QUALITY EVALUATION OF DIFFERENT CODING STANDARDS FOR FULL HD AND ULTRA HD VIDEOS

Naeem Ramzan

Outline

- Motivation
- Codecs and configurations
- Dataset
- Test
  - Methodology
  - Session
  - Environment
- Results
- Conclusions
Codecs

- JCT-VC (MPEG and ITU)
- H.264/MPEG4 (AVC)
- H.265/MPEGH (HEVC)
- WebM data format
  - VP8
  - VP9
- Comparison of three latest video encoders subjectively and objectively
## Encoding

- **Standard codecs**
  - JM 18.6 (AVC)
  - HM 16.0 (HEVC)

- **Configurations**
  - Random access
  - GOP size 8
  - Intra period 1 sec.

- **VP9**
  - IntraPeriod2 1 sec.

### Table: Configuration Codec

<table>
<thead>
<tr>
<th>Configuration/Codec</th>
<th>AVC</th>
<th>HEVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encoder</td>
<td>JM 18.6</td>
<td>HM16.0</td>
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<tr>
<td>Profile</td>
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<td>Main</td>
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<tr>
<td>Reference Frames</td>
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<td>TZ search</td>
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<td>GOP</td>
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<td>Temporal Levels</td>
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<tr>
<td>Intra Coding</td>
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<td>Deblocking Filter</td>
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<td>Transform Unit Size (Min/Max)</td>
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<td>8x8 Transform</td>
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<td>Internal Bit Depth</td>
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<td>Rate Control</td>
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```
--good --cpu-used=0 --threads=0 --profile=0
--aq-mode=0
--fps=< FrameRate >
--end-usage=3 --cq-level=< QP >
--kf-max-dist=< IntraPeriod > --kf-min-dist=< IntraPeriod >
--minsection-pct=0 --maxsection-pct=2000
--auto-alt-ref=1
--arnr-maxframes=7 --arnr-strength=5
--codec=vp9 -v -t 0 -w < Width > -h < Height > -p 2
```
Dataset

- **HD (1920x1080)**
  - SVT15
  - UnderBoat1

- **UHD (3840x2160)**
  - Traffic Flow
  - Tree Shade
Test - Methodology

- Double Stimulus Impairment Scale (DSIS)
Test - Session

- ITU BT.500
  - One test session should not last more than 30 minutes
  - Alternate as many content as possible
- 10s sequences – requires a lot of attention for evaluation
  - Test sessions (4 sequences * 4 bitrates * 3 codecs)
  - Each session followed by resting phase
- Further details
  - Randomization to effect possible effect of content presentation order
  - Never the same content in same presentation order
  - Dummy sequences
  - Reference vs. reference
Test - Environment

- PC sever
  - SSD based solution to read and play ultra HD sequences (~400 MB/sec)
  - Alternate as many content as possible
- 55” Sony 4K TV (consumer grade)
  - Post processing disabled/neutralised
- ITU-R BT.500 complaint environment
  - Mid grey walls
  - No direct light, etc
- Pre-test screening
  - Snellen + Ishiara chart
- Subjects
  - 20 (6F/14M) of average age 27 years
Results – SVT15

- HEVC vs AVC
- VP9 vs AVC
- HEVC vs VP9
Results – UnderBoat1

- HEVC vs AVC
- VP9 vs AVC
- HEVC vs VP9
Results – Traffic Flow

- HEVC vs AVC
- VP9 vs AVC
- HEVC vs VP9
Results – Tree Shade

- HEVC vs AVC
- VP9 vs AVC
- HEVC vs VP9
Conclusions

- Comparison for broadcasting scenario
- Subjective and objective evaluation
- Variability in codecs performance
  - Depending on coding and contents
- AVC and VP9 have comparable performance
- HEVC and VP9 performance comparison
  - HEVC outperforms VP9 for low to high bitrates

- Future directions
  - Verify the results with more test sequences
  - Comparison of HEVC and AVC in Internet streaming