

# Multiview Video Coding

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1. Introduction – Purpose and Applications
2. MVC standardization – Technical Solutions and Status
3. Free-viewpoint video
4. Conclusions

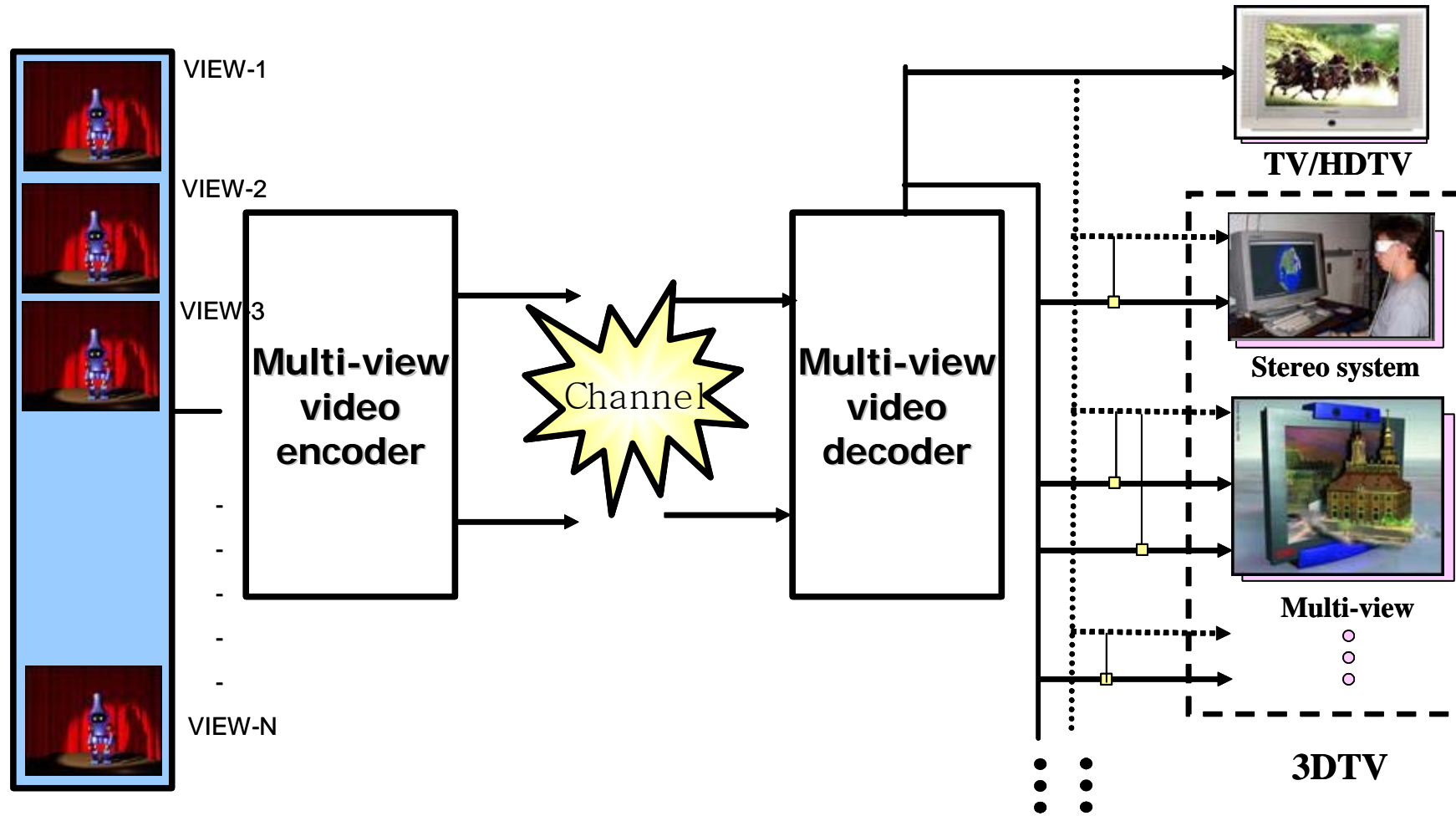
## Multi-view Video Coding (MVC)

- FVV and 3DV representations require transmission of **multiple synchronized video signals** that show the same scenery from different viewpoints
- **Huge amount of data** that need to be compressed efficiently
- Contains a large amount of **inter-view statistical dependencies**



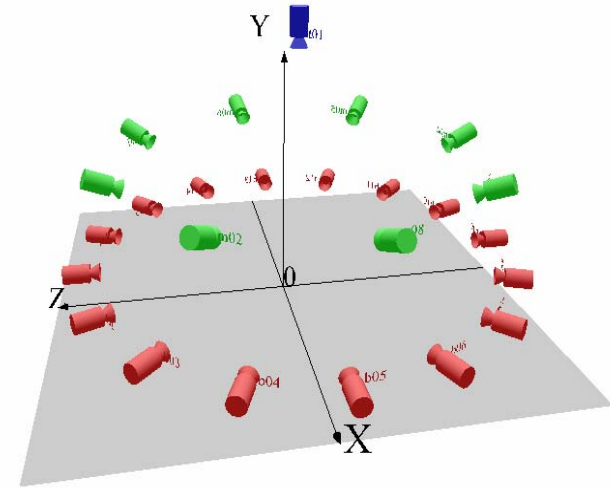
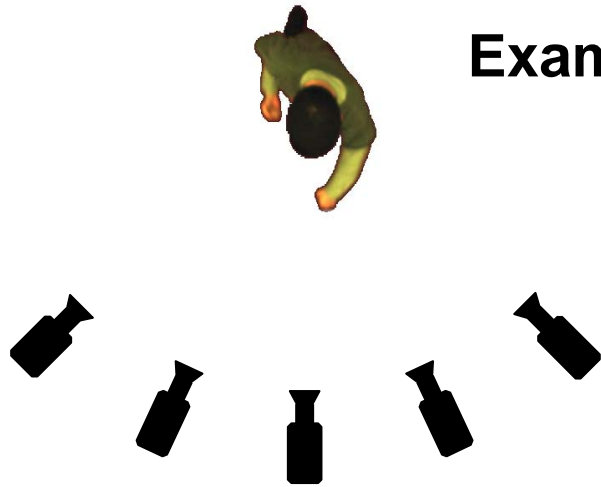
We would like to thank the Image Based Realities Group of Microsoft Research for providing the Breakdancers and Ballroom data sets.

# MVC



- 3D displays have largely improved recently, and are targeting consumer markets
  - High-end displays require many views
  - Autostereoscopic displays for several users and with view correction
  - Low cost stereoscopic e.g. for mobiles
  - *In these cases, all available views need to be decoded*
  
- Adaptation of view direction
  - Support head motion parallax viewing
  - Integral imaging
  - *In these cases, only some views are selectively decoded (all must be available for choice)*

# Example Camera Setting

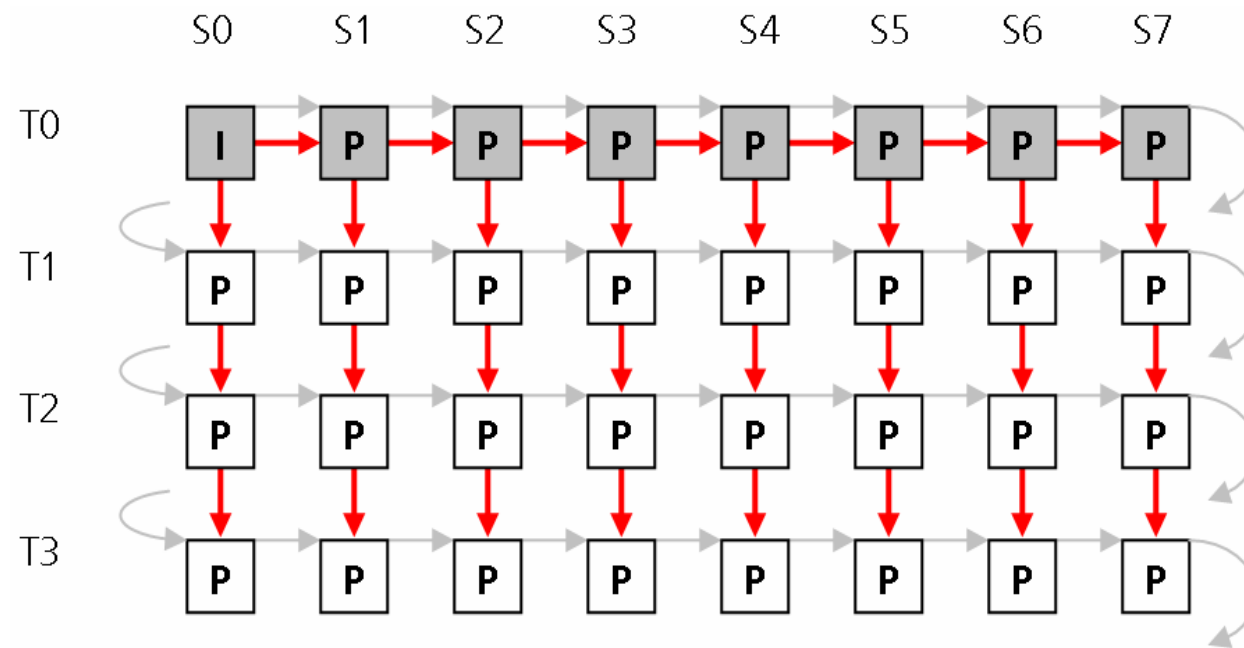


- MPEG decided to launch a new standard on MVC
- Based on the results of CfP, it was decided to start this on basis of MPEG4-AVC
  - Currently under development:  
14496-10:200x/Amendment 1
  - Joint work with ITU-T, performed by Joint Video Team (JVT)

<input type="checkbox"/> Evaluation of Call for Proposals	January 2006
<input type="checkbox"/> First WD	July 2006
<input type="checkbox"/> PDAM	July 2007
<input type="checkbox"/> FPDAM	January 2008
<input type="checkbox"/> FDIS	July 2008

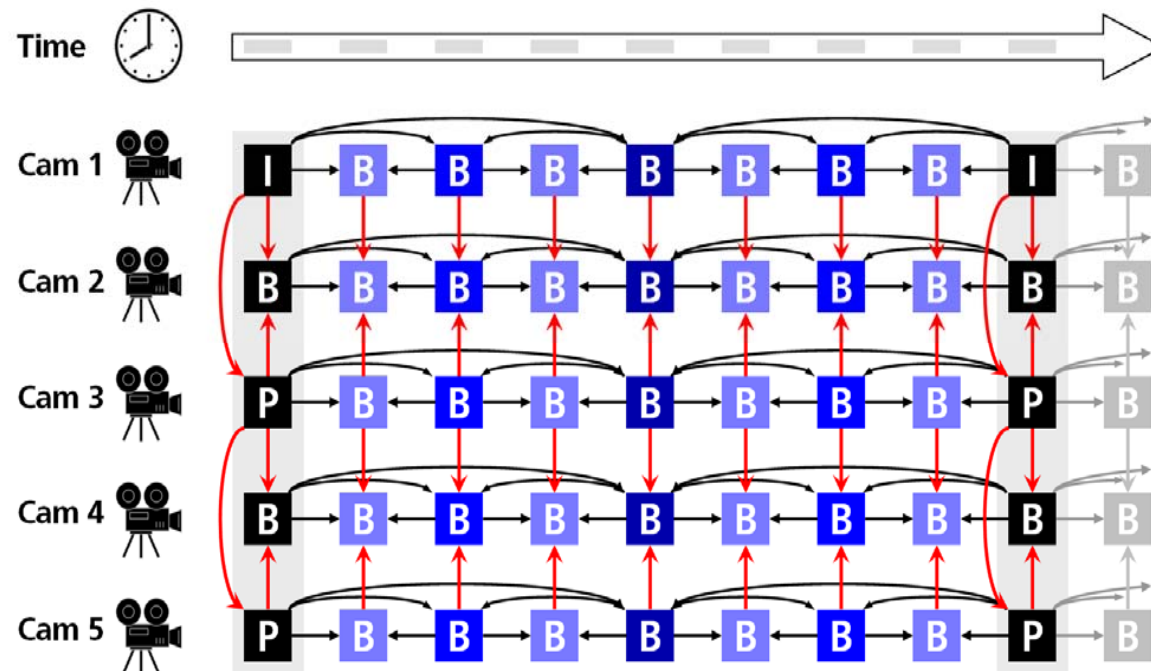
## Multi-view Video Coding (MVC)

- Evaluations have shown that specific MVC exploiting inter-view statistical dependencies provides additional coding gain

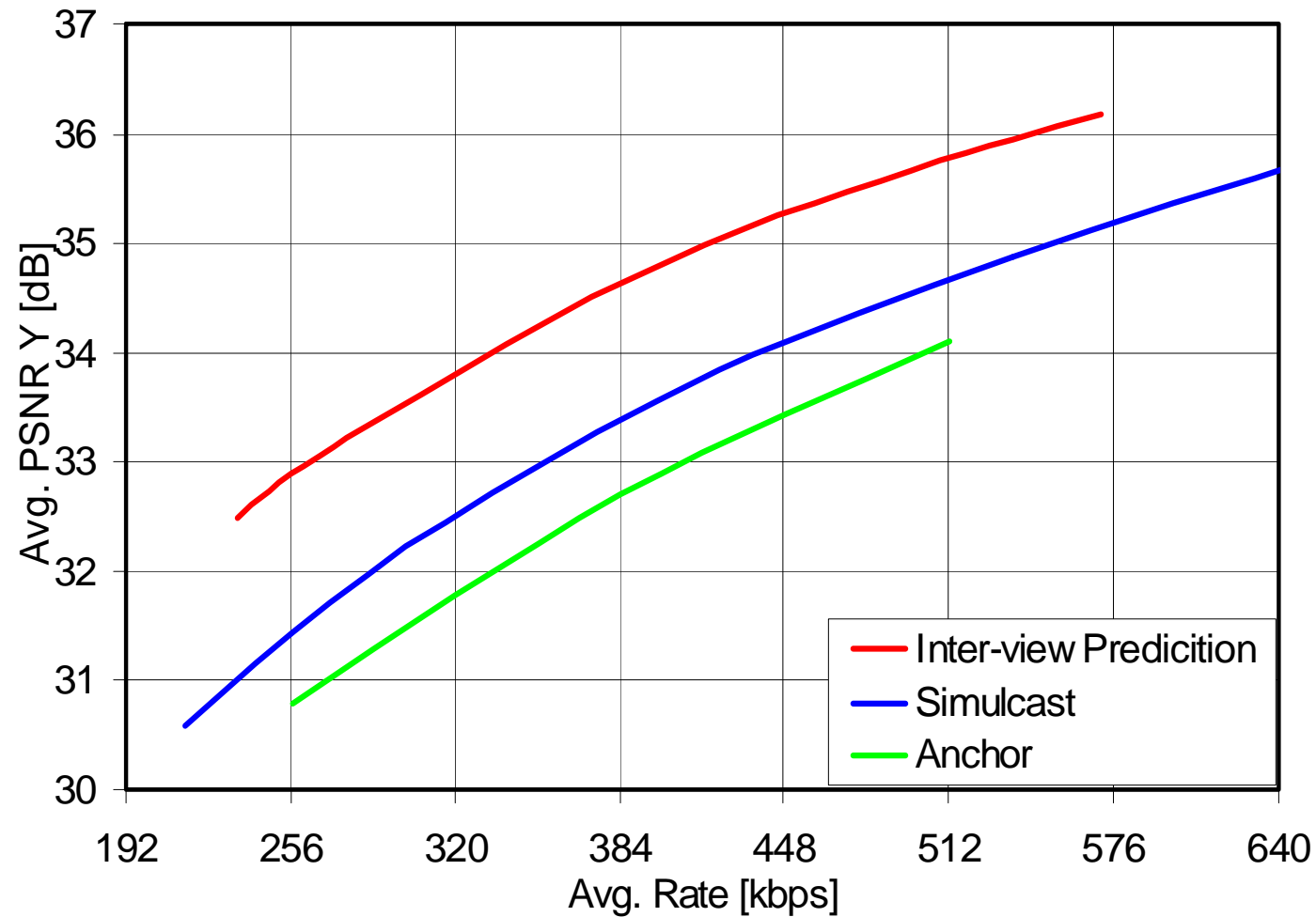




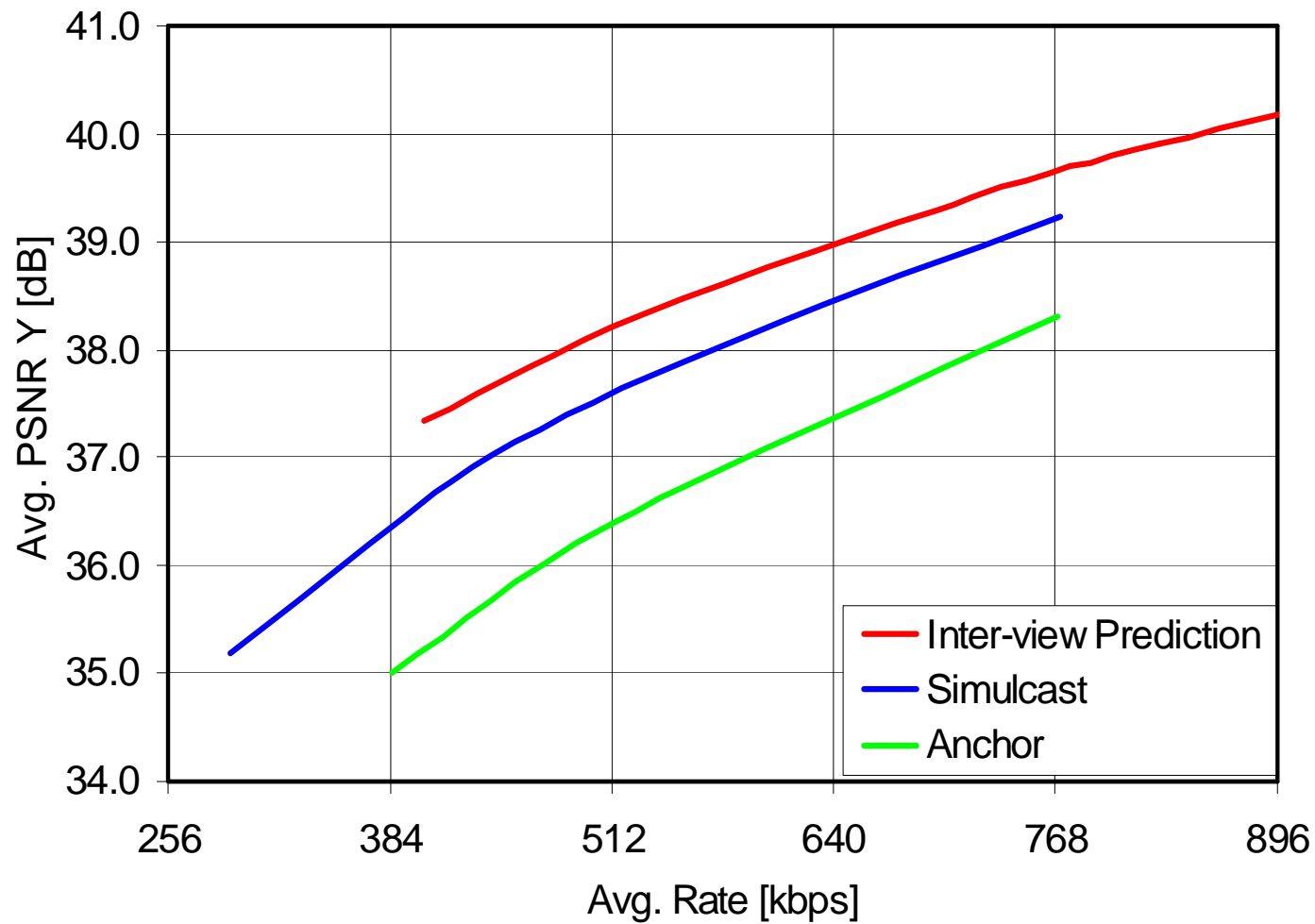
- Fully compatible to MPEG4-AVC at slice layer and below
- Can be seen as reorganization of input images into a single stream prior to encoding
- Uses hierarchical B-pictures combined in temporal and inter-view dimension



## Objective Results Ballroom



## Objective Results Race1



## Results

- Without significant changes, roughly 20% bit rate reduction can be achieved allowing inter-view prediction
  - Sophisticated temporal+inter-view prediction structures can be implemented based on flexible reference picture indexing of AVC
  - No distinction between motion vectors and disparity vectors in this case
- Efficient methods for buffer and access management have been defined for this case, including possibilities for low delay and random access

## Results

- Using additional tools (changing AVC at macroblock level), up to 10% additional bitrate saving have been achieved so far, in particular using
  - Illumination compensation
  - Combined motion/disparity vector coding (e.g. disparity-based motion skip)
- Improvements and more technologies under consideration, e.g. adaptive filtering of references before disparity compensation
  - May lead to some more reduction (< 10% ?)

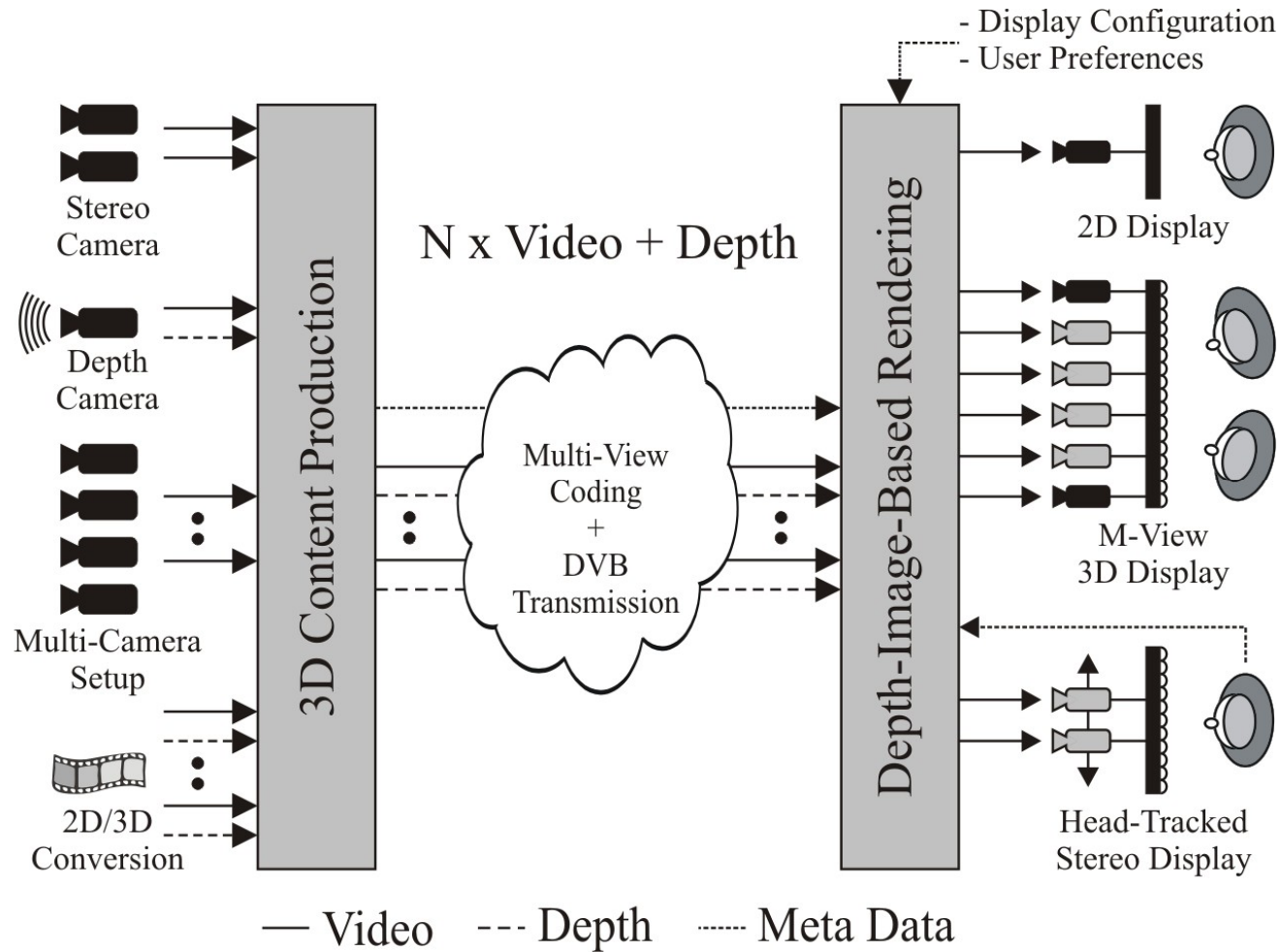


**Parameters to adjust for lighting conditions are derived efficiently from already transmitted macroblocks, low rate overhead**

## Free-viewpoint Video

- MPEG has defined MPEG-C part 3 (23002-3) standard
  - Format enabling simple stereoscopic application
  - Allows one video plus depth from which a second view is generated
  - Almost same rate as monoscopic video
- MVC is about encoding a discrete set of multiple views
  - Goal: Highest pixel fidelity
  - Rate significantly higher than monoscopic video
- Exploration activity in MPEG: **Free-viewpoint video** would be a compressed representation and technologies allowing to generate a large number of views from a sparse view set
  - Requires depth/disparity maps representation/compression and interpolation/rendering method
  - Higher distortion may be expected (in terms of pixel fidelity, not necessarily visual quality)

## Free-viewpoint Video





New 3D display types will enable the launch of multiview video services for professional and consumer-level applications

The new MVC standard will allow common compression of multiple video views, allowing additional compression gain

More progress expected by moving into wider-range view synthesis – as required by free-viewpoint video

Thank you for your attention!