

Title: **Evaluation report of SJTU test sequences for future video coding standardization**

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Purpose: Report

Author(s) or Contact(s): Sang-hyo Park
Haiyan Xu
Euee S. Jang

Tel: +82-2-2295-1086
Email: foriamweak@gmail.com
haiyan3322@gmail.com
esjang@hanyang.ac.kr

Hanyang University, R&D Building 512,
222 Wangsimni-ro, Seongdong-gu, Seoul,
South Korea, 04763

Source: Hanyang University

Abstract

Five SJTU test sequences of JCTVC-V0083 were encoded by HM16.6 to evaluate the visual quality and to provide bitstream files for subjective viewing. In this contribution, the followings are provided as required in N15791: rate distortion curves (bit rate vs. PSNR graphs), the still pictures of encoded sequences, summary tables, and the conclusion of the evaluation under given coding conditions. Based on the evaluation, two sequences are recommended: *Marathon* and *Runners* sequences.

1 Introduction

Based on the work plan for investigation of test sequence encoding [1], we encoded five SJTU test sequences [2] to evaluate the visual quality and to provide bitstream files for subjective viewing. In this contribution, the followings are provided as required in N15791 [1]: rate distortion curves (bit rate vs. PSNR graphs), the still pictures of encoded sequences, summary tables, and the conclusion of the evaluation under given coding conditions.

2 Test material and test environment






Assigned to us, five sequences among SJTU sequences [2] were encoded in this evaluation, and the names of the sequences are as follows: “Marathon”, “Runners”, “Residential Building”, “Rush Hour”, and “Tall Buildings”. They were converted from YUV 4:4:4 10-bit to YUV 4:2:0 10bit through following ffmpeg script provided by the contents provider (and we shared the script through JVET email reflector on Jan. 2016):

```
ffmpeg.exe -s 3840x2160 -pix_fmt yuv444p10le -i inputfile.yuv -c:v rawvideo -pix_fmt yuv420p10le  
outputfile.yuv
```

Detailed encoding conditions are as follows:

- Encoder: HM16.6 [3]
- Encoded frames: 300 (whole frames were encoded as their frame rates are 30)
- QP: 22, 27, 32, 37 and 42
- Coding configuration: Low-delay main 10 and random access main 10
- I period: 32

3 Summary table

Scenario	Description	Thumbnail	Comments
Marathon	The early stages of 2012 Shanghai International Marathon Race		Complex texture and many slow moving objects without camera motion.
Runners	The runners in midway of 2012 Shanghai International Marathon Race		Big moving objects and large stationary background without camera motion.
Residential Building	A residential building with dense texture of the outside wall and intricate lines		Slow camera panning over a complex texture
Rush Hour	The students on the ways to canteen or dormitory after classes		Many slow moving objects without camera motion
Tall Buildings	Skyscraper in Lujiazui, Pudong New District in Shanghai		Slow camera panning over a complex texture

4 RD curve

In this section, RD curves were drawn for LD main 10 and RA main 10 configurations. The detailed bitrate and PSNR results can be found in the attached excel file that presents sequence by sequence under QP by QP encoding. For LD case, PSNR (dB) vs. Bitrate (kbps) graphs for five sequences are drawn as shown in Figure 1. For RA case, PSNR vs. Bitrate graphs for five sequences are also drawn as shown in Figure 2.

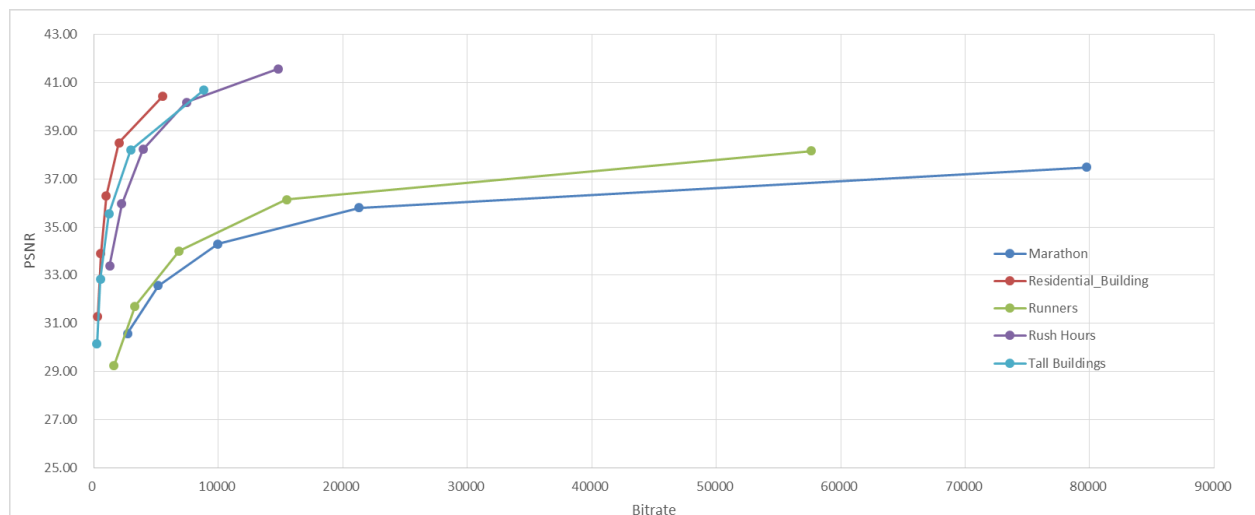


Figure 1. PSNR vs. Bitrate graph for LD scenario

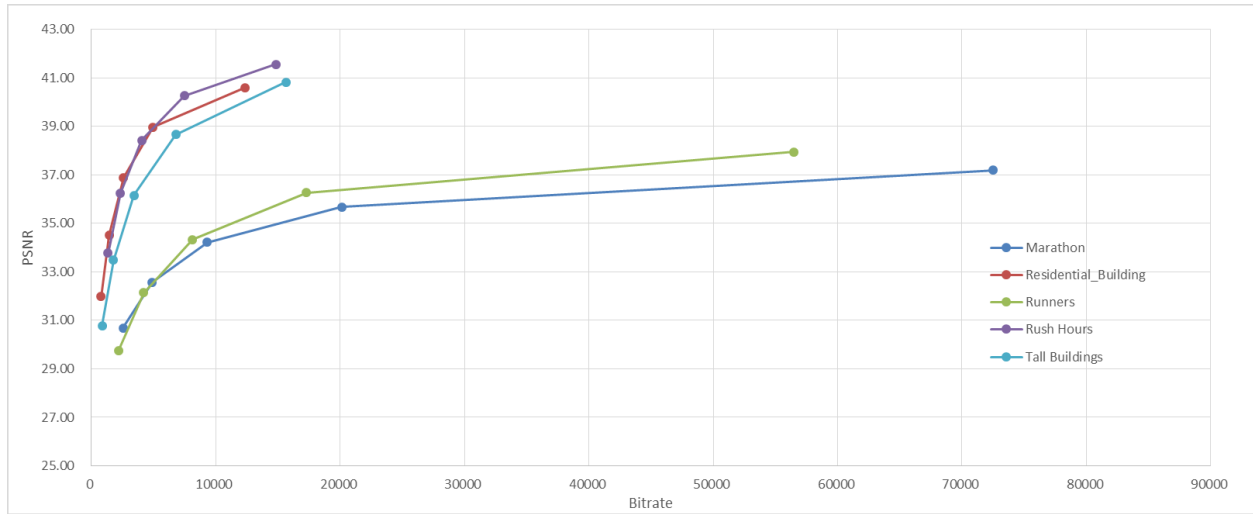


Figure 2. PSNR vs. Bitrate graph for RA scenario

5 Still pictures of the encoded sequences

Based on our subjective evaluation, we tried to figure out particular frames that clearly shows artifacts, and attached those frames in this section. Bitstream files encoded by QP 37 were decoded and taken captured as required, and we put results of low-delay configuration. Additionally, adjacency frames were also captured to give more hints on the characteristics of each sequences for readers.

Figure 3 shows frames of *Marathon* sequence which has complex texture and many different motions of objects, but no camera motion. Many blurred artifacts can be seen, and some part of people suddenly disappeared in video. The sequence has complex texture and many slow moving objects without camera motion.



(a)



(b)

Figure 3. Decoded pictures of Marathon sequence after encoding under QP 37: (a) is the 71th frame and (b) is the 72th.

Figure 4 shows frames of *Residential Building* sequence which is very static and has very little distortion in image quality. The sequence has slow camera panning over a complex texture.



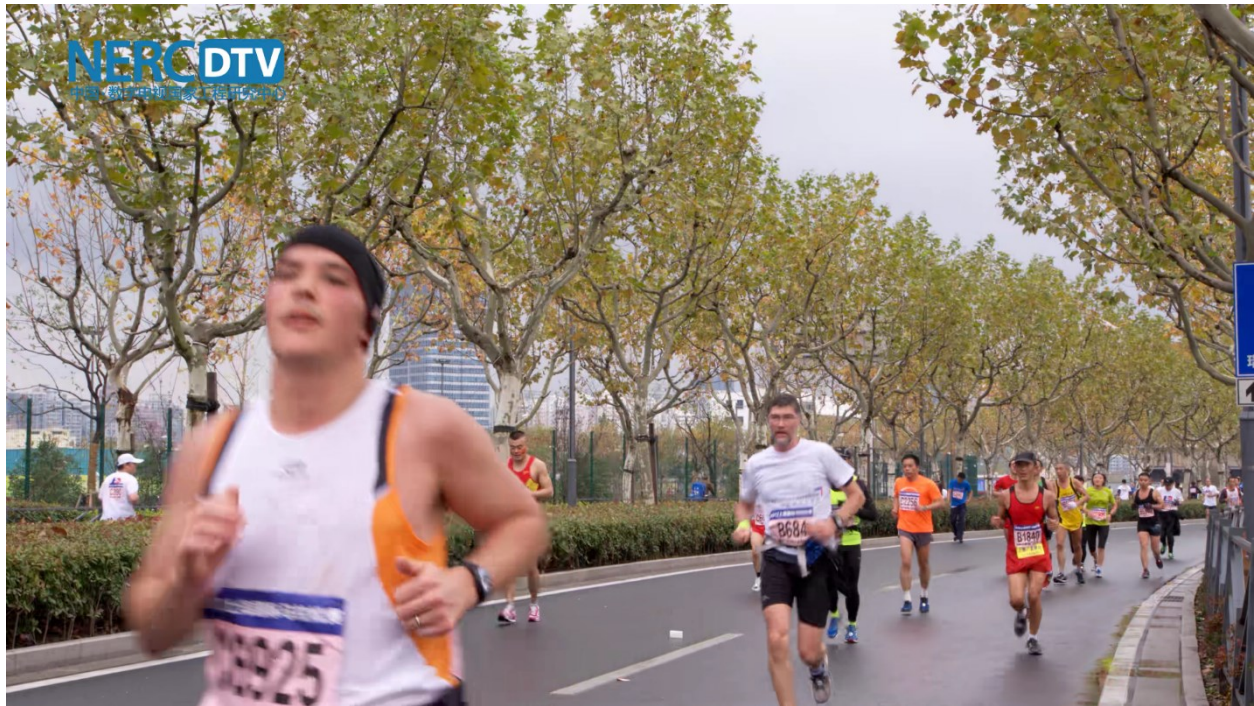
(a)



(b)

Figure 4. Decoded pictures of *Residential Building* sequence after encoding under QP 37: (a) is the 283th frame and (b) is the 284th.

Figure 5 shows frames of *Runners* sequence which has fast and big motions on runners and a little moving on leaves. It can be found that there are blurred artifacts on the neck and shoulder of first runner on picture (a). The sequence has slow camera panning over a complex texture.



(a)



(b)

Figure 5. Decoded pictures of Runners sequence after encoding under QP 37: (a) is the 209th and (b) is the 210th.

Figure 6 shows frames of *Rush Hours* sequence which also has complicate and blurred artifacts in people's face. The sequence has many slow moving objects without camera motion.



(a)

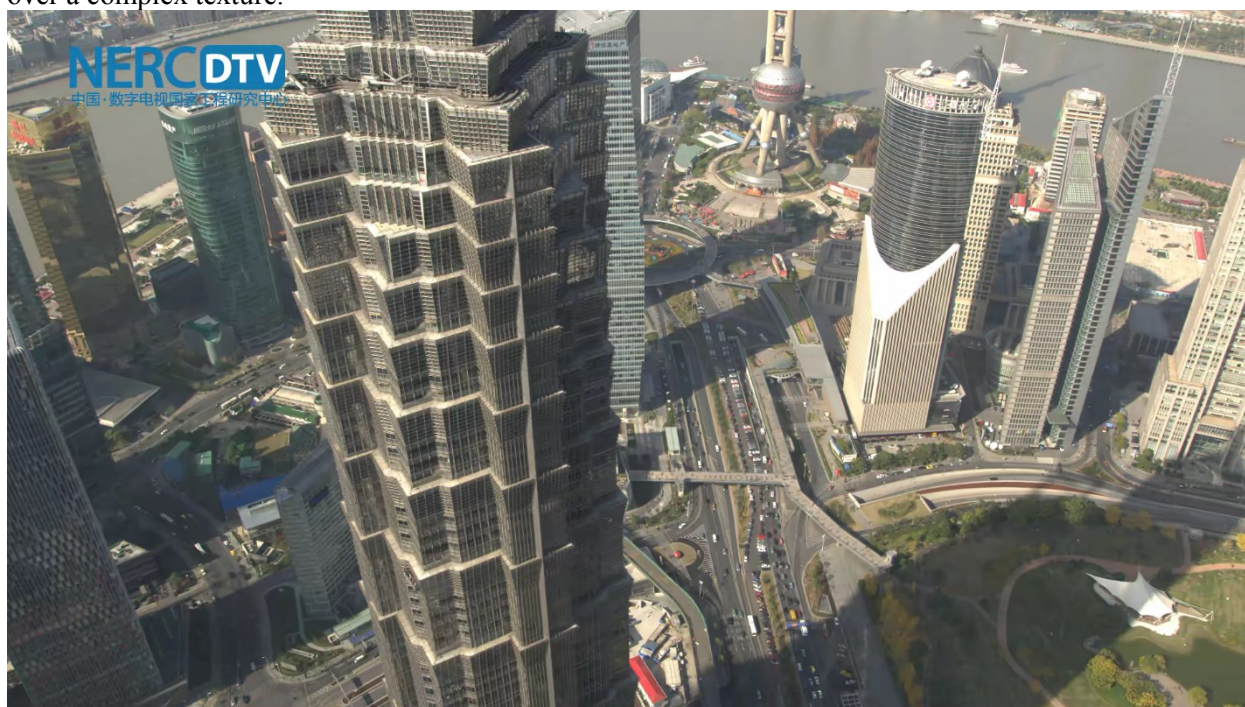


(b)

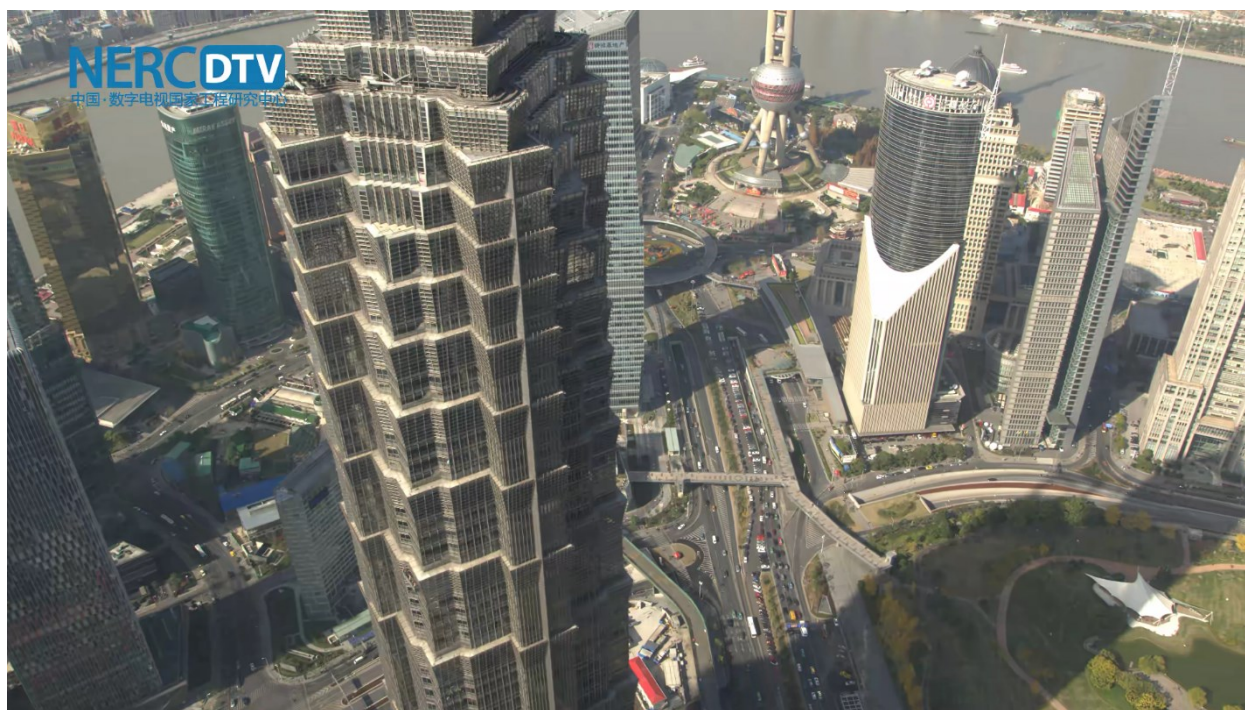
Figure 6. Decoded pictures of Rush Hours sequence after encoding under QP 37: (a) is the 239th and (b) is the 240th.

Figure 7 shows frames of *Tall Buildings* sequence which is very static, few random noise can be found around the words NERC, but it is quite difficult to find errors. The sequence has slow camera panning

over a complex texture.



(a)



(b)

Figure 7. Decoded pictures of Tall Building sequence after encoding under QP 37: (a) is 223th and (b) is 224th.

6 Conclusion

The test results of five SJTU sequences were presented, encoded by HM 16.6. **Based on the evaluation, our recommendation is two sequences (*Marathon* and *Runners* sequences).** Additionally, we would like to put the priority of recommendation in the following order: Marathon, Runners, Rush Hour, Tall

Buildings, and Residential Building. Tall Buildings and Residential Building sequences shows too static to find artifacts though they were encoded under quite high QP values (e.g. 37).

7 References

- [1] ISO/IEC JTC1/SC29/WG11/N15791, “Work plan for investigation of test sequence encoding,” Oct. 2015, Geneva, Switzerland.
- [2] JCTVC-V0083, “SJTU Test Sequences for video coding development,” Oct. 2015, Geneva, Switzerland.
- [3] https://hevc.hhi.fraunhofer.de/svn/svn_HEVCSoftware/tags/HM-16.6

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