UC265 HEVC ENCODER TEST REPORT

UC265 HEVC 编码器测试报告

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SUMMARY

摘要

The comparison results between UC265 v1.0.5 and x265 v3.0 show big advantages in both bandwidth saving and CPU speedup when using UC265:

UC265 v1.0.5 和 x265 v3.0 的比较结果显示在带宽节省以及 CPU 速度提升上，UC265 以较大的优势领先：

Encoder Mode 编码器模式	BD-rate Saving BD-rate 节省	Speedup 速度提升
CQP	**-27.8%***	**4.9x**
UC265 CQP vs. x265 CRF	**-18.8%**	**4.6x**

(*) Negative percentages indicate bandwidth savings by using UC265 with the same video quality.

负的百分数表示同样视频质量下的带宽节省。

A. TEST ENVIRONMENT

测试环境

A1. Hardware

硬件

Item（项目）	Description（描述）
Machine（机器）	DELL XPS 8910
CPU	Intel i7-6700K 4.00 GHz
# of Cores（内核数）	4
# of Threads（线程数）	8
RAM（内存）	24 GB
Operating System（操作系统）	Ubuntu 18.04 LTS

A2. Software

软件

Name（名称）	Version（版本）	Speed（速度）
x265*	3.0	placebo
UC265	1.0.5	1

(*) x265 could be downloaded from https://bitbucket.org/multicoreware/x265.

x265 可以从上面的链接下载。

To make this report simple, only one speed preset comparison result is presented. x265 is tested using its slowest speed preset which has the highest video quality: placebo. UC265 is tested using speed preset 1。We provided executable file of UC265 so the users could test other speed presets by themselves.

为了简洁，本报告仅仅展示了一种速度预设的比较结果。x265 选择了最慢但是视频质量最高的速度预设：placebo。UC265 选择了速度预设 1。我们提供了 UC265 可执行文件，用户可以自行测试其它速度预设。

A3. Quality Metrics
质量指标

We use YUV-PSNR as the quality metrics. The calculation of them is in file UCYuvPsnr.c. Video objective quality comparation results vary with different PSNR calculation methods. Please make sure to always use the same quality metrics with the same calculation method when comparing video objective quality. We don't provide SSIM calculation methods since there is no unified formulas, and we recommend the users to calculate it by themselves.

我们使用 YUV-PSNR 作为质量指标。计算方法参见文件：UCYuvPsnr.c。视频客观质量的比较结果随着 PSNR 计算方法的不同而变化。请确保在比较中一直使用由相同计算方法得到的客观质量指标。因为缺乏统一的公式，我们没有提供 SSIM 计算方法，我们建议由用户自行计算。

$$psnr = \frac{6psnrY + psnrU + psnrV}{8}$$

USAGE: `$ ./UCYuvPsnr original-yuv-file decoded-yuv-file summary-file width height [binary-file] [fps]`

Example 1: `$ ./UCYuvPsnr input_1080p.yuv decoded.yuv summary.txt 1920 1080`

Example 2: `$ ./UCYuvPsnr input_1080p.yuv decoded.yuv summary.txt 1920 1080 encoded.bin 60`

Bjøntegaard-Delta bit-rate (BD-rate) is calculated using the method described in [1].

B. TEST SEQUENCES

测试序列

We use 20 JCTVC HEVC video test sequences in this report as follows, which could be downloaded from http://www.ucodec.com/resources.html.

在本报告中，我们使用如下 20 个 JCTVC HEVC 视频测试序列，可以在 http://www.ucodec.com/resources.html 下载。

Class（类别）	Video File and md5（视频文件及 md5）
A 4k (2560x1600)	**NebutaFestival_2560x1600_60_8bit_crop.yuv** 018b0ef5af2df995533fc49d7decc34a
	PeopleOnStreet_2560x1600_30_crop.yuv 150c8e78fe90c24462eda5c509783bbb
	SteamLocomotiveTrain_2560x1600_60_8bit_crop.yuv 757d23ee2ffd1a08532493ca70dd9f0d
	Traffic_2560x1600_30_crop.yuv 4f03a86b03b47fc821acffb8baea56f6
	BasketballDrive_1920x1080_50.yuv d38951ad478b34cf988d55f9f1bf60ee
	BQTerrace_1920x1080_60.yuv efde9ce4197dd0b3e777ad32b24959cc

Class（类别）	Video File and md5（视频文件及 md5）
B 1080p (1920x1080)	**Cactus_1920x1080_50.yuv** 3fddb71486f209f1eb8020a0880ddf82
	Kimono1_1920x1080_24.yuv 4a83005bc719012ac148dd3898e5e4ed
	ParkScene_1920x1080_24.yuv b7ada0912d693304165254177d08343d
C WVGA (832x480)	**BasketballDrill_832x480_50.yuv** bd215136fed04067d82c10b2e49b2c7c
	BQMall_832x480_60.yuv f889efea02b0c9a7d174b0f7a99cb51b
	PartyScene_832x480_50.yuv 4766c455665b6d228a6390e3d3ff2647
	RaceHorses_832x480_30.yuv 0a351df99f22d837bc528bd4901c6968
D WQVGA (416x240)	**BasketballPass_416x240_50.yuv** bfd9abbdc677790130dc4023b4e409f0
	BQSquare_416x240_60.yuv 713ef64958345859b9bae986c3a3f763
	BlowingBubbles_416x240_50.yuv

Class（类别）	Video File and md5（视频文件及 md5）
	50a520722f0e906b7884b6b9fea48699
	RaceHorses_416x240_30.yuv 290a63e86213abc4459fce1dbd39edbe
E 720p (1280x720)	**vidyo1_1280x720_60.yuv** 13cc00d5ee4192ddd3fd99b96f348310
	vidyo3_1280x720_60.yuv e015f528fe204e21dc6fa029d1eedd33
	vidyo4_1280x720_60.yuv 2994b585d04715696a7860c38bec39b7

C. TEST SCRIPTS

测试脚本

C1. Constant QP (CQP)
常数 QP

The test scripts are in files cqp_x265.sh and cqp_UC265.sh. We first fix x265's QPs to 25, 30, 35 and 40, and generate encoded bitstreams. Then we set UC265's QPs to the values which could generate the closest bitstream sizes. This way can guarantee a fair apples to apples comparison.

测试脚本在 cqp_x265.sh 和 cqp_UC265.sh 文件中。我们首先固定 x265 的 QP 至 25，30，35 和 40 并生成编码码流。然后我们把 UC265 的 QP 设置到能够生成大小最接近的码流的数值。这样可以保证公平的比较。

C2. UC265 CQP vs. x265 Constant Rate Factor (CRF)
UC265 常数 QP vs. x265 常数速率因子

The test scripts are in files crf_x265.sh and cqp_UC265_vs_crf_x265.sh. We first fix x265's Rate Factors to 20, 25, 30 and 35, and generate encoded bitstreams. Then we set UC265's QPs to the values which could generate the closest bitstream sizes. This way can guarantee a fair apples to apples comparison.

测试脚本在 crf_x265.sh 和 cqp_UC265_vs_crf_x265.sh 文件中。我们首先固定 x265 的 QP 至 20，25，30 和 35 并生成编码码流。然后我们把 UC265 的 QP 设置到能够生成大小最接近的码流的数值。这样可以保证公平的比较。

D. TEST RESULTS

测试结果

The detailed test results are in file UC265-vs-x265.xls.

详细测试结果在文件 UC265-vs-x265.xls 中。

D1. Constant QP (CQP)

常数 QP

Video Classes 视频类别	BD-rate Saving BD-rate 节省	Speedup 速度提升
A	-16.7%	4.3x
B	-28.5%	4.9x
C	-29.3%	4.0x
D	-27.6%	4.5x
E	-40.0%	7.5x
Average（平均）	-27.8%	4.9x

D2. UC265 CQP vs. x265 Constant Rate Factor (CRF)
UC265 常数 QP vs. x265 常数速率因子

Video Classes 视频类别	BD-rate Saving BD-rate 节省	Speedup 速度提升
A	-13.4%	4.1x
B	-17.4%	4.4x
C	-15.8%	3.8x
D	-15.8%	4.2x
E	-36.5%	7.0x
Average（平均）	-18.8%	4.6x

E. REFERENCES

参考文献

[1]. G. Bjontegaard, “Calculation of average PSNR differences between RD-curves,” in *Proc. 13th VCEG Meeting ITU-T Q.6/SG16*, Document VCEG-M33.doc., Austin, TX, Apr. 2001.

[2]. x265, https://bitbucket.org/multicoreware/x265