Diyala Journal of Engineering Sciences Vol. 13, No. 01, March 2020, pages 78-83 ISSN 1999-8716
DOI: 10.24237/djes.2020.13108 eISSN 2616-6909

RECENT TECHNICAL OF ADDED SAMPLE ADAPTIVE OFFSET FOR HEVC

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Abstract

Video compression uses encoding to convert video files into smaller files for efficient storage and transmission in image processing. A decoder reconstructs the received data into a representation of the original video. This research presents recently added in-loop as a filtering technique for extension of sample adaptive offset (SAO) in High-Efficiency Video Coding (HEVC).The principle of SAO is to lessen pixel errors caused by the compression process. Through this an average data reduction up to 1.43% in Low delay configuration and 1.03% in Random access configuration.

Keywords: HEVC, SAO

Paper History *:(Received :27-12-2016; Accepted :23-5-2019)*

Introduction

The work together of joint project latest video codec of the ITU-T Video Coding Experts Group (VCEG) and standardization organizations the ISO/IEC Moving Picture Experts Group (MPEG) in the context referred to as "joint cooperative partnership group to Video Coding (JCT-VC)may be presents the (HEVC) standard. The main objective of the (HEVC) [2] reducesthe bit rate of 50% compared with H.264/AVC [3], under identical video quality. In (HEVC),then still takes place based on the block as inter/intra prediction, quantization, and transmutation. In the former video coding standards applied a deblocking filter (DBF) reconstructed block border to minimize blocking monuments.In addendum to DBF, use new technology referred to as SAO filter after DBF to adapt the rebuild samples.SAO is helpful of transmutation coefficients which principally come from the quantization errors to reduce the ringing monuments. The paper is organized as follows in section 2 describe the (HEVC), in section 3 explain (SAO), in section 4 show experiments and results, in section 5 concludes this research.

High-Efficiency Video Coding

The (HEVC) is the latest videotechnology for compression is designed including coding efficiency, easy transportation system integration, data loss resilience, and parallel processing architectures implement ability exploitation[2]. The video coding of (HEVC) by followed 2-D converting coding is used the traditional block-based hybrid approach, i.e., inter-/intra-picture prediction.

Figure (1) shows the HEVC encoder block diagram [4]. The HEVCencoding algorithmproduced bitstream when partitioned into block-shaped regionsfor the picture to be encoded. The first frame with the help of intra-picture prediction alone of the encoded video sequence. The pictures coded using inter-picture prediction mode exploiting the temporal redundancies between the random access points or the remaining sequence pictures. Inter-picture prediction comprises which consists of the motion vector (MV) and the specific reference picture of choosing motion data, for use to predict each block samples. Mode decision data and motion vectors as side data are transmitted to the decoder and using this information both encoder and decoder produce identical inter-picture prediction signals. Theresidual signal is generated for both intra and inter-prediction blocks with the difference between the original block and its predicted block. The linear spatial transform to transformed residual signal, the resulting with the prediction information along is scaled, quantized, entropy coded and transmitted.

Sample Adaptive Offset

The (SAO) rely on the kind of the sample may using various offsets sample by sample in a zone, and are adapted parameters from zone to zone [5]. The zone size is fixed to one coding tree block to achieve low torpor encoder and reduce the requirements barrier; then diverse coding tree units can be merged combined for share sample adaptive offset parameters to minimize side information [6]. The two kinds of SAO which could meet the requirements the edge of the offset (EO) and the band offset (BO)of low complexity in the HEVC. For (EO) the sample arrangement is depending on samples as current and neighboring but in the (BO), depending on the values of the sampleas a comparison between them. Note that each component of the color may have its own SAO parameters [7].

In the band offset mode, the adaptive offset ofsample stratifies formality to the values of the sample that only on a sample density basis and not on the sample district. It is divided into three ‘ band'sdensity’: (a) low, transition and high. The field of the entire value 32 binsquantity of every ingredient, explained by the five most significant bits from sample value.The bin lowest index i_0 as a position of the SAO band in the bitstream of the transition ,b the and is signaled. The transition band are indicated for individual sample intensity offset value in the bitstream as wtheidth of four bins. These values adaptation dedicated to density values in the bandcan be pa ositive or negative offset for each component and not changein ranges high or low density samples with values.

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An example of positioning the band (SAO) is given in Figure (2) [8].

Figure (3) shows four the 1-D three-pixel patterns, then to classify pixels based on their edge direction the (EO) uses one of the four 1-D patterns [9]. Theapply to different regions encoder selects (BO) or (EO) of the picture, and it can also signal that both selects don't use in a particular region of the picture.

Experiments and Results

The proposed method can improve the filter in HEVC shown in figure (4). Spacious experimentsand gauge the performance are executed. Evolutions are performed in reference 2D-(HEVC) codec version (HM-KTA)[10]. All tests are executed which describe configuration default encoder through the International Organization of Standardization in keeping with (JCT-VC) Common check Conditions for assessment of 2D codec performance applied.The coding efficiency at four points of operative (QP = 37; 32; 27; 22) is measured, the average rate reduction computing in compared to the (HEVC) while not (SAO)[11] and in Table 1 the results will be summarized. Figure (5) show bitrate reduction of the BQSequare and PartyScene sequences in random access configuration. The for all check sequences for (HEVC) with (SAO) and without, YPSNR values and also the corresponding total bitrates are given in Table 2.

Sequences	Random Access Configuration		Low Delay B Configuration	
	Avg.P SNR	BD-Rate %	Avg.P SNR	BD-Rate %
BQSquare 416x240	0.12	-2.35	0.11	-2.34
CITY704x576	0.01	-0.30	0.05	-1.24
PartyScene 832x480	0.02	-0.98	0.03	-0.77
RaceHorses _832x480	0.01	-0.49	0.05	-1.38

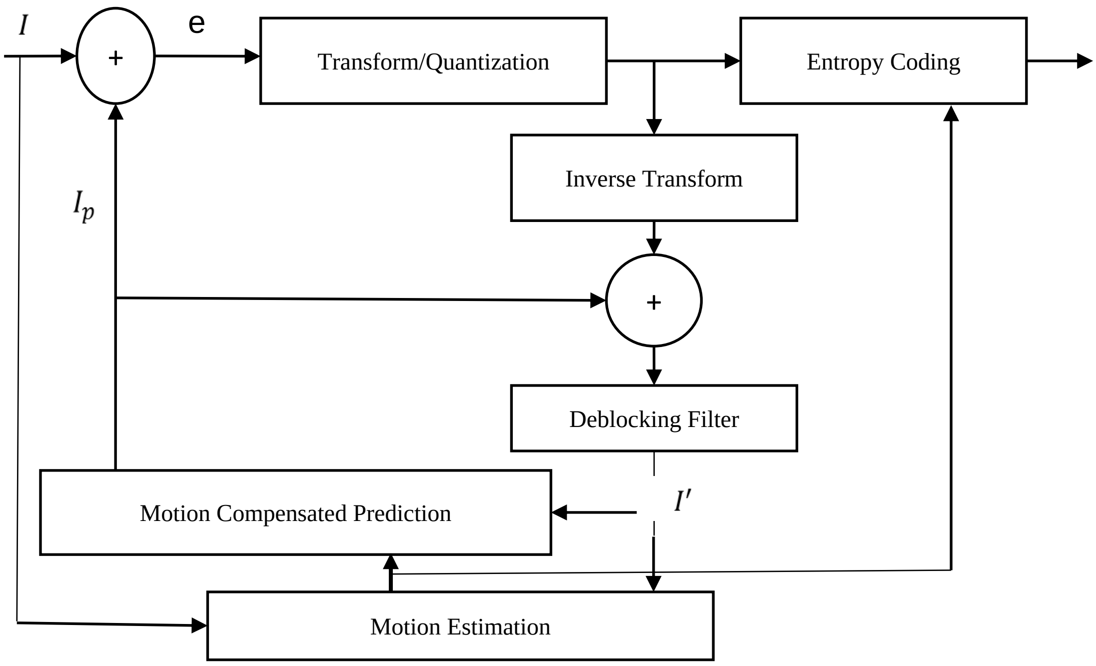

Figure (1): HEVC encoder block diagram

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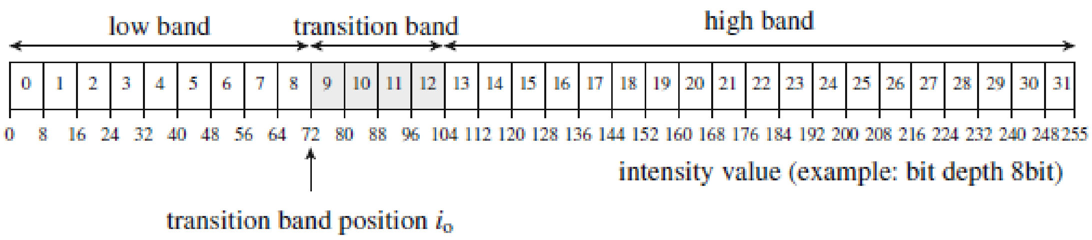

Figure (2):Example for the areas of the band offset mode for SAO band position i_0= 9

Table 1: BD-rate calculated using Bjontegaard rates for PSNR introduced by HEVC with SAO against HEVC without SAO for sequences.

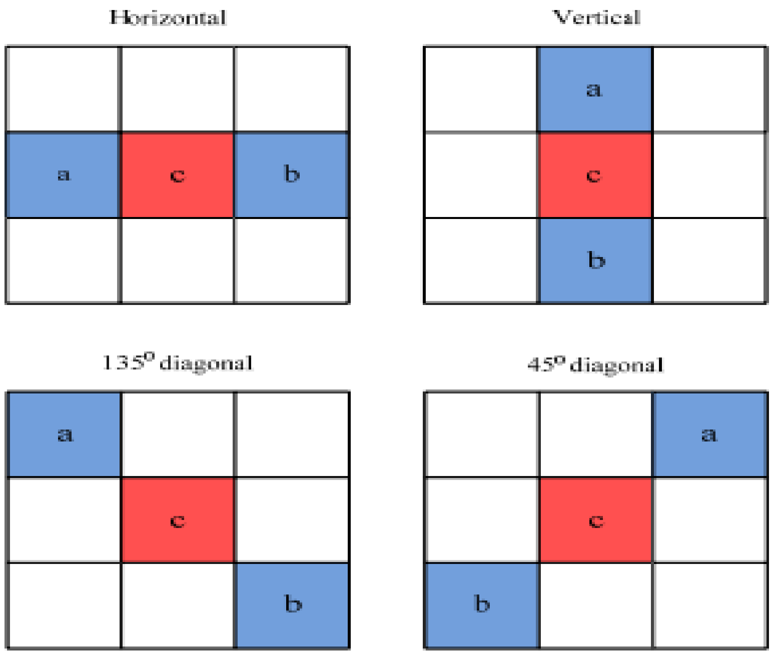

Figure (3): One dimensional three pixel patterns

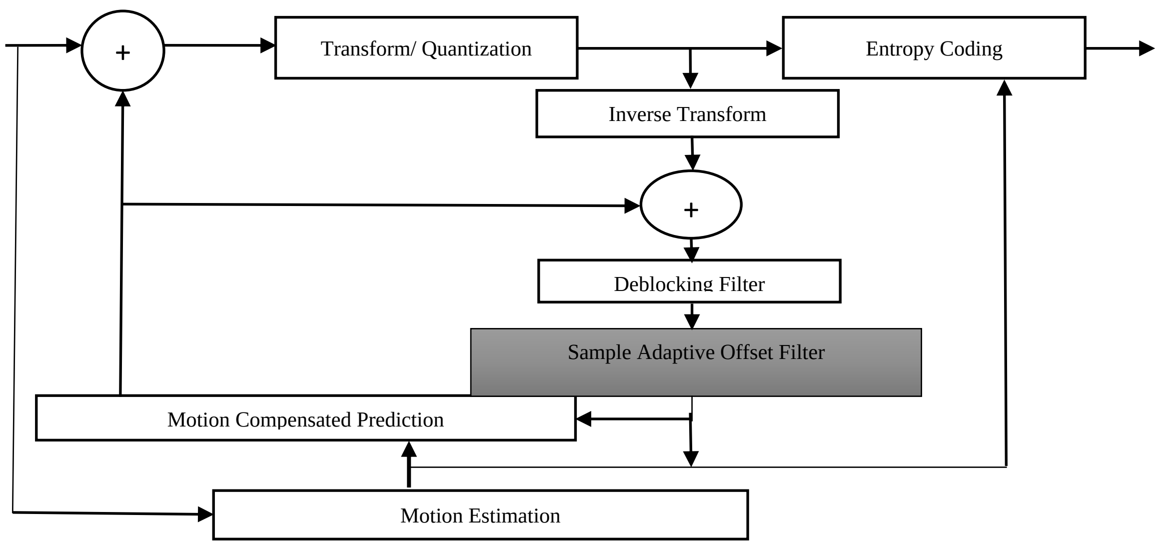

Figure 4: HEVC with SAO filter

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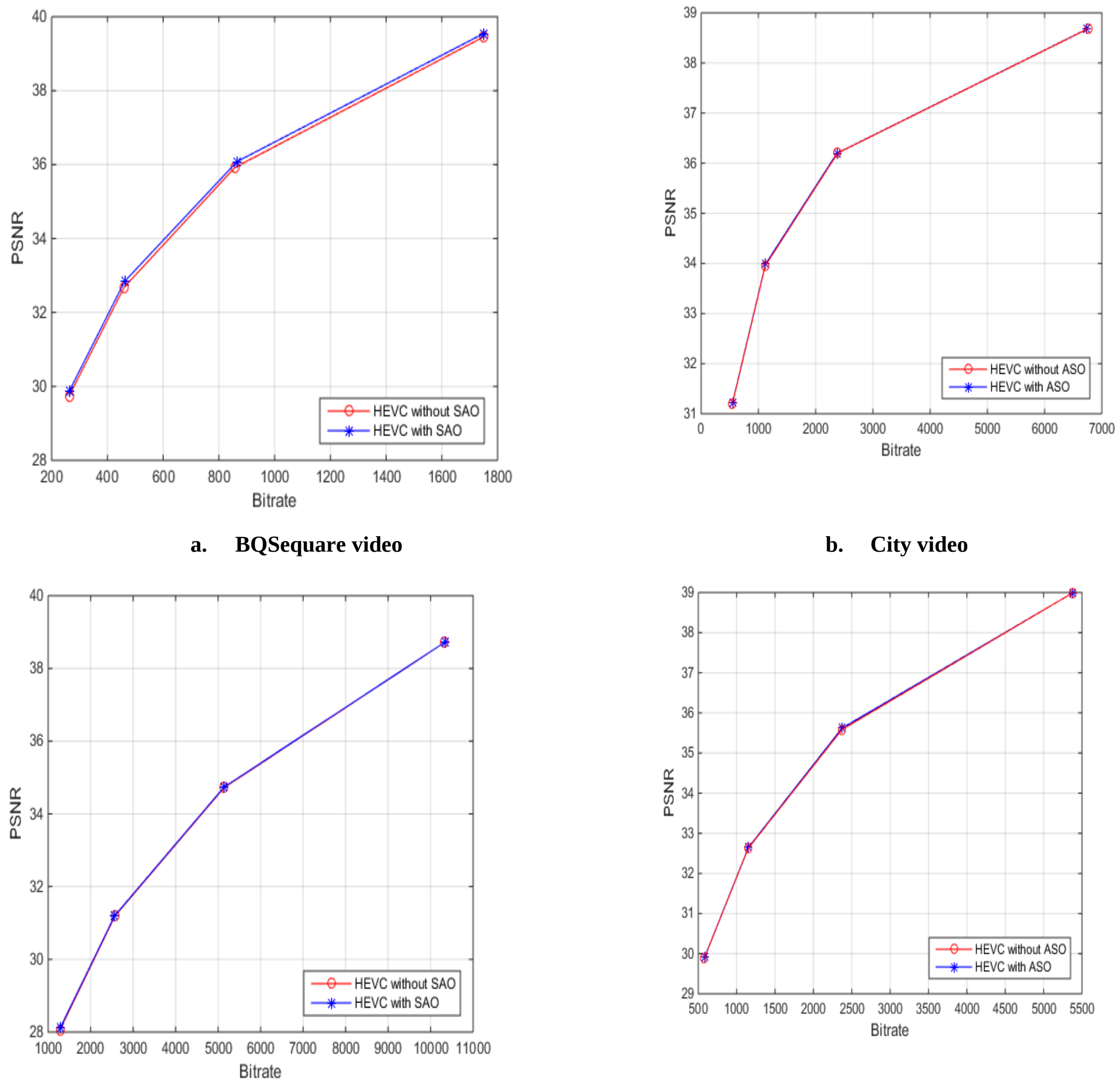

a. BQSequare video

b. City video

c. PartyScene video

d. RaceHorsesvideo

Figure (5): BD-rate of the BQSequare and PartyScene videos.

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Table 2: Experimental results for all test sequences for HEVC with SAO and HEVC without SAO.

Sequence	QP	Low Delay Configuration									
		HEVC with SAO					HEVC without SAO				
		trate [kbit/s]	YPSNR [dB]	UPSNR [dB]	VPSNR [dB]	Time [sec]	Bitrate [kbit/s]	YPSNR [dB]	UPSNR [dB]	VPSNR [dB]	Time [sec]
QSquare	22	2184.60	39.2962	43.4564	44.3278	294.771	2196.528	39.2403	43.4617	44.299	267.141
	27	1005.864	35.4139	41.2621	42.0951	213.68	1011.264	35.3051	41.2353	42.0877	194.646
	32	499.392	32.0702	39.5196	40.2651	188.02	500.544	31.9672	39.4987	40.2583	154.319
	37	270.096	29.1056	38.5223	39.1443	169.733	268.80	28.973	38.373	38.9501	132.717
CITY	22	8788.248	39.3866	44.8791	46.9017	2047.474	8804.016	39.387	44.8171	46.8305	2339.762
	27	2608.392	35.9753	42.9254	45.1949	1335.573	2612.16	35.9559	42.8747	45.1086	1578.770
	32	1094.784	33.3986	41.3772	43.733	1033.271	1099.848	33.3688	41.3474	43.667	994.486
	37	520.416	30.6093	40.3829	42.7496	884.450	522.96	30.5728	40.3253	42.6963	892.945
rtyScene	22	12172.34	38.8637	40.9853	41.5115	2147.839	12179.82	38.8697	40.958	41.4739	2457.554
	27	5943.06	34.6996	38.2758	38.6379	1960.299	5949.28	34.6856	38.2407	38.609	1887.144
	32	2853.14	30.975	36.4188	36.6133	1473.002	2857.40	30.9484	36.346	36.5764	1713.096
	37	1357.12	27.7195	35.1978	35.3028	1245.525	1354.04	27.6754	35.1317	35.2694	1295.744
ceHorses	22	6453.276	39.9074	41.4011	42.3816	3293.036	6468.072	39.9122	41.3386	42.2665	7715.059
	27	2727.96	35.9734	38.8826	40.0218	2206.91	2725.908	35.9523	38.79	39.8761	6047.717
	32	1264.212	32.647	36.9813	38.1359	2921.51	1271.712	32.6175	36.8975	38.0195	2079.069
	37	609.552	29.7733	35.8631	36.8086	1586.868	609.336	29.7144	35.7634	36.6691	1822.164

equence	QP	Random Access Configuration									
		HEVC with SAO					HEVC without SAO				
		Bitrate [kbit/s]	PSNR [dB]	PSNR [dB]	VPSNR [dB]	ime [sec]	Bitrate [kbit/s]	PSNR [dB]	UPSNR [dB]	VPSNR [dB]	ime [sec]
QSquare	22	1748.736	39.5422	43.9614	44.8777	324.781	1751.64	39.4604	43.9482	44.862	240.974
	27	864.936	36.0812	41.6859	42.4362	184.159	857.568	35.9231	41.6523	42.439	193.147
	32	461.88	32.8423	39.8673	40.7357	164.714	459.84	32.6805	39.8645	40.6589	291.525
	37	263.448	29.8783	38.6893	39.437	158.611	263.064	29.7471	38.602	39.2992	164.292
CITY	22	6735.624	38.6743	44.9846	47.1136	1893.083	6766.512	38.6874	44.978	47.1026	1933.68
	27	2372.304	36.1988	43.2481	45.5998	1270.809	2385.744	36.202	43.229	45.5838	1281.41
	32	1123.968	33.9866	41.5778	43.9669	855.748	1120.848	33.9533	41.5856	43.9273	873.434
	37	549.0000	31.2278	40.6338	43.0349	933.557	544.416	31.1881	40.6042	43.1036	1036.085
rtyScen e	22	10337.00	38.7214	41.2966	41.8643	1996.895	10331.18	38.7153	41.2635	41.8626	2003.959
	27	5139.44	34.7376	38.656	39.0673	1649.277	5144.32	34.7249	38.6312	39.0611	1715.238
	32	2565.82	31.201	36.7817	37.0812	1535.596	2574.04	31.1938	36.7286	37.0447	2399.093
	37	1279.38	28.1073	35.5283	35.6902	1272.407	1278.16	28.0592	35.4793	35.6032	1436.107
eHorses	22	5375.616	38.9876	41.3565	42.4438	2659.639	5381.868	38.9973	41.3358	42.4015	3830.707
	27	2372.604	35.6224	39.2098	40.3742	2416.985	2371.104	35.5823	39.1494	40.2878	2248.644
	32	1152.948	32.647	37.3874	38.5463	1893.520	1152.48	32.6288	37.3459	38.4869	1627.550
	37	582.732	29.9149	36.2052	37.2533	1706.898	577.572	29.8759	36.1303	37.1918	1678.825

Conclusion

In the paper, compare between (HEVC) with (SAO) and without a standard, that allowsimproving average PSNR and decreasing bit rate, have been presented.The performed experiments showed the average time reduction to over 1.03% in random access and 1.43% in low delay configurations for video sequences recorded when the (HEVC) with (SAO) comparing to the (HEVC) without (SAO).

Acknowledgment:

This work was supported by Al-Ma'moun University, Department of Electrical Power Techniques Engineering, which is gratefully acknowledged.

DOI: 10.24237/djes.2020.13108 eISSN 2616-6909

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