1. Motivations and Research Objectives

- The rapid growth of Visual Sensor Networks (VSNs)

- Some characteristics of VSNs
  - Following the up-link model where many senders deliver data to a central receiver.
  - Each sensor node has limited processing capabilities and power budget.
  - The restriction of the transmission bandwidth

The demand for seeking a Low Complexity Video Coding Solution which offers not only the compression efficiency but also requires a low encoding complexity for VSNs.

Solution:
- Low complexity HEVC solution with an appropriate profile.
- Raspberry Pi platform plays the role of sensor nodes in a VSN.
1. Motivations and Research Objectives

Presenting a practical, low complexity HEVC solution for VSNs using the common Raspberry Pi platform.

2. HEVC Low Complexity Profile

- Larger and flexible coding block size
- Angular prediction with 33 prediction directions
- Removing intra artifact by using boundary smoothing
- Removing intra artifact by using reference sample smoothing
- Block size-dependent transform selection
- Intra mode coding based on contextual information

3. Raspberry Pi

- Advantages:
  - Being small as a credit card, but can play 1080p resolution video without lagging.
  - Low price as compared to a computer.
  - Low power consumption.
- Disadvantages:
  - Not support Windows operation system

4. Proposed VSN using Raspberry Pi

At the sensor node side:
- Raspberry Pi encodes video sequences by using HEVC standard.

At the server side:
- A high complexity device (e.g. PC) is used to decode and further processing.
5. Experimental Results

- Test conditions:
  
<table>
<thead>
<tr>
<th>Test sequences</th>
<th>Spatial resolution</th>
<th>Temporal resolution</th>
<th>Number of frames</th>
<th>QP</th>
</tr>
</thead>
<tbody>
<tr>
<td>RaceHorses</td>
<td>832x480</td>
<td>30Hz</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>Basketball-Drill</td>
<td>50Hz</td>
<td>500</td>
<td>7,17,27,37,47</td>
<td></td>
</tr>
<tr>
<td>BQMall</td>
<td>60Hz</td>
<td>50Hz</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>PartyScene</td>
<td>50Hz</td>
<td>500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Assessment measurements:
  - Rate-Distortion (RD) performance (PSNR vs. Bitrate)
  - Complexity performance in terms of encoding time (s)

5. Experimental Results - RD performance

- RD performance are the same for both cases: Raspberry Pi and PC.
- Quality of the decoded video is decreased when the QP value is increased.
- The QP value 27 is considered as the most suitable for both cases.

6. Conclusions

- The encoding time of Raspberry is higher than PC.
- The encoding time difference is proportional to the QP.
- The QP 27 is also the most suitable selection for Raspberry Pi.

Advantages:
- The proposed architecture is compact and low cost.
- RD performance is quite good while the complexity performance is acceptable even in the case of encoding high resolution video sequences.

Disadvantages:
- Take a higher time consuming compared to PC.
THANKS FOR LISTENING!