Relying on a rate constraint to reduce Motion Estimation complexity

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Associated code: gitlab.com/baisc/vtm/tree/rate-elimination

Experimental Results

Our proposed candidate elimination technique was evaluated by combining:
- The VTM 6.2 encoder
- 17 test sequences from the Common Test Conditions [1][2]
- QPs 22, 27, 32 and 37
- Encoder configurations LDP and RA

Figure 4: Experimental results of rate-based candidate elimination applied, with a fixed threshold of $t = 4$, over TZS.

Rate-based Candidate Elimination

The cost function minimized during ME [8] is
\[ j(\mathbf{d}) = d(C_1) + \lambda \cdot r(\mathbf{d}) - m(p) \]
- $r(\mathbf{d})$ estimates the bitrate of a candidate MV
- $m(p)$ is block distortion, the most costly computation in IME

Previous works have indicated that selected MVs:
- Can usually be found right after the TZ prediction step [5]
- Are mostly within a small area around the predictor [4]

Simple and efficient elimination criterion: Skipped blocks need not be fetched from memory
Compatible with existing Rate-constrained ME algorithms
Configurable through the bitrate elimination threshold

Contribution

We define a bitrate threshold $t$ and use it to constrain the IME search area, eliminating distortion calculation whenever $r(\mathbf{d}) - m(p) > t$

Conclusions

In this work, we show that MV bitrate influences the efficacy of IME search patterns
We propose an algorithm that can reduce ME complexity by 86.6% at the cost of only an average 0.74% BD-Rate increase
Our results indicate that the IME search can be drastically simplified in some configurations

References