SAQENet: A Quality Enhancement Network for Compressed Video with Self-attention

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01 Introduction

1 Introduction

Background

The current encoding framework is still block-based. The blurring of edges and compression distortion will bring great negative effects on subjective quality with limited coding resources.

Therefore, it is very necessary to research a quality enhancement method under the same coding resources.

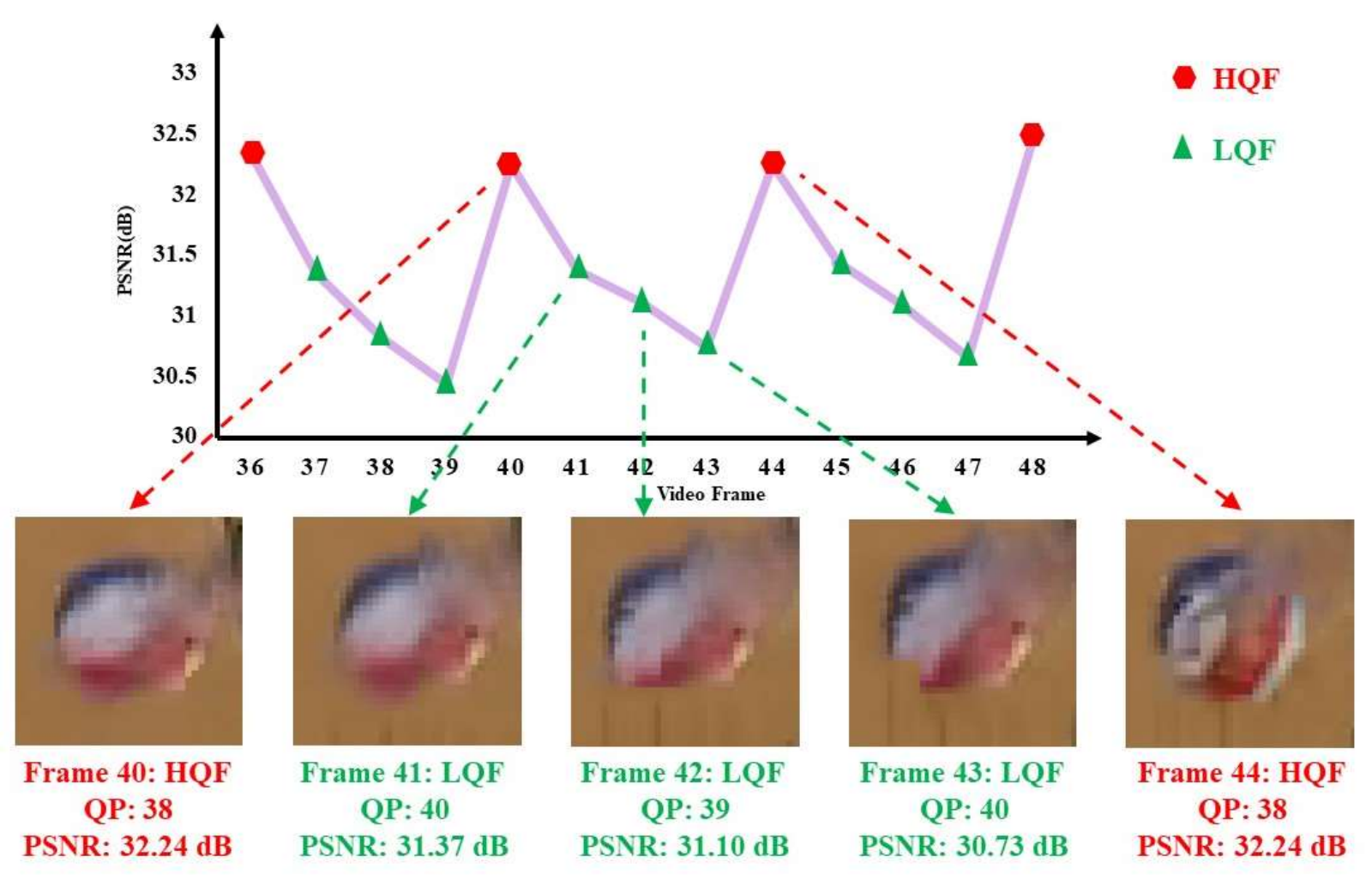
02 Research Contents

The Special Characteristics of Compressed Videos

We first create a new dataset with 148 pairs of YUV videos. Using this dataset, we have confirmed the "quality fluctuation", "missing textures", and "texture similarity" features of compressed videos.

These features indicate that certain information is missing from the compressed video compared to the original video and we require a new method for quality enhancement.

First Feature: Quality Fluctuation



Second Feature: Missing Textures

Source Frame

Area1-Source

Area2-Source

Area1-Compressed

Area2-Compressed

Third Feature: Texture Similarity

Source Frame

Source Optical Flow

Compressed Optical Flow

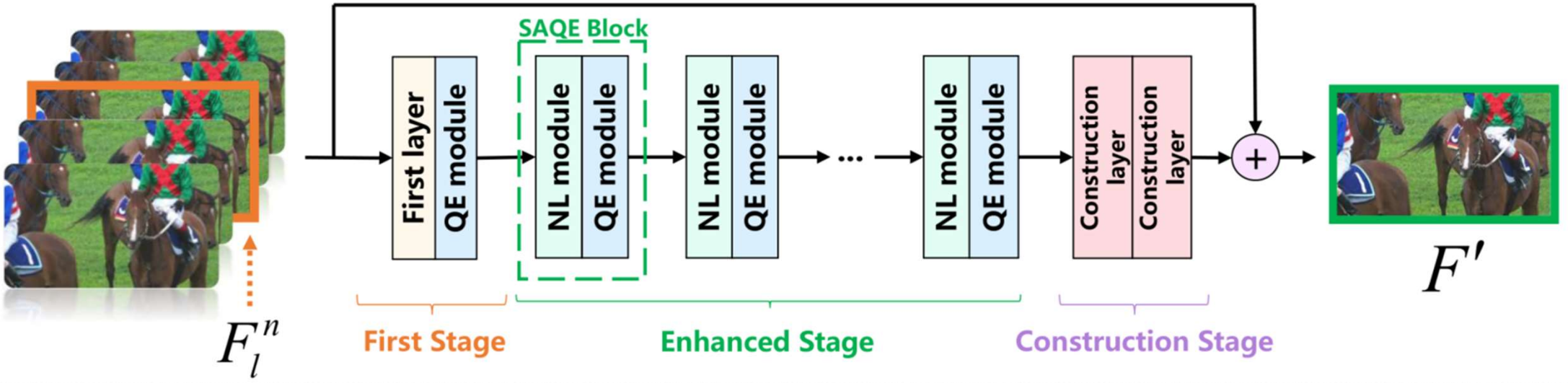
Source Frame

Source Optical Flow

Compressed Optical Flow

The whole framework

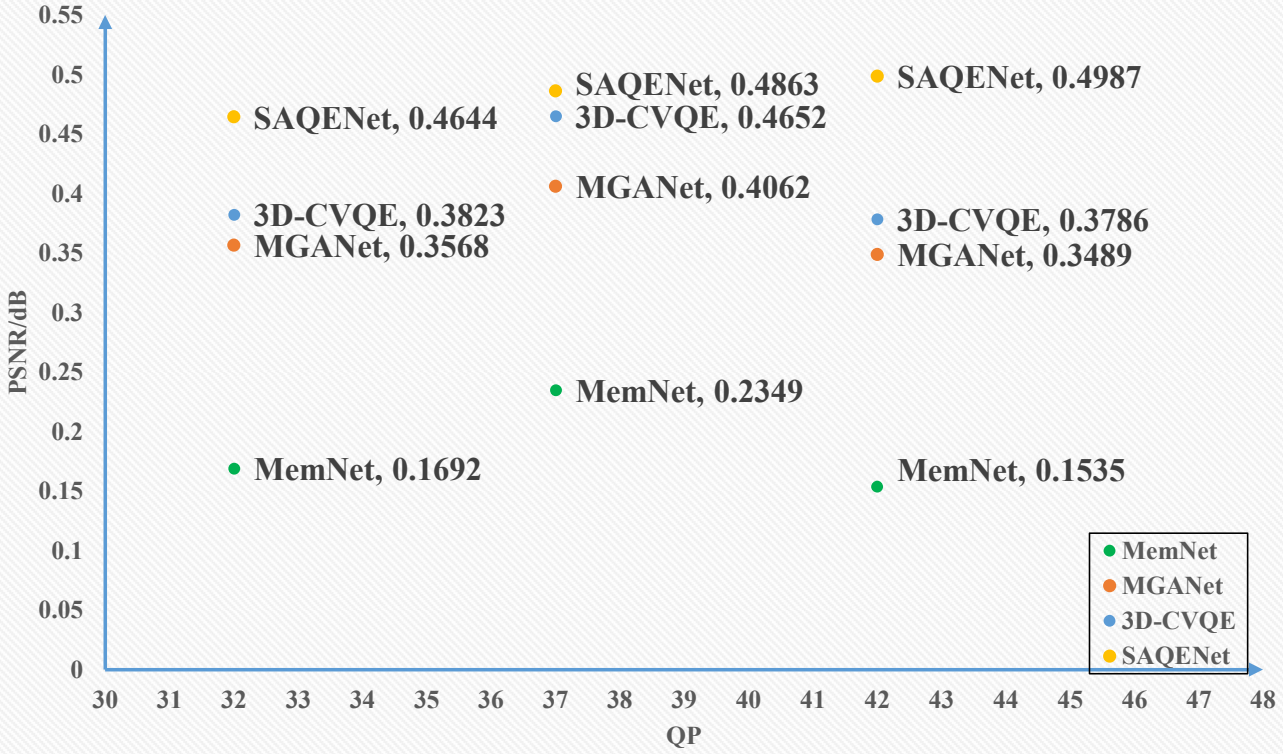
In this paper, SAQENet is designed with the 3D-CNN which makes motion alignment not necessary thanks to its spatial-temporal feature representation ability.



03 Experiments

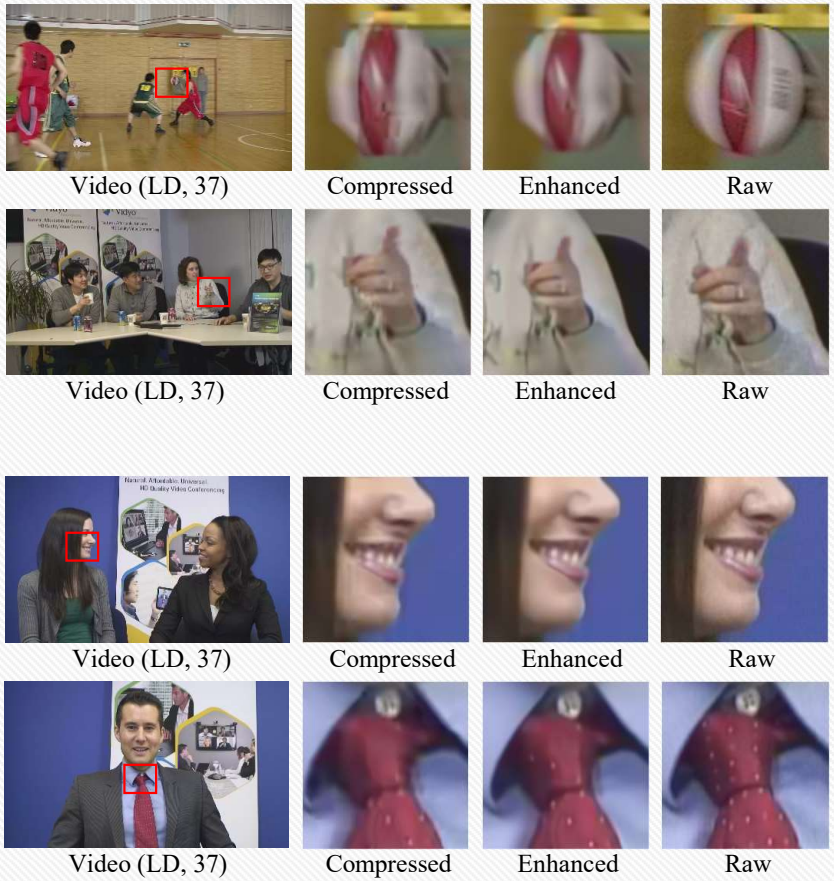
3 Experiments

Performance of SAQE approach

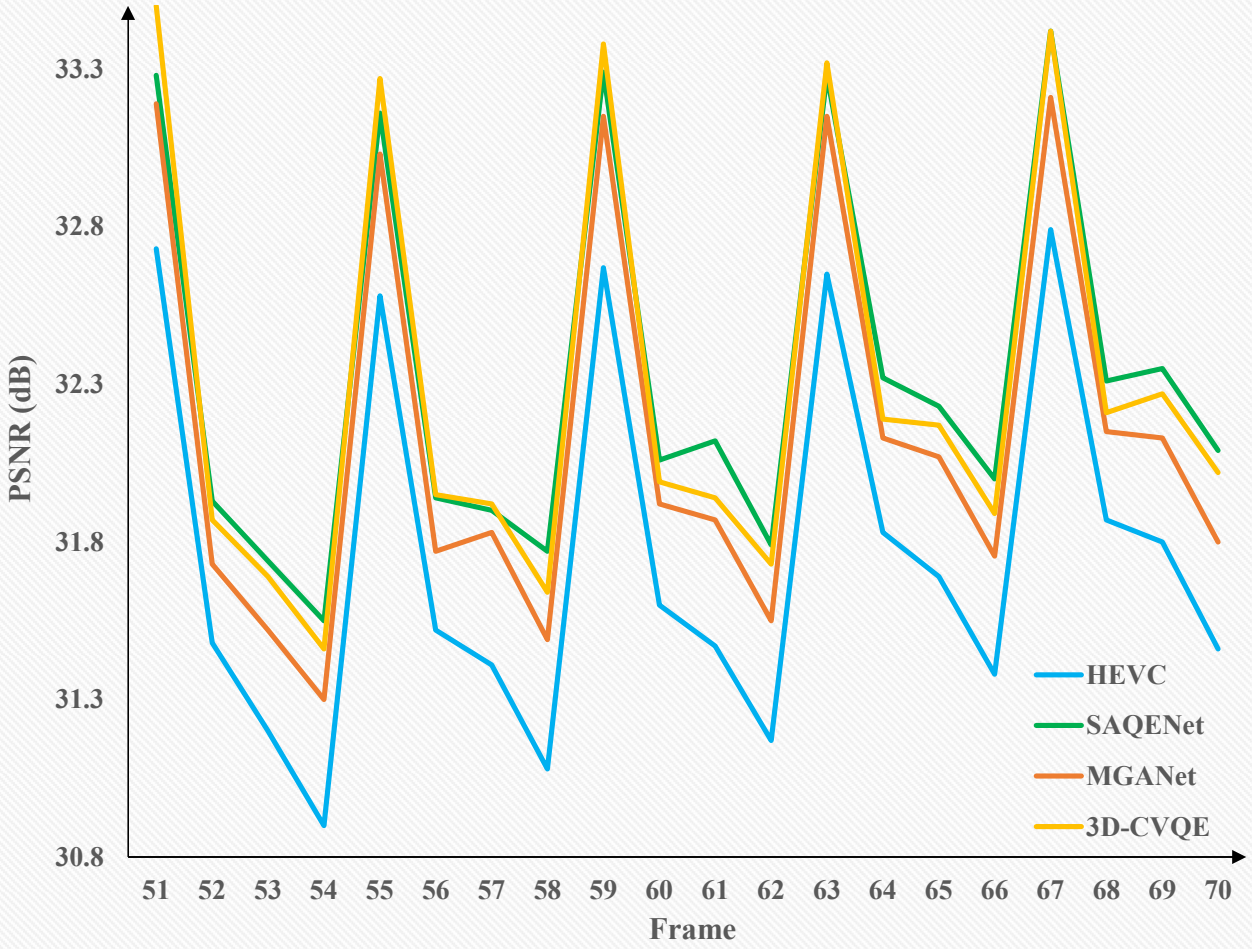


18 standard test sequences of JCT-VC are test set.

Subjective Performance of SAQENet approach



Improvement of quality fluctuation



It can be seen that the PSNR fluctuation of SAQENet is smaller than the HEVC baseline. SAQENet is also capable of reducing the quality fluctuation.

Conclusions

We demonstrate that the average PSNR of 18 HEVC standard sequences is enhanced by 1.4539 dB under the AI mode (QP=42) and 0.4987 dB under the LD mode (QP=42) with the number of parameters remaining at 0.49 million.

Based on these features, a quality enhancement method is proposed. This paper opens up new space for future exploration to use temporal and spatial information for quality enhancement of compressed video.

Thank you!