International Journal of Innovative Research in Science and Engineering
Vol. No.3, Issue 01, January 2017
www.ijirse.com
ISSN (O) 2454-9665
ISSN (P) 2454-0663

COMPARISONS OF H.265/HEVC (HIGH EFFICIENCY VIDEO CODING) AND H.264/AVC (ADVANCE VIDEO CODING) WITH THE HELP OF N-TAP INTERPOLATION FILTER

Miss. Shraddha S. Moghe[1], Mr.Lokesh R. Chawle[2]

[1,2]Rajiv Gandhi College of Engineering and TechnologyWanadongri,
Nagpur,(R.T.M.N.U)Maharashtra, India

ABSTRACT

The next-generation video coding standard of High-Efficiency Video Coding (HEVC) is especially efficient for coding high-resolution video such as 8K-ultra-high-definition (UHD) video. This paper provides the latest developments in HEVC related technologies, implementations and systems with focus on further research. The fractional-pel interpolation filter adopted in H.264/AVC improves motion compensation greatly. Recently, a new DCT-based fractional-pel interpolation filter is adopted in the oncoming standard HEVC. We are interested in the differences between these two types of fractional-pel interpolation filters. In this paper we describe the derivations of fractional-pel interpolation filters in HEVC and H.264/AVC in detail, and compare them on properties of frequency responses. In this project find that the half-pel interpolation filters in HEVC and H.264/AVC are very similar, but the low-pass properties of quarter-pel interpolation filters in HEVC are much better than those in H.264/AVC. The fractional-pel interpolation filters (6-tap FIR and Average) adopted in H.264/AVC improves motion compensation greatly.

Keywords:Fractional pel Interpolation filter, H.264/AVC,H.265/ HEVC, MATLAB, Video compression.

I. INTRODUCTION

Compare and analyze the fractional-pel interpolation filters in HEVC and H.264/AVC based on their FIR Interpolation Filter. The interpolation filters used in H.264 are 6 tap FIR filter for half pel interpolation and the average filter for quarter-pel interpolation In HEVC, an 8-tap DCTIF is used for half-pel interpolation and a 7-tap DCTIF is used for quarter-pel interpolation. In HEVC decoding application, fractional pixels are interpolated with eight-tap and seven-tap filters for the motion compensation process. The comparison of the modified filter coefficients based on frequency response, Bitrate.

Similarly, the DCT - based fractional-pel interpolation filters (7-tap and 8-tap) are adopted in the HEVC standard. This project involves the differences in performance between these two types of interpolation filter, compression ratio, FME and Bit rate frame per second.The rest of the

Paper is organized in five sections. In section 2, we will present the literature survey of HEVC and H.264/AVC. In Section 3, luma interpolation process is explained. Section 4 will present the methodology. Section 5 will described the desired output of our project. In section 6, we will give the brief conclusion of our project. At last in section 7 Future scopes is explained

II. LITERATURE SURVEY

The compression capability of several generations of video coding standards is compared by means of peak signal-to-noise ratio (PSNR). A unified approach is applied to the analysis of designs, including H.262/MPEG-2 Video, H.263, MPEG-4 Visual, H.264/MPEG-4 (AVC), and HEVC.The HEVC design is shown to be especially effective for low bit rates, high-resolution video content, and low-delay communication applications.[1].The fractional-pel interpolation filter adopted in H.264/AVC improves motion compensation greatly.In this paper we are interested in the differences between these two types of fractional-pel interpolation filters and Compare them on properties of frequency responses.we describe the derivations of fractional-pel interpolation filters in HEVC and H.264/AVC in detail.[2].The paper [3] presents the architecture of the high throughput compensator and the interpolator used in the motion estimation of the H.265/HEVC encoder. The low-pass properties of quarter-pel interpolation filters in HEVC are much better than those in H.264/AVC.Synthesis results show that the design can operate at 200 and 400 MHz when implemented in FPGAThe paper [4] presents that the video coding standard are achieved by improving many aspects of the traditional hybrid coding framework.These improvements include filter coefficient design with an increased number of taps.Coding efficiency improvements over the H.264/AVC interpolation filter are studied and experimental results are presented.

III. LUMA INTERPOLATION PROCESS

Interpolation filter is applied in motion compensation for fractional position values generation. Current motion vector accuracy for luma components in HEVC is still quarter-pel, so 15 fractional-pel pixels will be interpolated showed in Fig.1, For fractional positions a, b and c, horizontal 1D filter is used. For fractional positions d, h and n, vertical 1D filter is used. For remaining positions, first horizontal 1D filter is applied for extended block and then vertical 1D filter is used. The block extension is 2M-1 (2M is the number of filter taps). For example, The fractional-pel pixels labeled a0,0, b0,0 and c0,0 shall be derived by applying the 8-tap filter in horizontal direction to the adjacent integer pixels as described by Eq.(14a)~(14c). And the fractional-pel pixelslabeled d0,0, h0,0 and n0,0 shall be derived by applying the 8-tap filter in vertical direction.

$$a_{0,0}=(-A_{-3,0}+4\times A_{-2,0}-10\times A_{-1,0}+58\times A_{0,0}+17\times A_{1,0}-5\times A_{2,0}+A_{3,0}+32)>>6 \quad \text{——[1]}$$

$$b_{0,0}=(-A_{-3,0}+4\times A_{-2,0}-11\times A_{-1,0}+40\times A_{0,0}+40\times A_{1,0}-11\times A_{2,0}+4\times A_{3,0}-A_{4,0}+32) >>6 \quad \text{——[2]}$$

$$c_{0,0}=(-A_{-2,0}-5\times A_{-1,0}+17\times A_{0,0}+58\times A_{1,0}-10\times A_{2,0}-5\times A_{2,0}+4\times A_{3,0}-A_{4,0}+32) >> 6 \quad \text{——[3]}$$

Integer pixels (A^x,y), half pixels (b^x,y, h^x,y, j^x,y), and quarter pixels (a^x,y, c^x,y, d^x,y, e^x,y, f^x,y, g^x,y, i^x,y, k^x,y, p^x,y, q^x,y, r^x,y, n^x,y) in a PU are shown in Fig. 1.

ISSN (O) 2454-9665
ISSN (P) 2454-0663

$A_{-1,-1}$				$A_{0,-1}$	$a_{0,-1}$	$b_{0,-1}$	$c_{0,-1}$	$A_{1,-1}$
$A_{-1,0}$				$A_{0,0}$	$a_{0,0}$	$b_{0,0}$	$c_{0,0}$	$A_{1,0}$
$d_{-1,0}$				$d_{0,0}$	$e_{0,0}$	$f_{0,0}$	$g_{0,0}$	$d_{1,0}$
$h_{-1,0}$				$h_{0,0}$	$i_{0,0}$	$j_{0,0}$	$k_{0,0}$	$h_{1,0}$
$n_{-1,0}$				$n_{0,0}$	$p_{0,0}$	$q_{0,0}$	$r_{0,0}$	$n_{1,0}$
$A_{-1,1}$				$A_{0,1}$	a_{01}	$b_{0,1}$	c_{01}	$A_{1,1}$

[Fig1.integer,half,and quarter pixels. The positions of integer pixels,half pixels, and quarter pixels in pu. Variable (A^xy) represent integer pixel. Variable (b^xy, h^xy, j^xy) representnhalf pixels. Variable (a^xy, c^xy, d^xy,e^xy,f^xy,g^xy, i^xy, k^xy, p^xy, q^xy,r^xy,n^xy) represent quarter pixels.

The half pixels are interpolated from the nearest integer pixels in either horizontal direction or vertical direction. The quarter pixels are interpolated from the nearest half pixels in the horizontal direction and in the vertical direction, respectively, using type A, type B, or type C filter. According to which fractional pixel should be computed, oneinterpolation filter is chosen. As the position of a quarter pixel point is close to the integer pixel, we can choose a seven-tap interpolation filter. But for the farther half pixel point, an eight-tap filter is required.

IV. METHODOLOGY

This paper provides the latest developments in HEVC relatedtechnologies, implementations and systems with focus on further research In this paper we design the FIR luma filter for HEVC (High efficiency video coding).we compare the H.264/AVC with H.265/HEVC with respect to frequency response, bit rate, compression. A detailed analysis of the compression performance of HEVC compared against various other international standards.The best way to measure compression performance is to measure subjective quality as perceived by actual human viewers

ISSN (O) 2454-9665
ISSN (P) 2454-0663

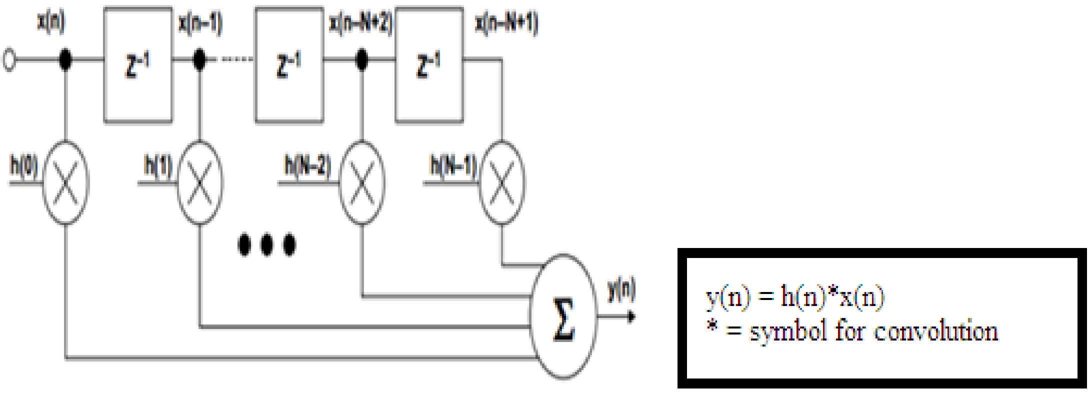


Fig 2. N Tap Finite impulse response (FIR) Filter

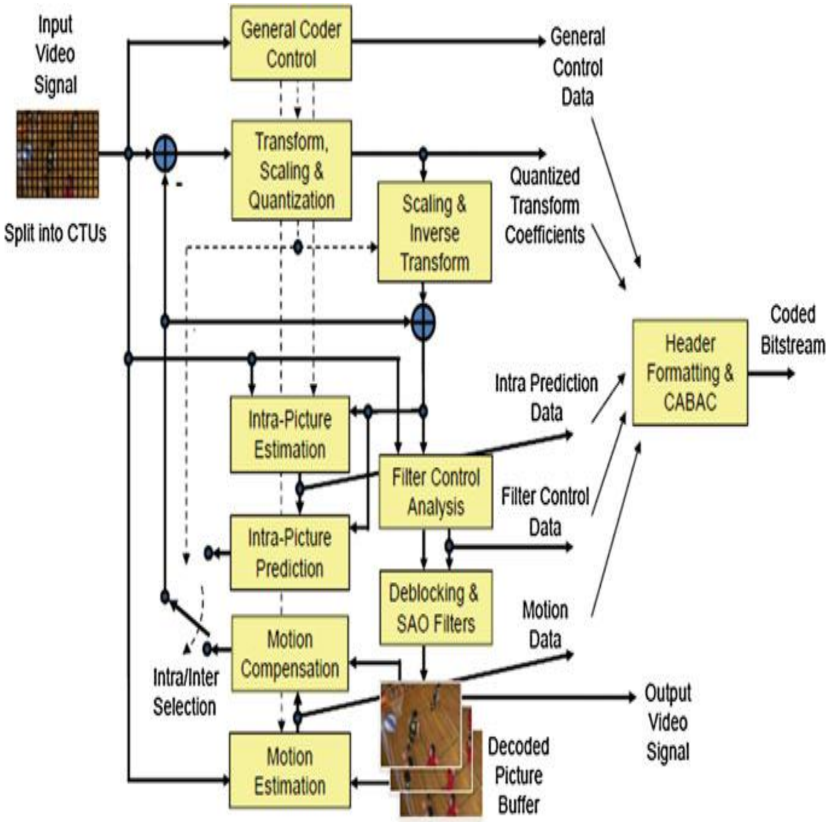
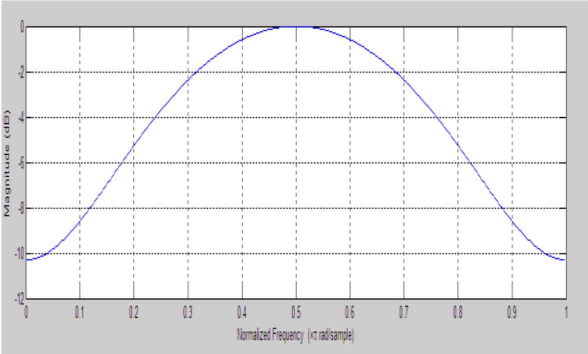


Fig 3. HEVC encoder block diagram

V. DESIRED OUTPUT

International Journal of Innovative Research in Science and Engineering
Vol. No.3, Issue 01, January 2017
www.ijirse.com
ISSN (O) 2454-9665
ISSN (P) 2454-0663



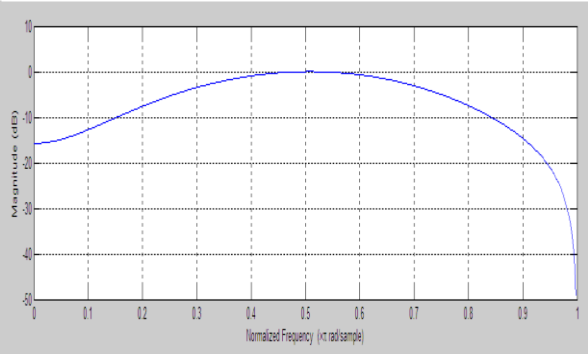
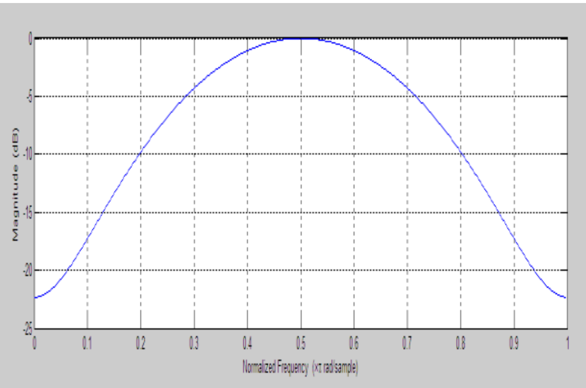


Fig 4 Frequency response for 6 taps FIR Filter in H.264/AVC.Fig 5: Frequency response for 7 tap



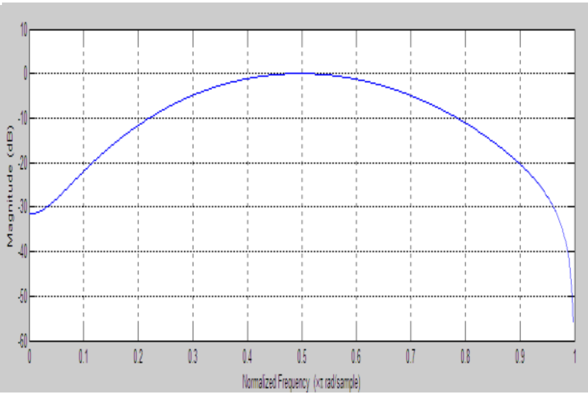


Fig 6: Frequency response for 8 taps FIR Filter in H.265/HEVC.Fig 7: Frequency response for 9 taps FIR Filter

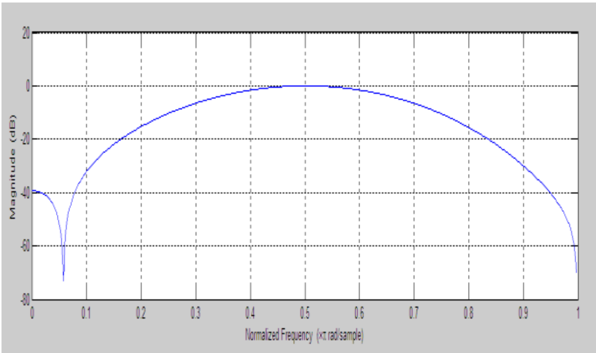


Fig 8: Frequency response for 11 taps FIR Filter

It shows that the power consumption is reduced in different Tap filtering.

VI. CONCLUSION

In the family of video coding standards, HEVC has the promise and potential to replace/supplement all the existing standards (MPEG (Moving picture expert group) and H.26x series including H.264/AVC (Advance video coding))... Researchers are exploring about reducing the HEVC encoder complexity.Comprehensive comparison both in coding performance and complexity between the fractional-pel interpolation filters in HEVC and those in H.264/AVC is given by this paper. The evolution process of fractional-pel interpolation filter in HEVC is described in detail. We find that the frequency responses of quarter-pel interpolation filters in HEVC are much better than those in H.264/AVC.

In H.264/AVC entropy coding used is CABAC (Context adaptive binary arithmetic coding) and CAVLC(Context adaptive variable length coding) while H.265/HEVC use only CABAC. It also can be seen that AVC support up to 4K (4,096*2,304) while HEVC support up to 8K UHDTV (8,192*4,320)

V. FUTURE SCOPE

In addition to the overall bit rate savings results, the following important characteristics of the HEVC compression capability benefits relative to prior standards:

- The benefit in terms of subjectiveperceptual video quality seems tobe greater than what is suggested bythe simpler PSNR analysis results.
- The benefit seems to be greater forhigher-resolution video content thanfor lower-resolution video.
- The benefit seems to be somewhatgreater in the context of low-delayreal-time communication scenariosthan in higher-delay entertainmentapplications with frequent randomaccess(e.g., channel change)requirements.
- The benefit seems to be somewhatgreater when the bit rate (and thereforethe video quality) is lower.

REFERENCES

[1.] Comparison of the Coding Efficiency of VideoCoding Standards—Including High Efficiency Video Coding (HEVC)Jens-Rainer Ohm, *Member, IEEE, Gary J. Sullivan, Fellow, IEEE, Heiko Schwarz,*Thiow Keng Tan, *Senior Member, IEEE, and Thomas Wiegand, Fellow, IEEE*

[2.] Hao Lv Ronggang Wang1, Xiaodong Xie2, Huizhu Jia2 and Wen Gao2 “A comparison of fractional-pel interpolation filters in HEVC and H.264/AVC” School of Computer & Information Engineering, Peking University Shenzhen Graduate School, Shenzhen, China

[3.] J Real-Time Image Proc (2016) 11:663–673 DOI 10.1007/s11554-014- 0422-1 Architecture design of the high-throughput compensator and interpolator for the H.265/HEVC encoder Grzegorz Pastuszak Maciej Trochimiuk.

[4.] IEEE journal of selected topics in signal processing, vol. 7, no. 6, december 2013 Motion Compensated Prediction and Interpolation Filter Design in H.265/HEVC Kemal Ugur, Alexander Alshin, Elena Alshina Frank Bossen, Woo-Jin Han, Jeong-Hoon Park, and Jani Lainema

[5.] “HEVC video standard finished; highend improvements coming” January28, 2013 4:59 AM PST SciTech *by Stephen Shankland @stshank*

[6.] Директор по развитию TELCO GroupГ.Авдеев “High Efficiency Video Coding (HEVC)” article

[7.] Spatial Scalable Video Compression Using H.264 Divya. R 1, Athilakshmi2, Fahmitha Soukath. J 3, Gayathri. P 4 Department of Electronics communication and engineering Dr.S.J.S Paul Memorial College of Engineering and Technology, Puducherry, India

[8.] IEEE JOURNAL OF SOLID-STATE CIRCUITS, VOL. 45, NO. 1, JANUARY 2010 "A 212 MPixels/s 4096 2160p Multiview Video Encoder Chip for 3D/Quat Full HDTV Applications Li-Fu Ding, Wei-Yin Chen, Pei-Kuei Tsung, Tzu-Der Chuang, Pai-Heng Hsiao, Yu-Han Chen, Hsu-Kuang Chiu, Shao-Yi Chien, *Member*, *IEEE*, and Liang-Gee Chen,*Fellow*, *IEEE*

[9.] K.R.Rao, D.N.Kim and J.J.Hwang, "Video coding Standards", Springer Publications, Jan. 2014: **http://www.springer.com/physics/book/978-94007-6741-6**