COMPRESSION EFFICIENCY OF THE EMERGING VIDEO CODING TOOLS

Context

- **HEVC standard**: enable a rate-distortion gain up to 50% compared to H.264/AVC;
- Emerging video applications: Virtual Reality (VR 360), High Dynamic Range (HDR), High resolution (4K, 8K) are a new veritable challenge for video coding community;
- New coding tools have been integrated within the HEVC reference software (HM);
- Goal of this platform, called **JEM** (Joint Exploration Model): provide a bit rate saving between 25-30%.

- Main tools included in the **JEM** software:
  - Expected total BD-rate gain: 32%.

Subjective Quality Assessment

- **Purpose**: Evaluating the quality of two codecs (HM, JEM) for HD and 4K resolutions

- **Experimental environment**:
  - IETR lab. psycho-visual room, complying with the ITU-R BT.500;
  - 18 participants (10 men & 8 women, aged from 18 to 44 years);
  - An UHD 75” Sony HDR TV KD-75X9405C.

- **Sequences**:
  - Six video sequences from MPEG and 4EVER databases;
  - A total of 96 videos: 6 (original) x 4 (BR) x 2 (codec) x 2 (HD, 4K).

- **Evaluation procedure**:
  - Used method: **DCR** (Degradation Category Rating);
  - Collected Mean Opinion Score (**MOS**).

Results

- **Objective results**: comparison-based PSNR.
- **Subjective results**: comparison-based MOS.

- JEM codec enables a significant subjective quality improvement compared to the HM reference software;
- At high bitrates, the HM codec enables a high video quality and reaches the quality of the video coded with the JEM;
- Bit rate savings of about 25% can be achieved by the JEM codec for the same perceived video quality, depending on video content and resolution.

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Tool name</th>
<th>Gain</th>
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<tbody>
<tr>
<td>AMT</td>
<td>Adaptive Multiple Transforms</td>
<td>5%</td>
</tr>
<tr>
<td>PMMVD</td>
<td>Pattern Matched Motion Vector Derivation</td>
<td>5%</td>
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<tr>
<td>QTBT</td>
<td>Quad-Tree Plus Binary Tree</td>
<td>4%</td>
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<tr>
<td>ALF</td>
<td>Adaptive Loop Filters</td>
<td>4%</td>
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<tr>
<td>BIO</td>
<td>Bidirectional Optical Flow</td>
<td>2%</td>
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<tr>
<td>NSST</td>
<td>Secondary Transforms</td>
<td>2%</td>
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<tr>
<td>AMVR</td>
<td>Adaptive Motion Vector Resolution</td>
<td>2%</td>
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<tr>
<td>OBMC</td>
<td>Overlap Block Motion Compensation</td>
<td>2%</td>
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