A Novel Feature: Motion Strength Count (MSC)

\[ \mathbf{M} = \sum_{i} \left( \sum_{j} v_i \in V \mathbf{M}^{n-1} \right) \]

Frame #30

\[ v_i \in V \mathbf{M}, \mathbf{M}^{n-1} \]

Frame #40

• Important for coding performance – 5.29% BD-rate saving
• Percentage of Intra-coded blocks is low – 9.84%
• But costs a lot of time – 21.49% of total coding time

The impact of Intra-prediction for Inter-frames

• The impact of Intra-prediction for Inter-frames
• New contents
• Non-rigid motion

Decision Algorithm

• In depth 1
  - if \( MSC^1 \) \( \geq T_A \)
    - go to check smaller blocks;
  - else
    - finish further checking;
    - return;
  - end

• In depth 2
  - if \( MSC^{2} \) \( > T_B \) \( \sum_{i} v \in V \mathbf{M}^{n-1} \) \( MSC^{2} \) \( > TB \)
    - examine intra-mode in current depth;
    - check smaller blocks;
    - else
    - finish further checking;
    - return;
  - end

• In depth 3-4
    - examine intra-mode in current depth.

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MSC MAP of the First CU Depth

<table>
<thead>
<tr>
<th>Class</th>
<th>( \text{BPool} )</th>
<th>( \text{MIS} )</th>
<th>( \text{ATS} )</th>
<th>( \text{DTS} )</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>96.8%</td>
<td>99.7%</td>
<td>98.9%</td>
<td>95.9%</td>
</tr>
<tr>
<td>B</td>
<td>94.5%</td>
<td>96.6%</td>
<td>98.1%</td>
<td>93.1%</td>
</tr>
<tr>
<td>C</td>
<td>94.5%</td>
<td>96.6%</td>
<td>98.1%</td>
<td>93.1%</td>
</tr>
<tr>
<td>D</td>
<td>94.5%</td>
<td>96.6%</td>
<td>98.1%</td>
<td>93.1%</td>
</tr>
<tr>
<td>E</td>
<td>94.5%</td>
<td>96.6%</td>
<td>98.1%</td>
<td>93.1%</td>
</tr>
<tr>
<td>Av.</td>
<td>94.7%</td>
<td>97.2%</td>
<td>97.5%</td>
<td>97.4%</td>
</tr>
</tbody>
</table>

More than 60% intra-coding time saving with negligible performance loss

Decision Algorithm

Conclusions

• Proposed a new feature Motion Strength Count, MSC, to predict the possibilities of examining intra-prediction in Inter-frames.
• Designed a Fast Intra-prediction Decision algorithm based on MSC to fast determine whether a CU needs to be checked intra-prediction.
• Compatible with fast Intra-mode decision and fast intra-block size decision algorithms for further speedup.

Future Extensions

• Extending the calculation of MSC from P frames to B frames.
• Selecting the two thresholds adaptively according to the video’s contents.

Reference


Tingting Wang, Yangyang Men, Yihao Zhang, Hongyang Chao
Sun Yat-sen University, Guangzhou, P. R. China