim (Yonsei Univ.), Y. Choi (Konkuk Univ.)] A Simulator for Complexity Measurement
VCEG-AJ29 [M. Karczewicz, Y. Ye, P. Chen, G. Motta (Qualcomm)] Single Pass Encoding using Switched Interpolation Filters with Offset
VCEG-AJ30 [M. Karczewicz, Y. Ye, P. Chen, G. Motta (Qualcomm)] Experimental Results of Interpolation Filters on High-Definition Sequences
VCEG-AJ31 [V. Sze (MIT/TI), U. Demircin (TI), M. Budagavi (TI)] CABAC throughput requirements for real-time decoding
VCEG-AJ32 [S. Sekiguchi, S. Yamagishi, Y. Yamada, Y. Kato, K. Asai, T. Murakami (Mitsubishi Electric)] Comments on common test conditions for high-quality coding experiments
--End of List--

On media coding toolbox document

VCEG-AJ04 [TSB] Decision taken at WP 3/16 meeting (Geneva, 3 October 2008) concerning the media coding toolbox

This document is to inform Q6/16 meeting that the discussion and agreement at the recent WP 3/16 meeting (Geneva, 3 October 2008) concerning the media coding toolbox.

The following is an excerpt of COM16-R30 (not yet published):
…
3.5 Media coding toolbox
Q6/16 provided an update on their discussions concerning the toolbox for content coding in TD 372/WP3. Q23/16 also worked in the issue during its Rapporteur group meeting and prepared an updated version of the toolbox as found in TD 385/WP3.
The issue of how the toolbox would evolve was discussed at the Plenary. It was pointed out that a pragmatic approach should be taken, first by issuing the toolbox for content coding as a SG 16 Technical Paper – which would not preclude later on making it another type of publication (e.g. a Recommendation or Supplement). WP 3/16 was strongly urged to be more active in IPTV matters of its competency.
After discussion, WP3/16 decided that as a first step the toolbox for content coding will be published as a SG 16 Technical Paper (informative in nature). The audio part will be ready for approval in January 2009; it is hoped that the same will apply to the video part. Mr Hervé Taddei will be editor of the general part and of the audio part of the document. Q6/16 was asked to appoint an editor for the video part at its upcoming Rapporteur meeting in San Diego, USA, 10-12 Oct 2008.
…

Q6/16 experts are requested to review the issue and appoint an editor for the video coding part and invited to progress it aiming at approval of a SG 16 Technical Paper in the Jan-Feb 2009 meeting of SG 16.

VCEG-AJ05 [AVS China WG] Reply LS on IPTV video coding

On the 26th AVS meeting in Tianjin China, Sept. 23-27, the liaison letter "LS to SMPTE and China AVS on IPTV video coding" from ITU-T Q6/16 was reviewed. This letter is an answering liaison letter to the input liaison letter. The information about the characteristics and capabilities of the AVS1-P2 in relation to the IPTV application are provided.

AVS1-P2 is a short name for The Standards of People's Republic of China GB/T 20090.2—2006, Information Advanced 2: Video. AVS1-P2 has several profiles and levels. A "profile" is a subset of the syntax elements, semantics, and algorithmic features of the AVS standard. A "level" is a specified set of limits on the syntax elements and the values that may be taken by the syntax elements of a certain profile.

AVS1-P2 Jizhun profile is reportedly applied in the IPTV applications in China. It was reported to provide good quality and save at least half bandwidth used by the popular standard H.262. A summary of features are briefly introduced in the document TD 528 (GEN/16).

Question: Are there other profiles? Comment: Under development, there is a "movie" profile, and an "advanced" profile, a "surveillance" profile, and a "mobile" profile that are under development / finalization.

Question: Is interlace supported in Jizhun profile? Comment: Yes.

AVS1-P2 is reportedly a hybrid video codec with spatial and temporal prediction, integer transform and entropy coding. The basic encoding unit is a macro block, which consists of four 8x8 luma blocks and two 8x8 chroma blocks (for 4:2:0 format). The integer DCT transformation, quantization and two dimensional adaptive VLC are performed to the 8x8 pixel blocks. The AVS1-P2 bit stream is defined as a hierarchy of layers. Generally a sequence consists of several GOP (group of pictures, leading by an I picture), which could be a random access point. The other layers between a GOP and a macro block are pictures and slices. AVS1-P2 reportedly has many coding tools, which include deblocking, interlace coding, forward, backward and symmetrical prediction using up to two reference pictures, or four reference fields, variable block size motion compensation down to 8x8 block size, spatial-domain intra prediction with 5 directions, 2D-CAVLC entropy coding, 8x8 integer transformation, as well as weighted prediction, etc.

Level, bit rate, picture sizes, etc. were provided in a table included in the LS.

The latest exact reference of AVS1-P2 is reportedly GB/T 20090.2-2006. It was reportedly approved by the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China in February 2006, taking effect starting March 1, 2006 in China officially. An AVS WG translation of the GB/T 20090.2-2006 is attached with the liaison letter for the GSI IPTV standardization and document referrencing purposes. It was declared in the LS that the Chinese version of AVS1-P2 is the unique official version. If there is any inconsistency between the understanding of Chinese version and English translation, the standard in Chinese version prevails. AVS Working Group reportedly shall not take the responsibility for the inconsistency and any result related with the inconsistency.

The LS suggested that it is impossible to use one unique video coding standard for the global market since the market has already existed for some years. It was reported that MPEG-2/H.262 is used (for IPTV purposes) in some regions (of China?), and in the mean time, AVS or H.264 are reportedly used in other regions.

The AVS group indicated that they would like to closely cooperate with the ITU-T GSI IPTV standardization work in the future.

The complete LS with attachments was available to TIES subscriber ITU-T members at http://ties.itu.int/u/tsg16/sg16/documents/irls/AVS-Reply-LS-to-ITU-TSG16-Q6.zip.

To answer the question of "how the video coding standard is used in current IPTV application deployments", an example from CHINA NETCOM company IPTV application report was attached to the LS. That document reported (p. 7) a deployment of AVS P2 based IPTV with service to the public starting in March 2008, currently with approximately 200k subscribers, with further deployment growth projected. Some quality-of-experience test results were provided for several configurations of the deployed system (sec. 4.2). It was reported that there are currently about 1.5 million IPTV subscribers in China, and IPTV was reported to be a steady growth market.

Comment: There was no comparison to other systems, clear description of these configurations, clear description of how to interpret the reported data, or clear connection to video syntactical capability.

Question: Is AVS used in broadcast? Other IPTV systems?

Comment: This seems to be basically a closed/proprietary system deployment. Aspects other than the video codec are unknown.

Attached to the LS was also an unofficial English translation of AVS1-P2. (The official standard is published only in Chinese – there is no official publication in English – this document was produced by the Working Group.) It appears to contain only one profile (the Jizhun profile).

Comment: No reply yet from SMPTE.

Comment: Basically, toward the desire to assess comparative capabilities in order to consider the possibility of making a selection as advocated in prior contributions, there has been no progress in our understanding of the situation since July.

Defer, revisit.

Meeting plans:

Hawaii? Meeting fee?

VCEG-AJ02 [M. Horowitz] AHG computational efficiency

This report summarized the Computational Efficiency Ad hoc activities between Q.6/16 VCEG meeting held in Berlin, Germany (16 to 18 July 2008) and the current Q.6/16 VCEG meeting in San Diego, USA.

There was no activity on the VCEG-experts email reflector related to this Ad hoc group.

Contributions to this meeting relative to this topic can be summarized as follows:

- VCEG-AJ11 focuses on encoder complexity reduction with a minor (but normative) impact on decoder complexity.
- VCEG-AJ18 discusses computational complexity of a proposed coding efficiency feature, which has overall higher complexity than the current H.264 scheme.
- VCEG-AJ25 proposes complexity reduction for reference encoding software algorithms (with no normative impact).
- VCEG-AJ28 discusses and proposes methods to measure complexity in simulation experiments.
- VCEG-AJ31 provides analysis of throughput requirements for CABAC entropy coding to justify proposed alternative entropy coding technology which is asserted to have lower computational requirements.

VCEG-AJ11 Adaptive intra mode bit skip in intra coding
At the last meeting, an adaptive intra mode bit skip was proposed for improving intra coding performance, in which the proposed method was applied to Intra4×4 and chroma Intra8×8 modes at baseline profile. In this contribution, the proposed method shows the average bit saving of 2.69% and encoding time saving of 17% ~ 59% at baseline profile.

The proposed method also shows the average bit saving of 1.41% and encoding time saving of 17% ~ 59% at high profile when it is applied to Intra8x8 mode.

VCEG-AJ18 Fast Decoder Side Motion Vector Derivation
Decoder-side motion vector derivation (DMVD) using template matching has been shown to improve coding efficiency of H.264/AVC based video coding. Previously, DMVD was performed using a full template matching search in a limited search range. This document provides results for reduced complexity DMVD, where a candidate based fast search algorithm replaces the full search. BD-Bitrate savings of 6.5% averaged over CIF and HD sequences (7.8% for HD sequences) according to the VCEG common conditions for IPPP high profile are observed. By further omitting sub-pel refinement for DMVD, average savings observed for CIF and HD are 5.7% (7.2% for HD sequences).

VCEG-AJ25 Experimental Results on Simplified JMKTA 2.0 Software
Experimental results for simplified version of JMKTA 2.0 are presented. The simplifications include a modified frame level RD decision for B frames and the disabling of the tools not used in the common test conditions. The average complexity reduction for hierarchical B configuration exceeds 50% for HD sequences with 0.12% BD bit rate increase.

VCEG-AJ28 A Simulator for Complexity Measurement
In the 35th VCEG meeting of Berlin, a complexity measurement method was presented (VCEG-AI28). The presented method proposed to measure three complexities for a given algorithm, which enables to deliver more meaningful analysis. For such complexity measurement, the method employs a processor simulator which is easy to use and reasonably accurate. This contribution shows how simple and convenient to use the simulator is and the benefits of the simulator, providing its necessity. For the simplicity of the simulator, the simulation process of the simulator is compared to an execution process using a desktop PC. This comparison shows that these two processes are almost identical and thus, users do not require any education for the simulator. To prove the necessity of the simulator, provided are the problems that might incur when the complexity of a given algorithm is measured utilizing desktop PCs. Additionally, this contribution evaluates and compares the complexity of KTA algorithms to give an insight on what the complexity measurement method utilizing a processor simulator can deliver. For the completed version of the contribution, this document will be revised before it is presented.

VCEG-AJ31 CABAC throughput requirements for real-time decoding
The objective of this contribution is to quantify the H.264 context adaptive binary arithmetic coding (CABAC) decoder throughput requirements for real-time decoding. The necessity for enabling parallelism in CABAC decoding is demonstrated with computations and experiments. This study is expected to provide guidance for the next generation video coding standard CABAC design.

VCEG-AJ03 [T. Wedi & T. K. Tan] AHG coding efficiency

The following summarizes the Coding Efficiency Ad hoc activities between Q.6/16 VCEG meeting held in Berlin, Germany (16 to 18 July 2008) and the current Q.6/16 VCEG meeting in San Diego, USA.

1 Status of KTA-Software

Two new releases of the KTA software were announced by HHI, the software coordinator on 24 and 29 September 2008:

The JM11.0KTA2.1 software (http://iphome.hhi.de/suehring/tml/download/KTA/jm11.0kta2.1.zip) contains addition of

- RDOQ fixes.
  - Compatibility with CAVLC
  - Chroma
- QMS (Toshiba)
  - Replace AQMS with FQMS
- AIF related
  - Based on VCEG-AI12 (Tandberg)
- FDIF: fixed directional filters
- SFP: Special filter position
- LDCO: Local DC offset
  - Based VCEG-AI35 (Qualcomm)
- Frame-level selection among set of fixed filters
- Rounding control for B frames (like H.263+) [using syntax – encoder will indicate to round down if reference and round up in non-reference]
- Encoder B weighting trick (weighting based on the temporal distance) for AIF – consider as a bug fix
  - EAIF based on VCEG-AI38:
- Adaptive interp filter plus integer position filter plus custom per-position offset when doing AIF (all selected on a frame basis)
- Post Filter
  - Post Filter method based on VCEG-AI34

The JM14.2KTA1.0 software (http://iphome.hhi.de/suehring/tml/download/KTA/jm14.2kta1.0.zip) contains addition of

- Entropy Slice (Sharp)

o Adopt base on VCEG-AI32 into the latest JM14.0 version (create a new branch of KTA)
o A bug fix for rate control in combination with SliceMode=2 (constant number of bytes).

2 New Test Material

A total of 43 potential test materials ranging from 1024x768 to 1920x1080 were collected. These sequences were documented in a spreadsheet that was included in the contribution archive. Several comments were also received regarding the selection of the test material and are documented below. It is recommended that these sequences be reviewed and the selection process be discussed during the VCEG meeting.

2.1 Comments on sequences (generally agreed):

- Many of the sequences still have a reduced spectrum (lack of high-frequency detail) or contain a lot of camera noise. It is highly desirable to obtain sequences that have been captured by new cameras.

- Try to remain implementation-independent – the content inside a sequence should be as coherent as possible (rather than, e.g., containing two sections of video content with significantly different characteristics within the same sequence, there should be only similar video characteristics within one sequence); It's pointless to compute average PSNR on incoherent sequences.

- Try to have many test sequences in common conditions, instead of 4-5 (so the outliers will not have a big impact on the average numbers). This issue may, however, have a significant impact on the difficulty of performing experiments. Suggestion: Create an agreed subset of common conditions for those contributions that cannot provide results for the full (larger) set, rather than just having such proponents choose their own subsets. For example, a full set of 15 sequences and a half size set. Remark: One set of complete common conditions results currently takes more than a week with one (dual core) PC. Needs further discussion - breakout.

- Try to have sequences from different sources (cameras) as was mentioned in Berlin.

- The collection of VCEG test material should cover the range “normal” to “complex” sequences. We do not see a reason to include very simple material – assuming that there is something like a broadcast spectrum of material ranging from “simple” (news reader) to “normal” (drama scene) to “complex” (sports?).

2.2 Specific requests:

There is a desire to select sequenced with the following features

- Less regular (content) motion.
- Less regular camera motion for mobile encoding use-cases.

- Focus change (such as the Raven sequence), possibly with multiple focus planes in the picture.
- Spotlight / flash / local lightning. Flash and local lightning are represented in crew, but spotlight is a very different issue.
- Trees, leaves, and grass remain very challenging.
- Confetti is very often used in TV shows; they are mixed with fireworks in almost every sports event. That's a typical use case for broadcast encoders. Such sequences exhibit bit rates as high as 12 Mbps when encoded with the JM at QP 51! More generally, erratic motion has to be considered.
- Straight lines / curves, along with a slow camera pan / rotation / zoom. Typically, lanes in a track and field stadium with slow motion will create aliasing (alias is a major issue both for motion estimation and residual coding, as shown by the current work on interpolation).
- Shadows on highly textured area (for instance, players during a night soccer match).
- Face deformations. Faces should be included in almost every sequence, as a non-expert viewer will immediately identify coding artifacts and color changes on faces.
- Fades (in / out / cross) and text overlay.

2.3 Recommendations:

It was recommended that the collection of sequences be reviewed (including subjective viewing) and if necessary hold a breakout group during the VCEG meeting to discuss the selection of the sequences in depth. Suitable sequences should be shortlisted and unsuitable (eg. very noisy or dark) sequences should be excluded.

3 Coding Efficiency contributions to this meeting

The following contributions related to coding efficiency have been registered for this meeting. The coding efficiency contributions can be clustered as follows:

Information / Common Conditions / Test Sequences / Evaluation Methods:

- VCEG-AJ03 [T. Wedi & T. K. Tan] AHG coding efficiency (Section 2)
- VCEG-AJ22 [B. Haskell, X. Shi (Apple)] Quality Metrics for Coded Video Using JND Models
- VCEG-AJ25 [R. Panchal, M. Karczewicz (Qualcomm)] Simulation results and comments on Cleaned up KTA2.0 software
- VCEG-AJ26 [T. K. Tan, C.S. Boon, A. Fujibayashi (NTT DoCoMo, Inc)] New video coding test sequences
- VCEG-AJ32 [S. Sekiguchi, S. Yamagishi, Y. Yamada, Y. Kato, K. Asai, T. Murakami (Mitsubishi Electric)] Comments on common test conditions for high-quality coding experiments

Spatial Prediction:

- VCEG-AJ16 [D. Sim et al (ETRI, Kwangwoon Univ., and Kyunghee Univ.)] Unidirectional 4x4 intra prediction

Temporal Prediction:

- VCEG-AJ18 [Steffen Kamp, Benjamin Bross, Mathias Wien (RWTH Aachen Univ.)] Fast Decoder Side Motion Vector Derivation
- VCEG-AJ27 [L. Shangwen, L. Yu (Zhejiang Univ.)] Additional Results of Second Order Prediction (SOP) in P Slice
- VCEG-AJ29 [M. Karczewicz, Y. Ye, P. Chen, G. Motta (Qualcomm)] Single Pass Encoding using Switched Interpolation Filters with Offset
- VCEG-AJ30 [M. Karczewicz, Y. Ye, P. Chen, G. Motta (Qualcomm)] Experimental Results of Interpolation Filters on High-Definition Sequences

Prediction partitioning and transform coding:
- VCEG-AJ12 [S.C. Lim, H.C. Choi, S.Y. Jeong, J.S. Choi (ETRI)] Integer Sine Transform for Inter Frame
- VCEG-AJ20 [S. De Cock, S. Notebaert (Ghent Univ.)] Extended Partitioning with Shape-Adapted Transform
- VCEG-AJ21 [J. Kim, T. Na, C. Kim, B. Lee, M. Kim (ICU), C. Park, S. Hahm, I. Cho (KBS)] Enlarging MB size for high fidelity video coding beyond HD
- VCEG-AJ23 [P. Chen, Y. Ye, M. Karczewicz (Qualcomm)] Video coding using extended block sizes
- VCEG-AJ24 [Y. Ye, H. Wang, M. Karczewicz (Qualcomm)] Simulation results on MDDT and comments on intra coding

Entropy coding of mb_type and mb_skip_run
- VCEG-AJ15 [K. Nakamura, M. Takahashi, T. Yokoyama (Hitachi), K. Akie, S. Mochizuki, K. Iwata (Renesas Tech)] An Extended VLC for Coding Modes

Intra Prediction Mode Selection:
- VCEG-AJ11 [D.-Y. Kim, K.-H. Han, Y.-L. Lee (Sejong Univ), H.Y. Kim (SK Telecom)] Adaptive intra mode bit skip in intra coding

Motion Vector Selection / Coding:
- VCEG-AJ14 [M. Takahashi, M. Yamaguchi (Hitachi)] A new method for improving motion vector coding

Post / Loop Filter:
- VCEG-AJ13 [T. Chujoh, G. Yasuda, N. Wada, T. Watanabe, T. Yamakage (Toshiba)] Improvement of Block-based Adaptive Loop Filter \
- VCEG-AJ17 [D. Sim et al (ETRI, Kwangwoon Univ.)] Modification of Deblocking Filter for Improvement of Coding Efficiency

Other (computational efficiency):
- VCEG-AJ28 discusses and proposes methods to measure complexity in simulation experiments.
- VCEG-AJ31 provides analysis of throughput requirements for CABAC entropy coding to justify proposed alternative entropy coding technology which is asserted to have lower computational requirements.

Characteristics of contributions tabulated below:

	Category	Past Related Contribution	Common Conditions Used	Platform used	IPR statement
VCEG-AJ11	Intra Mode Skip	C.433 VCEG-AI23	VCEG-AI10	KTA 1.9r1	Yes
VCEG-AJ12	Integer Sine Transform		VCEG-AE10r1	KTA 2.0	Yes
VCEG-AJ13	Loop Filter	C.402 VCEG-AI18	VCEG-AE10r1	KTA 2.0	Yes
VCEG-AJ14	Motion Vector Coding		VCEG-AI10	KTA1.8	Yes
VCEG-AJ15	mb_type coding		VCEG-AI10	KTA 2.0	Yes
VCEG-AJ16	Intra Prediction			KTA1.8	Yes
VCEG-AJ17	Deblocking filter	VCEG-AI21		KTA1.8	Yes
VCEG-AJ18	Decoder side MV derivation	VCEG-AG16 VCEG-AH15	VCEG-AH10r2	JM13.2	Yes
VCEG-AJ20	Partitioning and Shape Adaptive Transform			KTA1.6	Yes
VCEG-AJ21	Larger MB Size			JM12.0	Yes
VCEG-AJ22	Quality Metrics		N.A.	N.A.	Yes
VCEG-AJ23	Larger MB Size		VCEG-AE10r1	KTA 2.0	Yes
VCEG-AJ24	MDDT	VCEG-AF15 C257 VCEG-AG11 VCEG-AH20	VCEG-AE10r1	KTA 2.1	Yes
VCEG-AJ25	Encoder Simplification		VCEG-AI10	KTA 2.0	Yes
VCEG-AJ26	New Test Sequences		N.A.	N.A.	Yes

	Category	Past Related Contribution	Common Conditions Used	Platform used	IPR statement
VCEG-AJ27	Second order prediction in P	VCEG-AG20 VCEG-AI27	VCEG-AH10	JM10.1	Yes
VCEG-AJ28	Computational efficiency	VCEG-AI28	N.A.	N.A.	Yes
VCEG-AJ29	Switched Interpolation Filter	C.463 VCEG-AI35		KTA 2.0	Yes
VCEG-AJ30	Temporal Prediction – results of interpolation filters	Various	VCEG-AI10	KTA 2.0 and 2.1	Yes
VCEG-AJ31	Computational efficiency	COM 16 – C 334	VCEG-AH10	JM 12.0	Yes
VCEG-AJ32	Common Conditions for 4:4:4 and HD	VCEG-AI30	N.A.	N.A.	N.A.

VCEG-AJ22 [B. Haskell, X. Shi (Apple)] Quality Metrics for Coded Video Using JND Models

In this contribution, it was proposed to use video quality measures for coded video that are based on a Just Noticeable Difference (JND) distortion visibility model. JND visibility models are much more reliable than traditional scoring models that attempt to predict the average quality scores that viewers would give to coded video in subjective tests. A JND visibility model reportedly need only predict if a majority of the viewers can see a difference between the coded video and the original. If they cannot, then a JND = 0 is assigned.

It was proposed to use quality metrics for coded video that are based on JND visibility models.

One such metric is the minimum bit rate for which JND = 0. While easy to describe, this metric requires multiple encodings in order to search for the minimum bit rate.

Another suggested metric is the minimum viewing distance (MVD) for which JND = 0. It was reported that viewing distance is part of the process of computing these JND metrics. It was proposed that this distance be measured as a multiple of pixel height.

Thus for ordinary TV viewing, a value of about 3000 was suggested to be desirable. This metric allows the comparison of different algorithms at the same bit rate.

Depending on the JND visibility model, other metrics that are derived from parameters in the model may reportedly also be feasible.

For constant quality coding, instead of setting qp constant, we specify a desired quality Q and then code each macroblock with the mode and parameters that give the minimum bit rate subject to MVD < Q.

This approach is more of a worst case error metric rather than an overall averaging metric.

Question: Is this metric something well documented that we are allowed to implement and use? (The word "proprietary is in the first sentence of the first reference, and the completeness of the description in the second reference is unknown.) Comment: Access to the technology seems limited.

Comment: Work would need to be done to develop confidence in (and an understanding of) such a metric, and we would need experience with it.

Suggestion: Issue an open call for a distortion metric (or other quality measurement methodology – subjective or objective) suitable for use in our work (not for purposes of approving such a metric to be a standard, but for purposes conducting our experiments). Reaction: Sounds like a good idea.

Revisit related aspects such as whether we can get feedback on our prior LS.

VCEG-AJ25 [R. Panchal, M. Karczewicz (Qualcomm)] Simulation results and comments on Cleaned up KTA2.0 software

Experimental results for a modified version of JMKTA 2.0 were presented. The modifications were reportedly made to simplify the encoding operation. The asserted simplifications include a modified frame level RD decision for B frames and the disabling of the tools not used in the common test conditions. The average complexity reduction for hierarchical B configuration reportedly exceeds 50% for HD sequences with 0.12% BD bit rate increase. The average complexity reduction for IBBP configuration is about 36% for HD sequences with 0.03% BD bit rate increase.

The simplification is to reduce the number of encoding passes, while applying rules to optimize weighted prediction decisions.

Disabling of experimental tools not used in the common test conditions – also seems desirable as a general clean-up issue.

Should be trivial to incorporate into latest KTA software.

Seems obviously desirable.

JVT decision: Adopt (subject to coordination with Karsten and clarification of relationship with RDO-Q). Integration into JM also encouraged.

VCEG-AJ26 [T. K. Tan, C.S. Boon, A. Fujibayashi (NTT DoCoMo, Inc)] New video coding test sequences

This document describes and introduces a set of WVGA and WQVGA resolution video coding test sequences that are made available to VCEG by NTT DoCoMo, Inc. Additionally two other WQVGA resolution sequences were also cropped from available 720p50 and 720p60 test sequences.

Comment: Restrictions on use are undesirable.

Comment: "Nuts" sequence may have too much variation in scene-cut behavior.

Comment: Water in some scenes.

Comment: Don't like "Optis" sequence – too easy.

Comment: Crowd run is better.

Comment: Too many simple sequences in current set.

Include these in the list of available sequences.

Tuesday noon test sequence viewing planned.

Revisit common conditions discussion.

VCEG-AJ32 [S. Sekiguchi, S. Yamagishi, Y. Yamada, Y. Kato, K. Asai, T. Murakami (Mitsubishi Electric)] Comments on common test conditions for high-quality coding experiments

This contribution proposes some recommended changes to the current common test condition for coding efficiency tests so that the conditions can accommodate high-quality coding tests including high-resolution (>= HDTV) and 4:4:4 chroma format.

Contribution subtopic 1: Qp range for reference – The current test condition recommends to use Qp range [22,27,32,37] (for I-slices). One suggested candidate of modified Qp range may be [20, 24, 28, 32].

Remark: Note that steps of 6 cause repetition of the position in the 6-step QP cycle.

Suggestion: How about [20, 25, 30, 35]?

Suggestion: Consider different QP ranges for different test sequences.

Question: Rough PSNR for these values? QP = 21 perhaps 41 dB.

Remark: The test range should cover 37-40 dB (perhaps some outside as well).

Remark: Although QP = 37 has substantial quality degradation, it does represent a useful thing to test, as such low quality is sometimes experienced by users, and worst case quality tends to have a substantial impact on viewer experience.

Remark: Note prior contribution discussion on having two areas of focus: both high quality and low quality ranges.

Further study needed to refine plan.

Contribution subtopic 2: New high-quality video sources

Some recommended candidate sequences discussed. Mitsubishi Electric indicated that they may be able to provide new high quality sequences in addition to those already available.

Contribution subtopic 3: On smaller motion blocks

The contribution reports that motion blocks smaller than 8x8 do not appear beneficial for 720p and higher resolution encoding.

Comment: Summarizing the results in terms of common conditions average BD-Rate and BD-PSNR (for the relevant subset of sequences) would be the right way to measure this.

Question: Is it because of a lack of high frequencies in the source material? Which sequences were tested? How about City sequence?

Comment: This can be a profiling issue as well as a common conditions issue.

Question: What is the software simulation run-time impact of turning off small block inter prediction? Response: May not be major – this is perhaps really more of a profiling comment than a common conditions topic. Suggestion: If it's not a testing issue, perhaps it's better to keep small inter prediction block size support in the common conditions to maximize consistency of settings across different tests and to ensure best quality.

Question: What about the transform? Haven't checked, but that is a less important issue in terms of computational efficiency (except for deblocking impact) than motion block size.

Contribution subtopic 4: Evaluation method for 4:4:4 coding performance

Common conditions do not include 4:4:4. The contribution suggests to include this in some form.

Suggests PSNR metrics to measure as being both of
- luma only (Rec. BT.709 assumptions)
- average of MSE of R, G, B per picture, convert to PSNR, then average across all pictures in sequence

Question: Encoding color space?

Question: What is the color format of the available source sequences? Response: Some form of RGB. Question: What kind of RGB (color primary chromaticity, white point, scaling, offsets)? Response: Unknown.

Revisit to review specific suggested changes to issue in modified CC document.

Spatial Prediction:

VCEG-AJ16 [D. Sim et al (ETRI, Kwangwoon Univ., and Kyunghee Univ.)] Unidirectional 4x4 intra prediction

This contribution proposed a "unidirectional 4x4 intra prediction" for improvement of intra-frame coding efficiency of H.264. The current H.264 has 4x4, 8x8, and 16x16 intra prediction modes. For 4x4 intra prediction, coding gain is achieved by accurate prediction with small block size.

However, it requires send 16 indications of prediction directions for a macro-block.

The proposal is to replace three of the Intra_16x16 macroblock prediction modes with intra prediction modes that operate on a 4x4 basis, but all 4x4 blocks in the macroblock use the same prediction mode, which is one of three modes: horizontal, vertical, or DC. The remaining Intra_16x16 macroblock prediction mode, namely the plane mode, is kept unchanged (didn't have time to replace that one, but could be done in principle).

For intra-frame coding, the proponent reported achieving
- 1.13 % coding gain in BD-bitrate for Baseline profile experiment conditions.
- negligible gain under High profile conditions

Remark: Perceptually, Intra_16x16 is useful for coding very smooth regions with isolated details. This scheme may harm the perceptual effect.

Remark: Consider sky areas, ramps, etc. Suggest review of old contributions from Bjontegaard on the subject.

Remark: Related contribution: VCEG-AF15.

Results also reported relative to KTA 1.8 with MDDT turned on and otherwise Baseline conditions: 1.7% overall savings reported.

Proponent suggests applying similar concept to 8x8 case as a further study topic.

Remark: Gain seems minimal (and only for all-intra), subjective impact unknown.

Contribution noted.

Temporal Prediction:

VCEG-AJ18 [Steffen Kamp, Benjamin Bross, Mathias Wien (RWTH Aachen Univ.)] Fast Decoder Side Motion Vector Derivation

Decoder-side motion vector derivation (DMVD) using template matching has previously been reported to improve the coding efficiency of H.264/AVC based video coding. Previously, DMVD was performed using a full template matching search in a limited search range. This contribution provided results for a reduced complexity DMVD, where a candidate based fast search algorithm replaces the full search.

BD-Bitrate savings of 6.5% relative to JM 13.2, averaged over CIF and HD sequences (7.8% for HD sequences) according to the VCEG common conditions for the IPPP case of High profile conditions were reported. By omitting sub-pel refinement for DMVD, average savings observed for CIF and HD was reported to be 5.7% (7.2% for HD sequences).

The new element of this contribution, relative to prior contributions, is the incorporation of fast search in the decoding process. Question: How much complexity saved? Response: Template search part of the process is reduced by a large factor (up to 40).

Question: Hierarchical B results? Not measured – not implemented yet for the B pictures.

Scheme adds an additional prediction mode, in which an average of the predictions from N "hypothesis" motion vectors obtained with

Remark: This scheme has sensitivity to decoded sample values, which has an impact on transmission error scenarios. Response: That would result in decoded picture corruption, and for skipped macroblocks, a parsing problem (unless skipped macroblocks do not use the scheme, which does not have a major impact on coding efficiency). Have not yet investigated the behavior under such circumstances.

Remark: Some interaction with rounding effects and offset effects.

Remark: There seems to be higher gain for higher frame rates and/or higher resolutions.

Hierarchical B results would be desirable.

Results with new offset and high precision filtering would be desired.

Further study encouraged.

VCEG-AJ27 [L. Shangwen, L. Yu (Zhejiang Univ.)] Additional Results of Second Order Prediction (SOP) in P Slice

Insert description.

Improvement relative to prior result described with new way to indicate modes within the 2nd-order prediction macroblocks.

* Testing with CABAC, B pictures (not yet tested)

* Testing with trellis-based quantization (not yet tested)

* testing with new offset

* Other aspects of exact alignment with common conditions – e.g., version of software used as reference.

* Other aspects of encoding search complexity

* The adaptive 8x8 and 4x4 transform use case seems the most important / relevant.

Further study planned to implement SOP on KTA platform with RDO-Q and then extend to B pictures and CABAC. Complexity study is also suggested.

Remark: What prediction modes tend to be used? A limited set is supported in this scheme (only two modes selectable at prediction block level). Is one of them always DC, for example?

Upload of presentation requested.

Further study encouraged.

VCEG-AJ29 [M. Karczewicz, Y. Ye, P. Chen, G. Motta (Qualcomm)] Single Pass Encoding using Switched Interpolation Filters with Offset

Extensions to a previously proposed method based on switching between fixed interpolation filters and sending a DC offset on the sub-pixel position level were described. The modifications allow single pass encoding. Comparing to single pass H.264/AVC encoder (JMKTA 2.0) the proposed scheme reportedly brings over 12.10% bit rate reduction for 720p sequences. Comparing to multiple pass encoding the gain is reportedly 10.74%.

Prior contributions: VCEG-AI35 and SG 16 contribution 463.

In addition to current 1/4 sample interpolation filter, 2 other fixed filter sets (6 tap 1-D or 4x4 2-D support filters) are provided. On a frame basis, for each of the 15 sub-pel positions, there is an indication of which of the three filters is to be used.

Also on a frame basis, 16 DC offsets are supplied – one for each sub-pel and full pel position.

This contribution describes a single pass encoding method of using this scheme.

Focus on High profile IPPP. (JM KTA did not have single pass hierarchical B support.)

Switchable interpolation filters with offset is already in KTA, but in the past has used multi-pass encoding. This contribution provides an alternative way to use this scheme – in a single-pass fashion – an encoder-only modification.

In the reference for comparison, WP was turned on, but was turned off when the scheme was applied.

Question: How would you use this scheme with weighted prediction at the same time?
Response: Use the scaling but not the offsets.

VCEG disposition: Adopt into KTA design.

Upload of presentation requested.

VCEG-AJ30 [M. Karczewicz, Y. Ye, P. Chen, G. Motta (Qualcomm)] Experimental Results of Interpolation Filters on High-Definition Sequences

Experimental results on the use of fixed and adaptive interpolation filters on new high-definition video sequences are presented here. Results were reported for the IPPP configuration, by following the common test conditions. Comparisons were reported in terms of BD bit rate decrease.

AIF schemes in current KTA software
- Non separable AIF
- Separable AIF
- Directional AIF
- Enhanced directional AIF (E-DAIF), which includes (5x5 nonsep) full-pel filter, filter offset, and better filter decision for each sub-pel position

Not in current KTA software
- Enhanced AIF (E-AIF) [COM 464 and VCEG-AI38], which includes (5x5 nonsep) full-pel filter, filter offset, better filter decision for each sub-pel position, and clustered 12-sample filter support

Previously, there was less data available about how these schemes would perform.

It was reported that the regions of support for E-AIF and E-DAIF are similar for most positions, while E-AIF was reported to have better compression capability (several percent benefit on some sequences).

Remark: For some positions (4 of the 16) there is a smaller region of support in E-DAIF (6 taps rather than 12) than in this scheme.

Remark: There are symmetries imposed in the E-DAIF scheme to reduce the quantity of data to send, and there is a different way to send the filter tap values – those aspects may hurt its comparative coding efficiency.

Remark: Cases other than IPPP would be desirable.

Contribution was submitted as an information contribution. Proponent indicates that this was a mistake, and it is intended as a proposal. A new version will be uploaded to reflect that.

VCEG disposition: Adopt (as 5th mode) into KTA design.

Computational efficiency

VCEG-AJ28 [S. Seo (Konkuk Univ.), Y. Choe, Y.-G. Kim (Yonsei Univ.), Y. Choi (Konkuk Univ.)] A Simulator for Complexity Measurement

discusses and proposes methods to measure complexity in simulation experiments.

Presentation deferred by request.

VCEG-AJ31 [V. Sze (MIT/TI), U. Demircin (TI), M. Budagavi (TI)] CABAC throughput requirements for real-time decoding

The objective of this contribution is to quantify the H.264 context adaptive binary arithmetic coding (CABAC) decoder throughput requirements for real-time decoding. A need for enabling parallelism in CABAC decoding was asserted. Supporting analysis and experiment results were presented. This study was suggested by the proponent to provide guidance for the next generation video coding standard CABAC design.

Prior contribution was COM 16 334.

The contribution provides analysis of throughput requirements for CABAC entropy coding to justify a proposed alternative entropy coding technology, which was asserted to have lower computational requirements. For example, level 4 would have worst-case 275 Mbins/sec, level 4.1 would have max 527 Mbins/sec, level 4.2 would have max 1116 Mbins/sec, level 5.1 would have max 2107 Mbins/sec.

Proposed changes relative to current CABAC design:
- N-ary arithmetic coder (e.g., N=2)
- Use multiplies rather than table look-ups to avoid combinatoric table size expansion (table sizes and contexts expand with N)
- Reduced number/frequency of state updates

Analysis was provided of which syntax elements dominate the throughput. It was suggested to only change the processing of those critical (approximately 12) syntax elements.

Approximately a factor of N reduction in processing cycles was reported with less than 1% bit rate penalty reported.

Remark: There are various (not a small number) current implementations that can handle stress bitstreams for High profile level 4.1. This issue is not being exhibited in today's (custom chip) products as being a problem. Response: Such implementations may use latency increases to accomplish that.

Remark: Also some of these issues are theoretical worst case evil bitstreams, not really what happens in practice.

Remark: But less complexity is a good thing.

Remark: And latency reduction is good.

Remark: And it's especially hard for general purpose CPU software.

Remark: There are implementation issues with implementing the N-ary scheme as well.

Remark: Multiplication-free operation, for example, is a nice property.

Remark: There is some parallel implementation without changing the spec.

Remark: There are High profile mobile phone chips with low power.

Remark: In future profile specifications, we should think about this throughput issue. Replying remark: Actually, we have already been doing that lately by imposing limits on the number of macroblocks in a slice.

Further study encouraged.

Prediction partitioning and transform coding:

VCEG-AJ12 [S.C. Lim, H.C. Choi, S.Y. Jeong, J.S. Choi (ETRI)] Integer Sine Transform for Inter Frame

This contribution proposed a rate-distortion optimized transform coding method that adaptively employs either integer cosine transform (ICT), also known as the integer transform of H.264, or integer sine transform (IST) for inter frames. The proposed method was reported to have been implemented into the KTA software (version 2.0) with a result of an average 2.11% of bit rate saving achieved in the IBBP prediction structure case for High Profile.

Implemented both 4x4 and 8x8 block sizes of IST.

Flag sent on MB basis or, when MB is partitioned into 8x8 sub-MBs, 8x8 basis to indicate the transform type. Question: Why not on MB basis? Response: Seemed to work better for sub-MB basis.

Remark: Consider relationship to adaptive prediction error coding (APEC). The amount of improvement seems in the same ballpark. A sine transform is more complex than no transform at all.

Remark: Ability to weight the quantization by frequency may be a benefit for considering the sine transform as a candidate – can't do that with no transform.

Further study encouraged.

VCEG-AJ20 [S. De Cock, S. Notebaert (Ghent Univ.)] Extended Partitioning with Shape-Adapted Transform

This document extends the partitioning scheme proposed in VCEG-AI25, by combining extended partitioning with shape-adaptive discrete cosine transforms. This results in the ability to transform residuals from distinct partitions separately, irrespective of their shape. This combination improves both objective and perceptual quality.

Prior contribution VCEG-AI25 (with ordinary block transforms but bi-partitioning of prediction additional macroblock mode with horizontal, vertical, and +/-45 degree partitionings with full pel positioning of the bifurcation point). This uses fewer angles of partitioning than prior VCEG-AF10, VCEG-AG13, VCEG-AH16 contributions. Partitionings with very small areas are omitted. The number of new MB modes was reduced from 90 to 50, and the number of new sub-MB modes was reduced from 42 to 22. Still substantially more things to test than in anchor case – about a factor of 5.

The prior proposal applied the block transform across the partitioning boundaries. This new contribution uses shape-adaptive DCT.

Has not been implemented with CABAC.

Improvement in coding efficiency relative to prior bifurcation scheme, although rather marginal in PSNR terms. Perceptually, the SA-DCT scheme is reportedly better – removing a significant number of artifacts.

Suggestion: Filter across boundary in prediction signal, then apply ordinary block-based transform.

Remark: Consider combination with increased macroblock size as proposed in other contributions.

Remark: Consider further investigation of shape coding issues, possibly in a more general way.

Further study encouraged.

VCEG-AJ21 [J. Kim, T. Na, C. Kim, B. Lee, M. Kim (ICU), C. Park, S. Hahm, I. Cho (KBS)] Enlarging MB size for high fidelity video coding beyond HD

In this contribution, it was proposed to extend the architecture of H.264 with enlarged MB sizes. It is suggested that the limitation of the MB size to 16x16 may be harmful to RD performance for high resolution video. This contribution considers by enlarging MB size to a maximum of 128x128. This attempt has been made with an extension to JM reference software. For this, the following aspects were redefined or extended: new MB mode types for enlarged MB, CBP for new MBs or block indexing etc. In this proposal, an extended architecture with the enlarged MB structure was proposed for ME&MC. Topics suggested for further study that were not yet addressed included new designs of transform kernels, intra prediction, luma/chroma DC transforms, CABAC context models and de-blocking filters for the enlarged MB supporting structure.

Experimental results not yet provided – this contribution just describes some interim preliminary design aspects.

Further study encouraged.

VCEG-AJ23 [P. Chen, Y. Ye, M. Karczewicz (Qualcomm)] Video coding using extended block sizes

Requested to delay presentation until Friday.

VCEG-AJ24 [Y. Ye, H. Wang, M. Karczewicz (Qualcomm)] Simulation results on MDDT and comments on intra coding

A few bug fixes for mode-dependent directional transform (MDDT) have been incorporated into the latest KTA software (version 2.1). MDDT performance gains for all prediction settings under the VCEG common testing conditions were collected and summarized in this submission. Some observations on intra coding were also discussed.

Information document reporting on latest simulation results.

Intra-only result on common conditions: 6% overall gain with CABAC enabled.

Also provides about 2% gain on IPPP, IBBP, and HierB cases on average.

Bidirectional intra prediction design reported to still be able to provide some additional gain (that scheme is not part of official KTA software).

Note: VLC changes were also previously proposed, not included in official KTA software, that can reportedly provide gain (a few additional percent) when combined with MDDT and bidirectional intra prediction, relative to CAVLC.

Note: There is no CAVLC mode of operation in the current KTA software supporting the current MDDT scheme due to lack of 16x16 transform support in current CAVLC scheme.

Updated information appreciated.

Entropy coding of mb_type and mb_skip_run

VCEG-AJ15 [K. Nakamura, M. Takahashi, T. Yokoyama (Hitachi), K. Akie, S. Mochizuki, K. Iwata (Renesas Tech)] An Extended VLC for Coding Modes

In this contribution, it was proposed to consider a modified VLC scheme for coding modes. In particular, the contribution discussed mb_type and mb_skip_run. In the proposed method, VLC tables for these syntax elements were adaptively created using

statistical information for the previously encoded/decoded blocks. Experimental results reportedly show an average 0.80% (maximum 3.70%) bit rate reduction for the Baseline IPPP structure reference when disabling some modes (inter 4x4, 8x4 and 4x8) in the anchor (to simplify the effort of implementing the design modifications by not supporting some modes in the modified scheme).

Future study work suggested by proponent includes B slices and CABAC and the missing prediction modes.

Question: How does the concept of application to CABAC make sense? Response: Apply to bin string. Remark: Doubt there will be any benefit to that.

Further study encouraged.

Intra Prediction Mode Selection:

VCEG-AJ11 [D.-Y. Kim, K.-H. Han, Y.-L. Lee (Sejong Univ), H.Y. Kim (SK Telecom)] Adaptive intra mode bit skip in intra coding

At the last meeting, an adaptive intra mode bit skip scheme was proposed in VCEG-AI23 for improving intra coding performance, in which the proposed method was applied to Intra4×4 and chroma Intra8×8 modes at baseline profile. In this contribution, the proposed method shows the average bit saving of 2.69% and encoding time saving of 17% ~ 59% at Baseline profile for all-intra coding. The proposed method also shows the average bit saving of 1.41% and encoding time saving of 17% ~ 59% at High profile when it is applied to Intra8x8 mode for all-intra coding. Gain reportedly improves for low bit rates and for high resolutions.

See also notes from previous meetings.

Implemented in KTA 1.9r1 with all-Intra use.

Question: Any new information about combination with MDDT? Has this been tested together with MDDT for High profile reference configurations? Not yet.

Note decoder complexity increase (variance of neighboring samples).

Note dependency of the parsing process on the values of the decoded samples. Probably can't apply this to intra macroblocks predicted from neighbor inter macroblocks.

Question: Was encoder-only (non-normative) application of the concepts tried and compared (or other encoder-only fast intra mode selection ideas)? No.

Further study encouraged.

Motion Vector Selection / Coding:

- VCEG-AJ14 [M. Takahashi, M. Yamaguchi (Hitachi)] A new method for improving motion vector coding

Post / Loop Filter:

- VCEG-AJ13 [T. Chujoh, G. Yasuda, N. Wada, T. Watanabe, T. Yamakage (Toshiba)] Improvement of Block-based Adaptive Loop Filter \
- VCEG-AJ17 [D. Sim et al (ETRI, Kwangwoon Univ.)] Modification of Deblocking Filter for Improvement of Coding Efficiency