# MPEG Requirements of 3D Video
# and
# Occlusion-Adaptive Unidirectional DCVF


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# Outline

- Part –I
  - Requirements of 3D Video
  - Reference Softwares
- Part –II
  - Occlusion-Adaptive Unidirectional DCVF
  - Experiments
- Present Scenario and Scope for Improvement

Part –I

# MPEG Requirements of 3D Video

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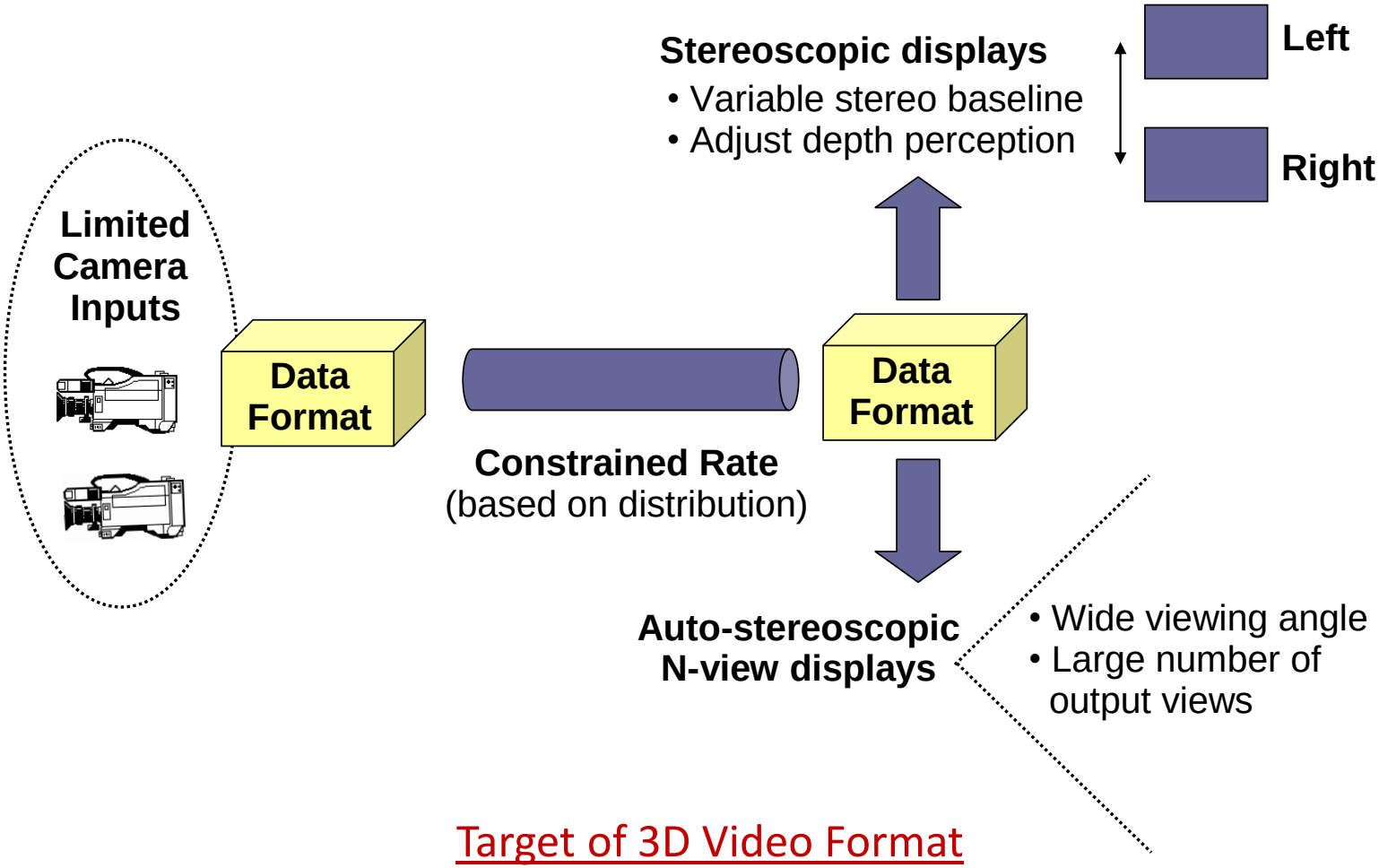
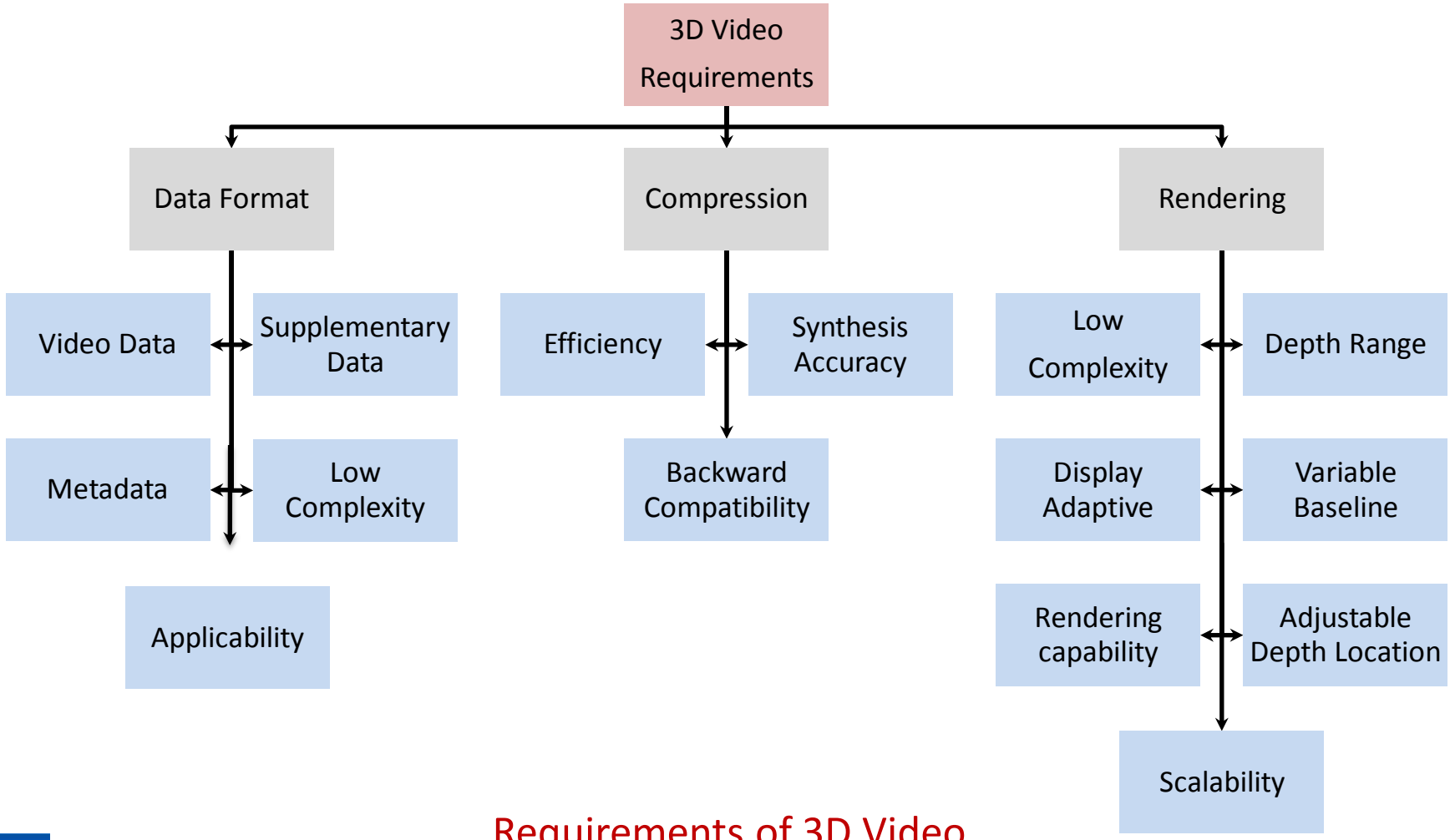



Target of 3D Video Format

# MPEG Requirements of 3D Video

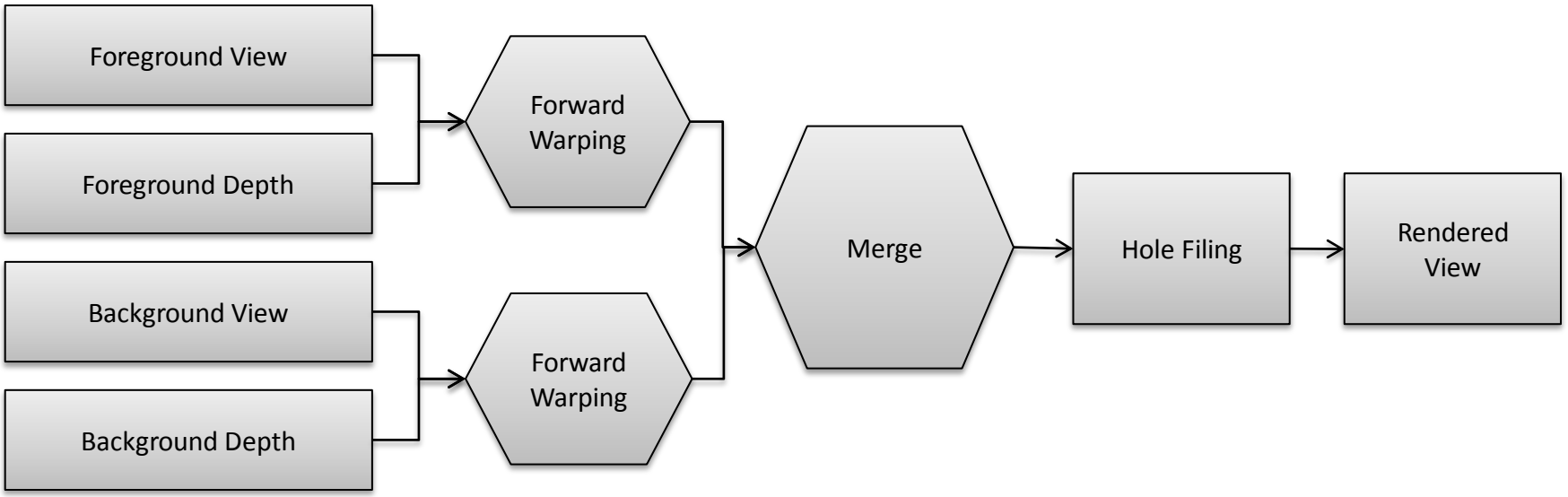



Requirements of 3D Video

# MPEG Reference Software

- Philips –Zhejiang Reference Software(LDVRS)
- Thomson Reference Software(ViSBD )
- Nagoya Reference Software(DERS, VSRS)

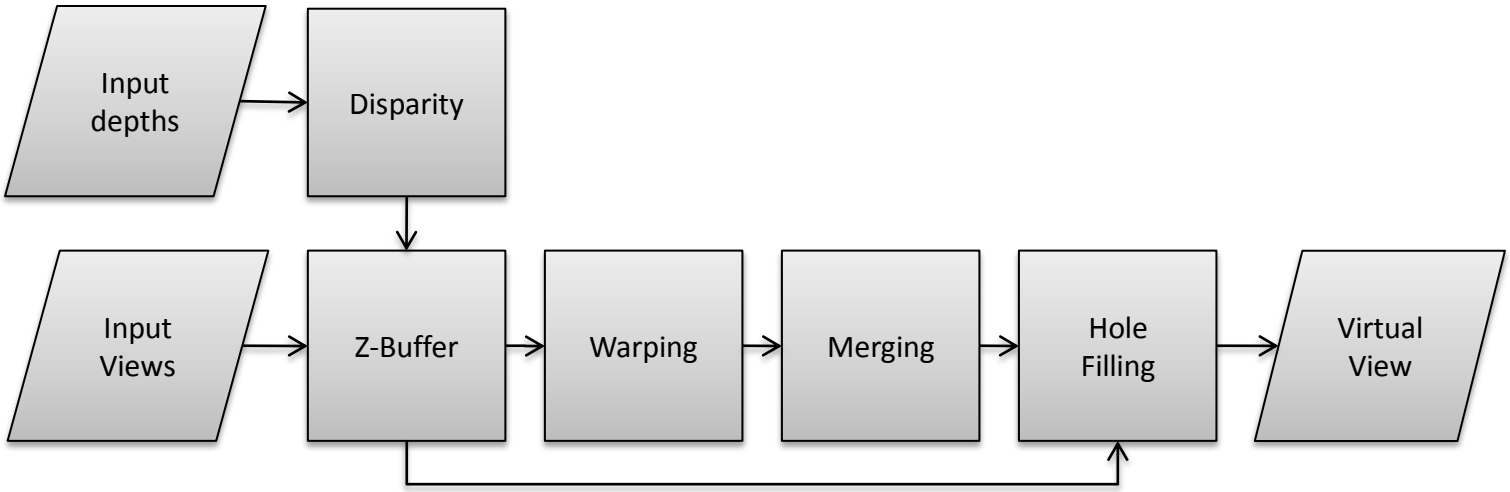
# Philips-Zhejiang Reference Software




LDV Rendering (LDVRen)

- Warping : The foreground view and background view are warped to the virtual view with foreground and background depth, respectively.
- Merge : The warped foreground view and warped background view are merged.
- Hole Filing : Remaining marked pixels as hole pixels after merge process in the rendered view are filled by Inpainting Technique .

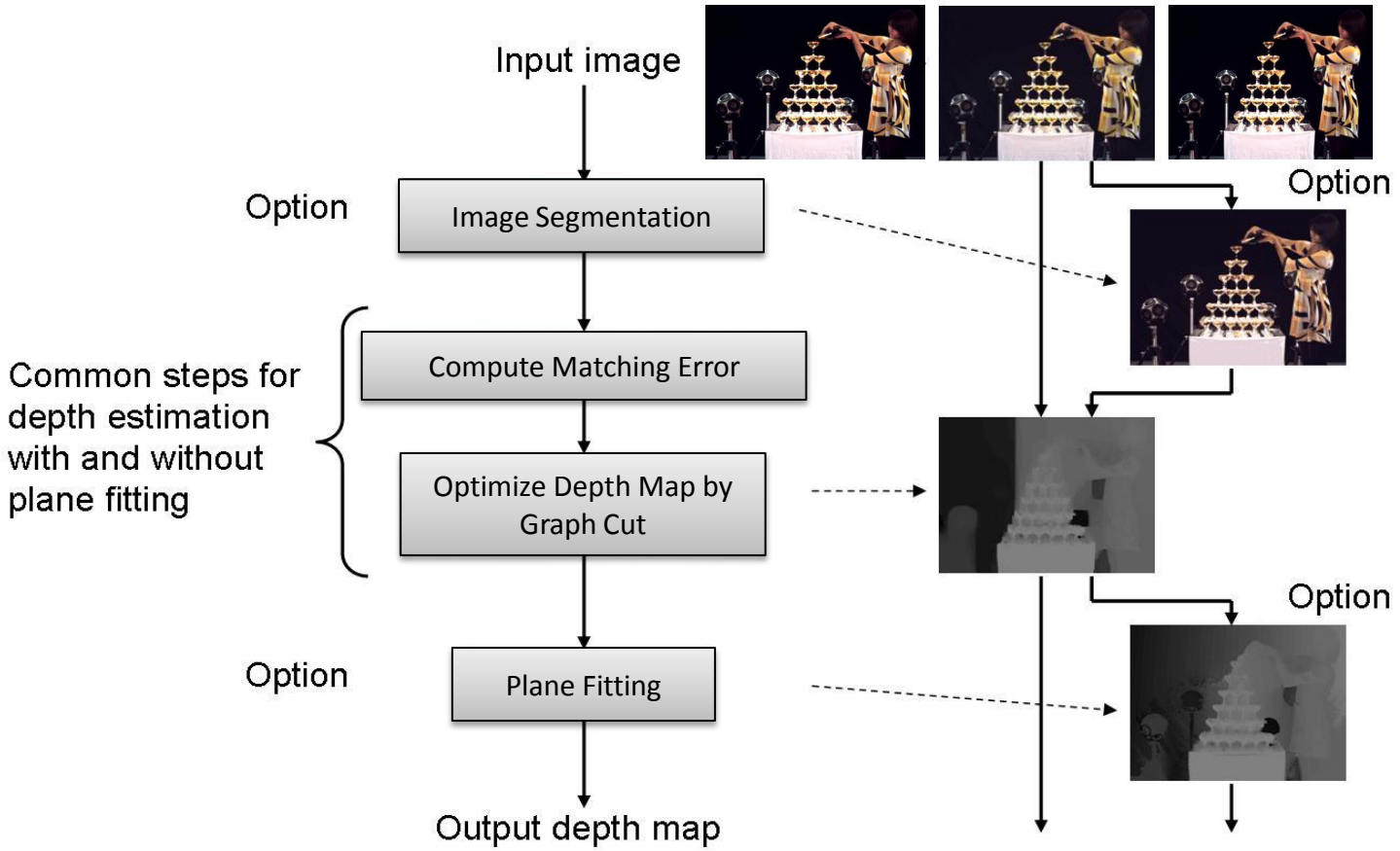
# Thomson Reference Software




View Synthesis Based on Disparity 1.0 (ViSBD 1.0)

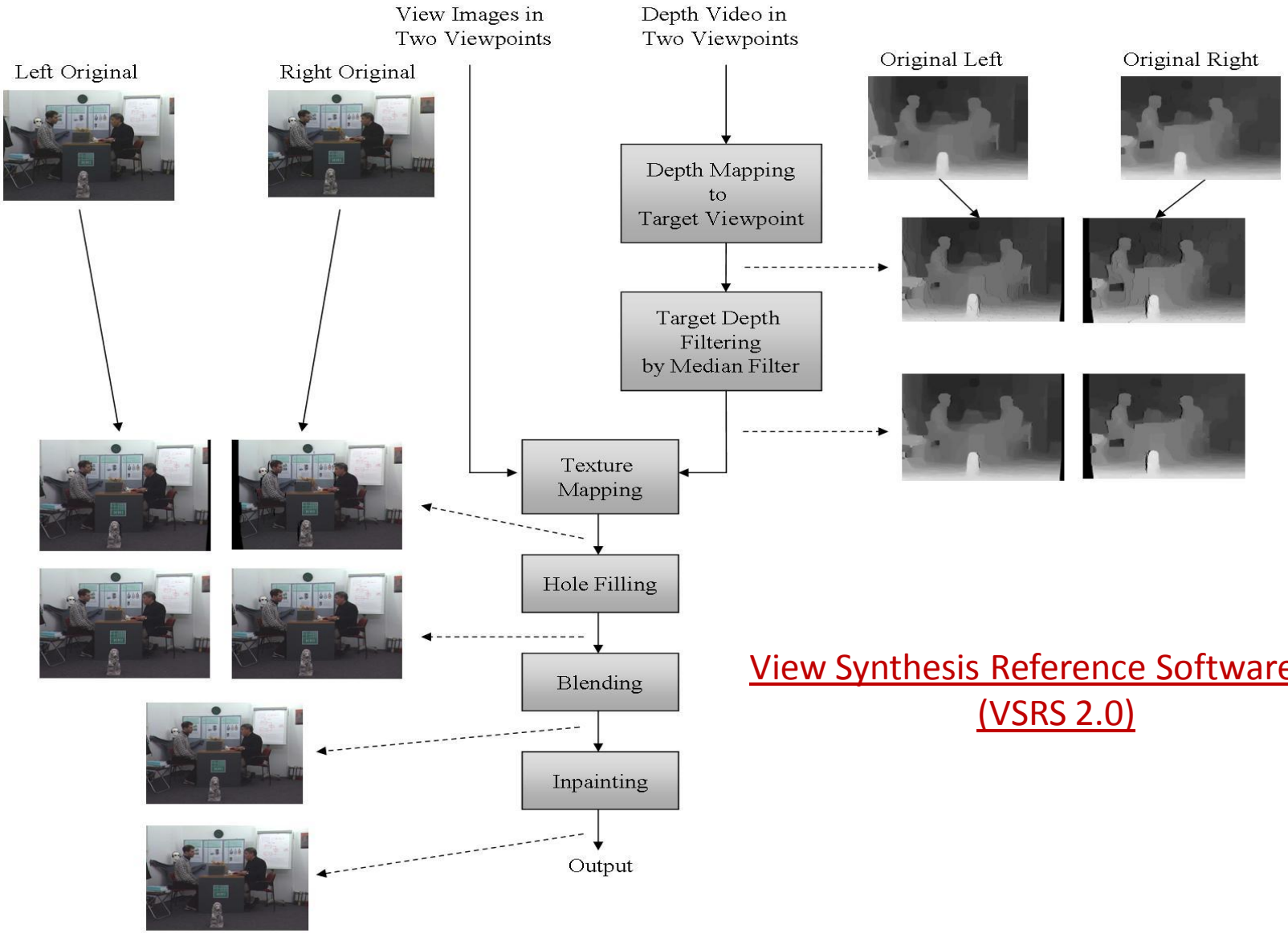
- ViSDB 2.0 (October 2008, Busan, Korea)
  - Reference View Upsampling
  - Boundary-aware Splatting
  - Smart Blending Method
  - Occlusion Layer Generation

# Nagoya Reference Software




Depth Estimation Reference Software 3.0 (DERS 3.0)

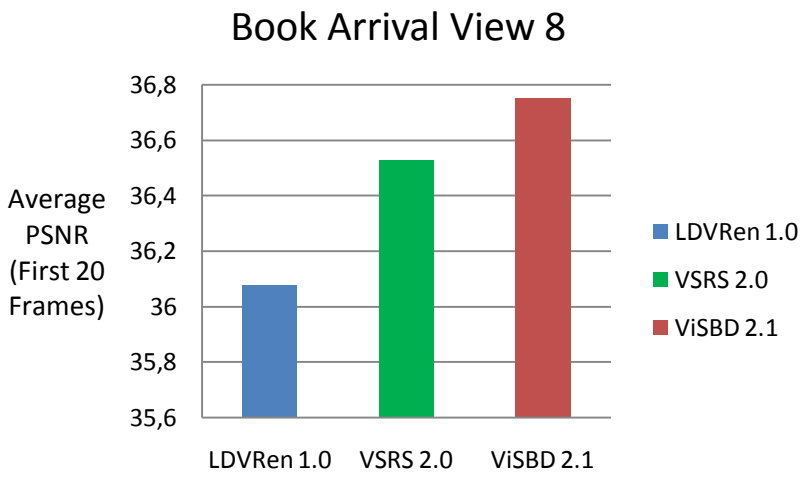
# Nagoya Reference Software



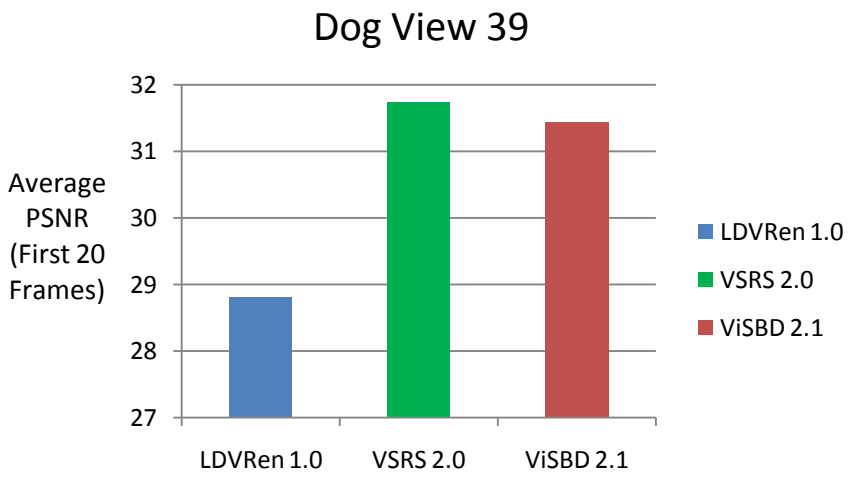

[View Synthesis Reference Software 2.0 (VSRS 2.0)]

# Reference Software Performance

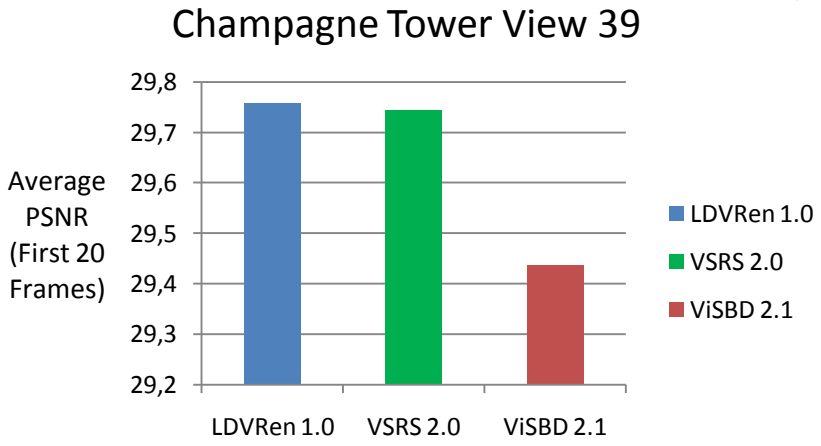
**Reference : MPEG2008/M16040, February 2009, Lausanne, Switzerland**




Average PSNR of Book Arrival synthesized view 8 by the three software




Average PSNR of Dog synthesized view 39 by the three software



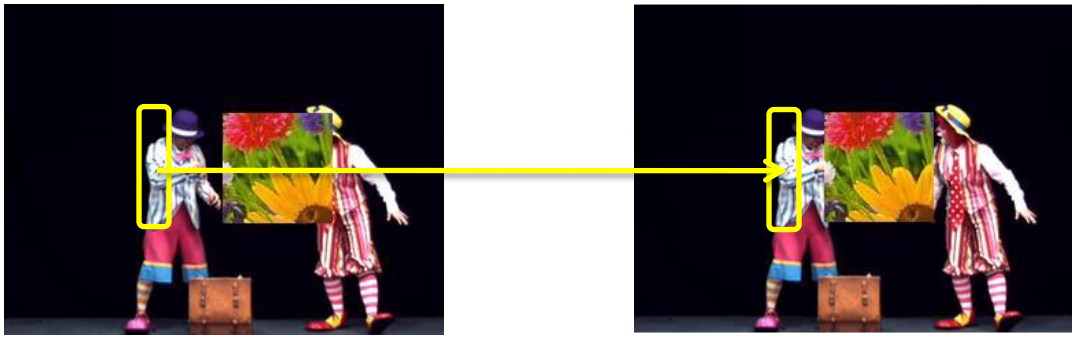

Average PSNR of Champagne tower view 39 by the three software

Part –II

# Occlusion-Adaptive Unidirectional DCVF

# Effect of Occlusion

- Well-Defined Disparity Field



Left view Right view

- Undefined Disparity Field

Left view Right view

- A pixel with undefined disparity field information affects energy compaction in the DCVF

# Transform Modes

- Unidirectional Mode
  - It is incremental orthogonal transform;
  - It is implemented to handle pixels with well-defined unidirectional disparity information.
- Identity Mode
  - It is identity transform;
  - It is implemented to handle pixels with undefined disparity information (i.e., occlusion).
- Criteria for Switching between Modes
  - Unidirectional Mode

Left view Right view

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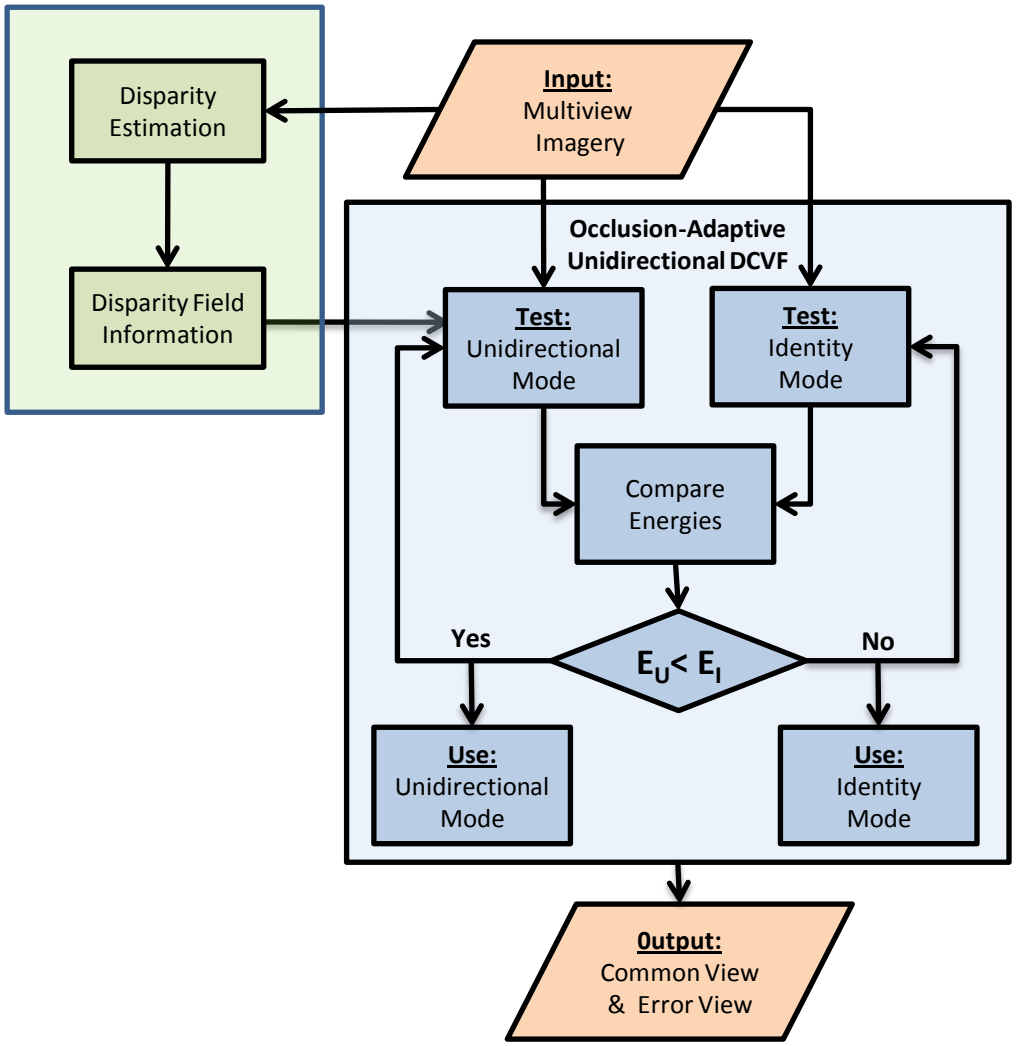
- Criteria for Switching between Modes
  - Identity Mode

Left view

Right view

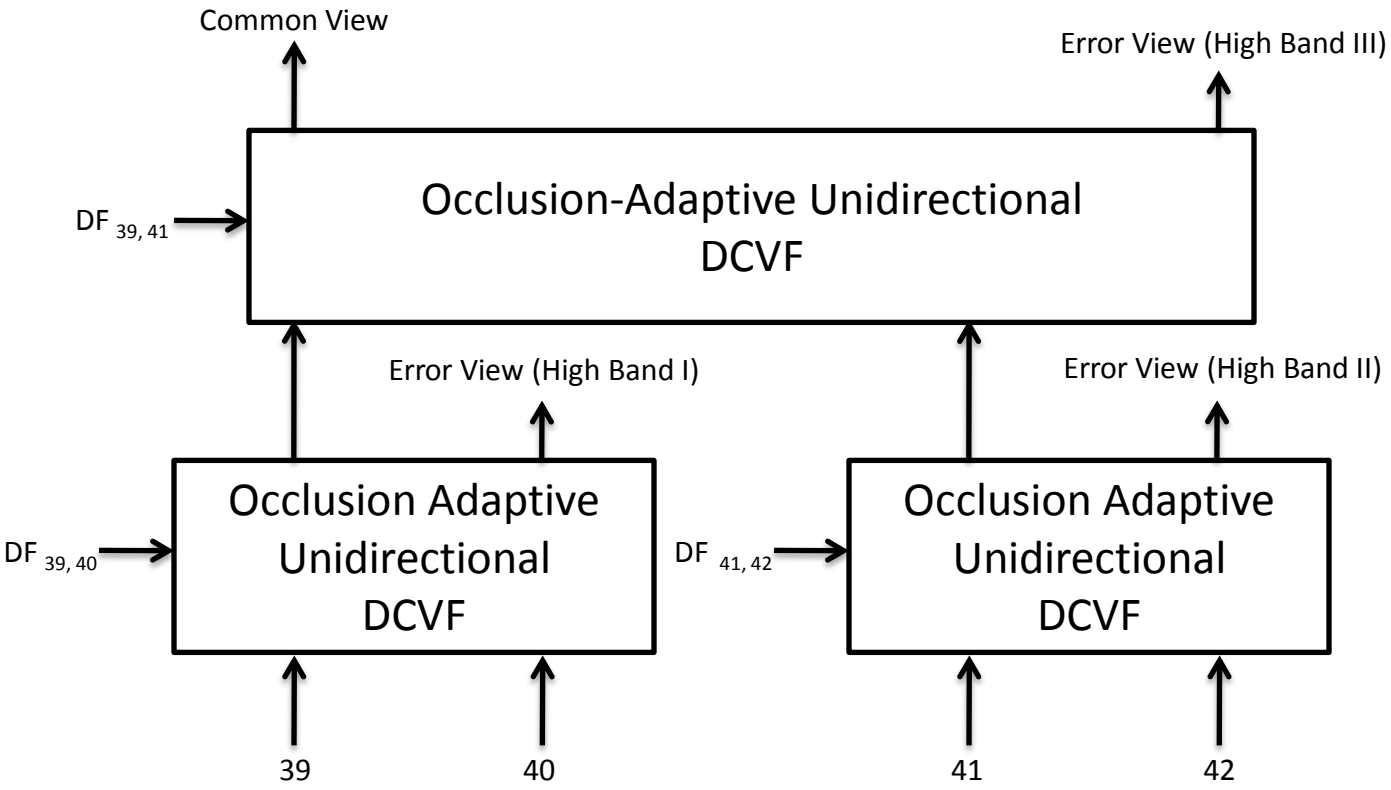
# Occlusion Detection
&
# High Band Energy Minimization Algorithm




$E_U$ = Energy of the pixel in the high band in unidirectional mode

$E_I$ = Energy of the pixel in the second view in the identity mode

# Occlusion-Adaptive Unidirectional DCVF



# Pantomime

common view

high band III

high band II

high band I

pantomime 39

pantomime 40

pantomime 41

pantomime 42

# Champagne Tower

common view

high band III

high band II

high band I

champagne tower 39

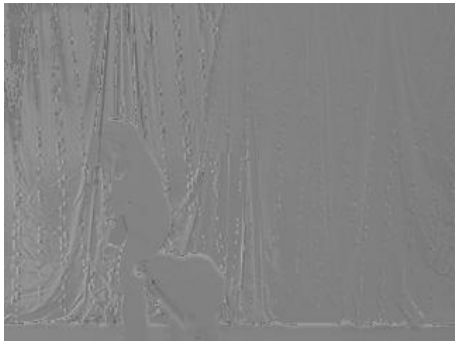
champagne tower 40

champagne tower 41

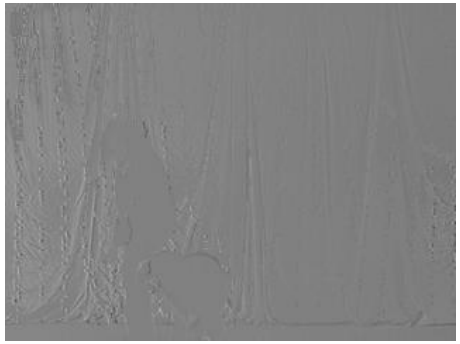
champagne tower 42

# Dog

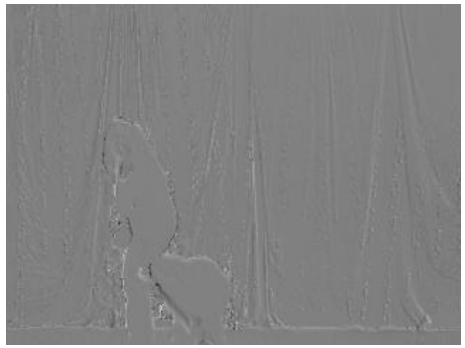
common view



high band III



high band II



high band I

dog 39

dog 40

dog 41

dog 42

# Performance Comparison

| | Disparity Compensated View Filters | |
|---|---|---|
| **Video Data** | **Energy Ratio(%) (Non-occlusion Adaptive)** | **Energy Ratio(%) (Occlusion-Adaptive)** |
| Pantomime | 0.30 | 0.27 |
| Champagne Tower | 0.24 | 0.20 |
| Dog | 1.65 | 0.50 |

# Present Scenario and Scope for Improvement

- Present Scenario
  - Depth estimation just form two views
  - Depth in MVD is not consistent
  - LDV just distinguishes between foreground and background.
- Scope for Improvement
  - Multi-resolution depth estimation
  - Consistence depth information across many scales
  - Minimize impact of hole filling / inpainting