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Coding of Still Pictures

JBIG

Joint Bi-level Image
Experts Group

JPEG

Joint Photographic
Experts Group

TITLE: Intra-Picture Decorrelation Tools for JPEG XS Screen Content Coding
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Overview

Temporal Difference Coding (TDC) was introduced in JPEG XS 3rd edition to improve the coding efficiency for screen content, specifically, the screen content image sequences by performing co-located inter-prediction. However, as a low-latency and low-complexity image comparison standard, JPEG XS has consistently employed only the intra-picture coding scheme for its first two versions. The intra-picture coding scheme provides the capability for temporal random access, which is crucial for various low-latency, low-complexity video applications, such as film and television production. Additionally, the relatively smaller memory cost of intra-picture coding tools can also help with the more cost-effective implementations of JPEG XS in memory cost-sensitive platforms, such as the ASIC in display interface compression. Based on these insights, we propose to add intra-picture decorrelation tools to improve the coding efficiency of JPEG XS for screen content coding (SCC).

Use Cases

The enhanced screen content coding efficiency, combined with the temporal random access capability and relatively small memory cost provided by the intra-picture decorrelation tools, will further improve the performance of JPEG XS in the following scenarios.

- Scenario 1: Film and television production

In video productions, editions and cuttings typically need precisely frame-level seeking. The intra-picture decorrelation tools will improve the coding efficiency for JPEG XS SCC, thereby enhancing the efficiency for television production that involves screen contents, such as live game streaming, news and cartoons.

- Scenario 2: Memory cost-sensitive applications

While the additional frame buffer in TDC profile can provide temporal prediction references and can gradually improve the reconstruction quality, in some memory cost-sensitive scenarios, such as the display interface compression, adding a full-frame buffer may not be feasible, even with the frame buffer compression. e.g., for a 4K image and frame buffer rate at 3bpp, this will require a 3MB high-speed memory.

Proposals

- Define test conditions for screen content coding under the intra-picture coding scheme.
- Issue the collection of proposals for intra-frame decorrelation tools for JPEG XS screen content coding.
- Evaluate the memory cost-prediction performance trade-off between TDC scheme and intra-frame decorrelation schemes for different application scenarios.

References

[1] Richter, Thomas, and Siegfried Foessel. "JPEG XS screen content coding extensions." Applications of Digital Image Processing XLV. Vol. 12226. SPIE, 2022.

[2] Richter, Thomas, and Siegfried Foessel. "JPEG XS profiles and levels for screen content coding." Applications of Digital Image Processing XLVI. Vol. 12674. SPIE, 2023.