SHVC(Scalable HEVC) Experiment:
360 VR Video Service with 16K Resolution based on Tiled Adaptive Streaming

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Scalable HEVC (SHVC)

- **Background**
  - For Scalable HEVC
  - Multi-layer Structure (Base layer and Enhancement layer)
  - Inter-layer prediction for referencing between two layers

Architecture of SHVC
Tiled Adaptive Streaming

- **Background**
  - Multi Layered Rendering 360 VR
  - ROI-based HEVC tiled adaptive streaming for 360 VR video

360 VR Tile Streaming for User’s Viewport
Test Sequences

- Test Sequences

<table>
<thead>
<tr>
<th>Sequence name</th>
<th>Resolution</th>
<th>Frame count</th>
<th>Frame rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Park Riding 16K</td>
<td>15360x7680</td>
<td>300</td>
<td>30</td>
</tr>
<tr>
<td>Ilsan KINTEX Drone 16K</td>
<td>15360x7680</td>
<td>300</td>
<td>30</td>
</tr>
</tbody>
</table>

Lake Park Riding 16K

Ilsan KINTEX Drone 16K
Experimental Results

- **Server**
  - 2 Linux servers (Ubuntu 16.04) were used in experiment
  - One has 2 Intel Xeon E5-2687W (12 cores, 24 threads) CPUs and 128GB memory
  - Another has 2 Intel Xeon E5-2620 (6 cores, 12 threads) CPUs and 128GB memory
  - Memory requirement is very high in SHM encoding process (>50GB)

- **Software**
  - SHM 12.0
  - HM 16.9
Experimental Results (-Cont’d)

• Experimental results for *Lake Park Riding 16K* and *Ilsan KINTEX Drone 16K*
  
  • For the objective evaluation, Y-PSNR is used
  • Lack of time, We experimented only 17 frame
  • We compare SHVC and HEVC-Simulcast
  • SHVC is slightly better, but not significantly.

<table>
<thead>
<tr>
<th>Sequence</th>
<th>BD-rate</th>
<th>DeltaQP</th>
<th>Group of Pictures (GOP)</th>
<th>Frame</th>
<th>Tile Scheme (EL)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Lake Park Riding 16K</em></td>
<td>-4.20%</td>
<td>5</td>
<td>16</td>
<td>17</td>
<td>20x20 Uniform</td>
</tr>
<tr>
<td><em>Ilsan KINTEX Drone 16K</em></td>
<td>-7.52%</td>
<td>5</td>
<td>16</td>
<td>17</td>
<td>20x20 Uniform</td>
</tr>
</tbody>
</table>

Results of SHVC BD-rate compare to HEVC-Simulcast
Experimental Results (-Cont’d)

RD-curve of Lake Park Riding 16K

Y-PSNR (dB)

Bitrate (Mbps)

Lake

SHVC
HEVC-simulcast

RD-curve of Lake Park Riding 16K
Experimental Results

RD-curve of *Ilsan KINTEX Drone 16K*