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RULING CODECS OF VIDEO COMPRESSION AND ITS FUTURE

[1]Dr.Manju.v.C, [2]Apsara and [3]Annapoorna

[1]Professor,KSIT

[2]Under-Gradute, Telecommunication Engineering, KSIT

[3]Under-Gradute, Telecommunication Engineering, KSIT

Abstract

Development of economical video codecs for low bitrate video transmission with higher compression potency has been a vigorous space of analysis over past years and varied techniques are projected to fulfill this need.
Video Compression is a term accustomed outline a technique for reducing the information accustomed cipher digital video content. This reduction in knowledge interprets to edges like smaller storage needs and lower transmission information measure needs, for a clip of video content. In this paper, we survey different video codec standards and also discuss about the challenges in VP9 codec
Keywords: Codecs, HEVC, VP9, AV1

1. INTRODUCTION

Storing video requires a lot of storage space. To make this task manageable, video compression technology was developed to compress video, also known as a codec. Video coding techniques provide economic solutions to represent video data in a more compact and stout way so that the storage and transmission of video will be completed in less value in less cost in terms of bandwidth, size and power consumption. This technology (video compression) reduces redundancies in spatial and temporal directions. Spatial reduction physically reduces the size of the video data by selectively discarding up to a fourth or more of unneeded parts of the original data in a frame [1]. Temporal reduction, Inter-frame delta compression or motion compression, significantly reduces the amount of data needed to store a video frame by encoding only the pixels that change between consecutive frames in a sequence.
There are three main categories of video codecs. The first are standards developed by standardization bodies such as MPEG (ex: MPEG-1 and MPEG-2) and ITU (ex: H.261 and H.263). These also include the more advanced and widely accepted standards H.264/AVC and H.265/HEVC, created when ITU and ISO experts joined forces. The second category are proprietary codecs developed by individual companies and research groups. The third category is open-source codecs, which do not go through official standardization, but by releasing the source code essentially create de-facto standards. This category includes codecs such as Theora, Dirac, Daala, VP8, VP9 and the emerging AV1.The main aim of this paper is to provide an overview on codecs like HEVC, VP9 and AV1 and also provide feature comparison between them.

2.VIDEO COMPRESSION TECHNIQUES

2.1HEVC

H.265 also known as HEVC, High-Efficiency Video Codec is the successor of H.264 (AVC). The High-Efficiency Video Coding (HEVC) standard is the most present-day joint video project of the ITU-T Video Coding Experts Group (VCEG) and the ISO/IEC Moving Picture Experts Group (MPEG) standardization organizations, working together in a partnership known as the Joint Collaborative Team on Video Coding (JCT-VC).HEVC is promising an massive 50% bandwidth reduction for the same video quality.

The HEVC standard is meant to attain leigon goals, including coding efficiency, simple transport system integration and data loss resilience, likewise implement ability using parallel processing architectures. x265 is an open source software library and application for encoding video streams into the H.265. HEVC is not supported on Firefox or Chrome, the top browser used by most platforms .HEVC has been supported on iOS since 2017, and although it is required on Android devices starting 5.0 and beyond, lots of devices will still have hardware HEVC decoding. Again, that comes back to licensing issues.

2.2.VP9

VP9 is an open codec standard from Google's webM project [2]. On the market since June 2013, it is the successor to the VP8 codec and VP9 is the last iteration of VPx, as Google formed the Alliance for Open Media in Sept 2015 to consolidate open source codec development with Mozilla, Cisco, Microsoft, Intel, and others. The next version of VPx codec family is being integrated into AV1, the codec from the Alliance for Open Media (AOM) [4] and thus VP9 can also be viewed as the forerunner to AV1. VP9 was designed to achieve up to 2x bandwidth compression over its predecessor (VP8) and in turn promises similar gains over H.264, the incumbent video standard for online streaming. With a combination of newer toolsets and unique features [7], VP9 is ideally placed to be the ensuing major step in improving online video services.
VP9 software is available in the form of libvpx, the open source VP9 implementation from the webM team. libvpx includes both encoder and decoder software implementations. Silicon implementations of the decoders are also available through Google and supported by several leading chip manufacturers. VP9 is mandatory for Android TV and is also supported by popular browsers like Chrome, Opera and Firefox in HTML5.

2.2.1 CHALLENGE IN VP9

Still, engineers and designers doing analysis on CPU simulator to identify hotspots in the existing code. By making use of an iterative approach in optimization – possible issue identification using internal tools and micro-architectural knowledge, coding and measuring performance for a new solution, and getting back to code review. Specifically, during WebM/libvpx optimization we came across of a lot of front-end related issues. These issues are easy to spot and fix and might provide substantial performance improvements to your application [8].
VP9 isn't slow; it is simply extremely inefficient in a multiple-core environment, which makes it harder for developers to design encoding systems that operate with higher potency. For this reason, expect to visualize substantial differences in encoding times (and quality) in programs that support VP9. Developers creating their own encoders should design their architecture from the start knowing that they're going to have to deploy a system like Google's to maximize VP9 encoding time and efficiency. This is especially true in the cloud, where you pay for an instance by the hour, and the ability to spread encoding chores over as few CPUs and CPU-hours as possible translates directly to the bottom line.

2.3 AV1

AV1 is an open, royalty-free, next-generation video coding format from the Alliance of Open Media Video. It is designed to switch Google's VP9 and vie with H.265/HEVC. AV1 is targeting an expected improvement of about 30% over VP9/HEVC with only reasonable increases in encoding and playback complexity.
Salient features:

- Interoperable and open
- Designed with a low computational footprint and optimized for the hardware
- Capable of consistent, highest-quality, real-time video delivery
- Optimized for the Internet
- Scalable to any modern device at any bandwidth
- Flexible for both commercial and non-commercial content, including user-generated content.

The goal of the AV1 project is to replace AVC/H.264 as the predominant video format for the web and to compete with the HEVC codec, so high-quality video can be shared freely and efficiently on the open web platform. Table shows a comparison of the main coding tools in MPEG-2, MPEG-4 Part 2 and H.264/ AVC.

Table 1: Feature Comparison Summary

	HEVC	VP9	AVC
Blocks	Quad-tree structure Coding Tree Unit of 16x16 -64x64 ▪ Coding unit (to 8x8) ▪ Prediction units (+asymmetric) ▪ Transform units (may be larger than prediction unit)	Quad-tree structure with 64x64 super-block ▪ Coding unit (to 8x8) ▪ Prediction units ▪ Transform units	16x16 MacroBlocks (MBs), Each MB can be further partitioned for prediction & transform
Sub-frame units	Rectangular Tiles and Slices	Dependent slices and segments	Slices - consecutive MBs or FMO (not in use)
Frame headers	VPS / SPS / PPS	Frame headers only - interleaved	SPS / PPS
# of INTRA prediction modes	33 + 2	8 directional +2	Up to 9
Inter prediction	1/4 pel MV, weighted prediction and direct modes	Up to 1/8 pel Motion Vector	1/4 pel MV, weighted prediction and direct modes
Reference frames	Up to 16 (up to 4 for high resolution)	Up to 3 active, Always 8 stored	Up to 16 (up to 4 for high resolution)
Frame types	INTRA (I), INTER (P) and Bidirectional (B)	INTRA, INTER & Hidden	INTRA (I), INTER(P) and Bidirectional (B)
Transform	▪ DCT and limited DST support ▪ Up to 32x32	▪ DCT and ADST ▪ Up to 32x32	▪ Integer DCT •4x4 8x8
Quant	Adapted at the CY level	Fixed at frame level but can differ per segment	Adapted at MB level
Entropy coding (VLC)	Context Adaptive Binary Arithmetic Coding (CABAC)	Adaptive Arithmetic coding-adapted at frame level	CABAC & CAVLC

3. CONCLUSION AND FUTURE SCOPE

Video compression is gaining popularity since storage and network bandwidth requirements are reduced with compression. In this paper, we have presented a survey on the different video codecs and their issues Most recent efforts on video compression for video have focused on scalable video coding. The primary objectives of on-going research on scalable video coding are to achieve high compression efficiency high flexibility (bandwidth scalability) and/or low complexity.

Due to the conflicting nature of efficiency, flexibility and complexness, each scalable video coding scheme seeks trade-offs on the three factors. Designers of video services need to choose an appropriate scalable video coding scheme, which meets the target efficiency and flexibility at an affordable cost and complexity.

Nowadays, industry is involved in video coding research , it appears that the area is more active than ever before. The Alliance for Open Media (AOM) was founded in 2015 by leading tech companies to collaborate on an open and royalty-free video codec. The goal of AOM was to develop video coding technology that was efficient, cost-effective, high quality and interoperable, leading to the launch of AV1 this year. In the ITU-T VCEG and ISO/IEC MPEG standardization world, the Joint Video Experts Team (JVET) was formed in October 2017 to develop a new video standard that has capabilities beyond HEVC. The recently-concluded Call for Proposals attracted an impressive number of 32 institutions from industry and academia, with a combined 22 submissions. The new standard, which will be called Versatile Video Coding (VVC), is expected to be finalized by October 2020

References

[1] M. Abomhara, O.O. Khalifa, O. Zakaria, A.A. Zaidan, B.B. Zaidan and A. Rame, "Video Compression Techniques: An Overview", Journal of Applied Sciences, 10: 1834-1840.
[2] Alliance for Open Media (AOM),
[3] Mukund Srinivasan,"VP9 Encoder and Decoders for Next Generation Online Video Platforms and Services",SMPTE Conference
[4] Debargha Mukherjee et. al., "A Technical Overview of VP9--the Latest Open-Source Video Codec", SMPTE Motion Imaging Journal
[5] Ashraf, G. and M.N. Chong, 1997. "Performance analysis of H.261 and H.263 video coding algorithms" Proceedings of the 1997 IEEE International Symposium on Consumer Electronics, Dec. 2-4, Sch. of Applied Science, Nanyang Technology Institute, pp: 153-156.
[6] Avaro, O. and P. Salembier, 2001. "MPEG-7 systems: Overview. IEEE Trans. Circuits Syst. Video Technol"., 11: 760-764.
[7] MSU Video Group. "Eighth MPEG-4 AVC/H.264 Video Codecs Comparison", http://compression.ru/video/codec_comparison/h264_2012/
[8] ITU-Recommendation BT.1788,"Methodology for the subjective assessment of video quality in multimedia applications"
[9] S. Winkler, "Digital Video Quality: Vision Models and Metrics",John Wiley and Sons Ltd., 2005. 175 pages.
[10] Z. Wang, AC Bovik, HR Sheikh and EP Simoncelli, "Image quality assessment: From error visibility to structural similarity," IEEE Transactions on Image Processing, vol. 13, no. 4, pp. 600-612, Apr 2004.
[11] The Consumer Digital Video Library. Http://www.cdvl.org/.
[12] MSU Video Group. http://compression.ru/video/
[13] A. Vetro, T. Wiegand, and G.J. Sullivan, "Overview of the stereo and multiview video coding extensions of the H. 264/MPEG-4 AVC standard," Proc. of the IEEE, vol. 99, no. 4, pp. 626-642, April 2011.
[14] "High efficiency video coding," ITU-T Recommendation H.265 and ISO/IEC 23008-2, April 2013 (and subsequent editions).
[15] G.J. Sullivan, J. Ohm, T.K. Tan, and T. Wiegand, "Overview of the High Efficiency Video Coding (HEVC) Standard," IEEE Trans. on Circuits and Systems for Video Technology (TCSVT), vol. 22, no. 12, pp. 1649–1668, December 2012.
[16] G. J. Sullivan, J. M. Boyce, Y. Chen, J. R. Ohm, C. A. Segall and A. Vetro, "Standardized extensions of high efficiency video coding (HEVC)" IEEE Journal of Selected Topics in Signal Processing, vol. 7, pp. 1001-1016, 2013.
[17] Mallik, B., & Akbari, A. S. (2016).HEVC Based Multi-view Video Codec Using Frame Interleaving Technique.2016 9th International Conference on Developments in eSystems Engineering (DeSE).doi:10.1109/dese.2016.31
[18] Richardson. I. E. G. H.264 and MPEG-4 Video Compression: Video Coding for Next-generation Multimedia, Wiley, Chichester, 2003.