MPEG 3DAV International Standardization Activities

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Outline

- ◆ What 3DAV is
  - ▪ Applications
  - ▪ Demonstrations
- ◆ History in MPEG
- ◆ Requirements on 3DAV
- ◆ Brief summary of EE
- ◆ Multi-view video coding
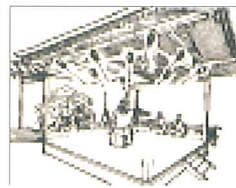- ◆ Conclusion

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What is 3DAV?

- ◆ 3DAV = 3D Video or 3D Audio
- ◆ 3D Video
  - ▪ Visual representation and coding format, taking geometry information of acquisition system
- ◆ Key features
  - ▪ Interactivity (free change of view point and direction)
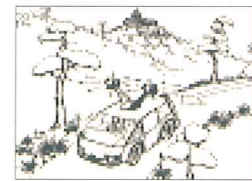 - ▪ Natural (Real!)
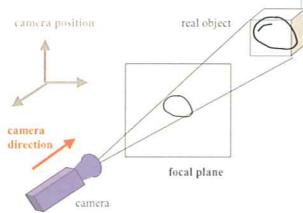
Supposed applications

- ◆ Basically applicable to any kind of visual application
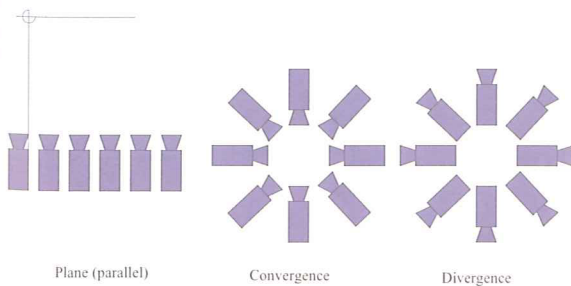- ◆ Especially for entertainment and education

Video archive of tangible and intangible cultural properties

Navigation

Examples of camera arrangements

Plane (parallel)   Convergence   Divergence

Application scenarios

FTV

is a promising application scenario!

There are some other also promising applications

Demonstration of omni-directional video

◆ Immersive media viewer
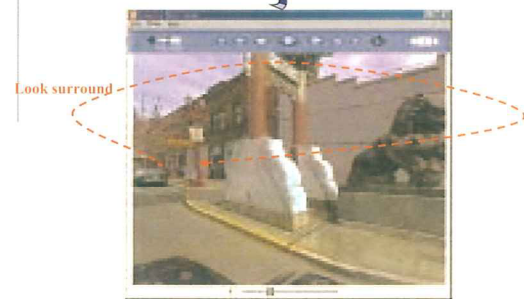
Look surround

Demonstration of free viewpoint video (model base)

◆ MRI volumetric 3D

History of 3DAV

2001/12	2002/05	2002/12	2003/10	2004/10	2005/07	2006/01	time
First proposal of 3D Video	First proposal of 3D Audio	3DAV seminar	CfC on 3DAV	CfE on MVC	CfP on MVC	Evaluation of proposals	

3D Video — 3DAV activities

Applications and Requirements on 3DAV

Representation format and Camera parameters

EEs on 3DAV

FTV and MVC

Components on 3DAV

AV Aquisition

Raw Video Data + Camera parameters

Format conversion

Representation format

Uncompressed Format

Compressed Format

Encoding (Compression)

Data processing (Integration AV with CG, Modeling, etc.)

Application Specific data (In Uncompressed Format)

Delivery

Backchannel
- Viewpoint selection
- Display type selection
- Listening point & sound direction selection
- Play type selection

Decoding

Rendering

Interaction
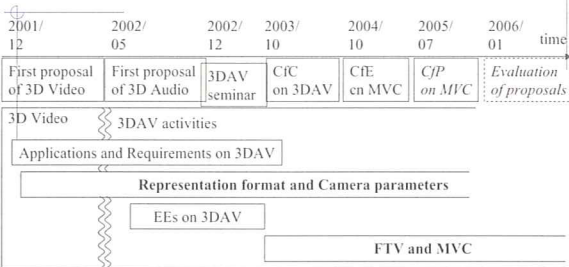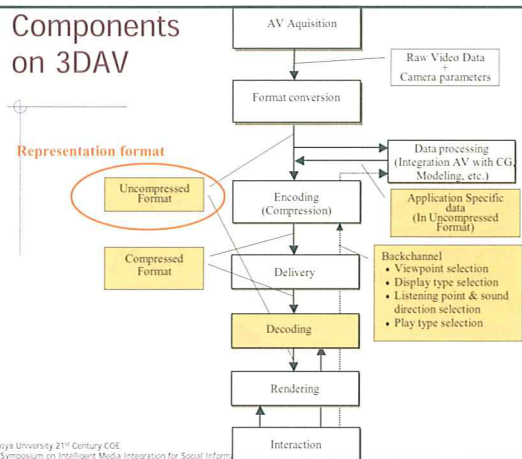
Exploration Experiments (EE)

◆ Experiments to determine existing MPEG tools could realize or not

◆ Categorized on application scenarios
◆ EE1: Omni-directional video
◆ EE2: FTV / Free viewpoint video
◆ EE3: Stereoscopic video (coding efficiency test)
◆ EE4: Stereoscopic video (depth base rendering)

Omni-directional video (EE1)

◆ Texture mapping to 3D mesh
- → representation format = video + mapping info
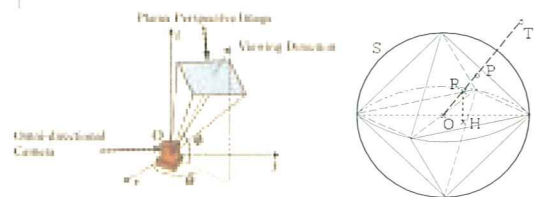
FTV / Free viewpoint video (EE2)

- 2 approaches
  - Image base (Ray-Space), this is for FTV
  - Model base
- Each approach evaluated individually
  - Functionalities
  - Supposed camera density
    - Dense – Image base
    - Sparse – Model base

FTV = Image base free viewpoint video

- Study functionalities, representation formats, and coding methods, with regard to Ray-Space
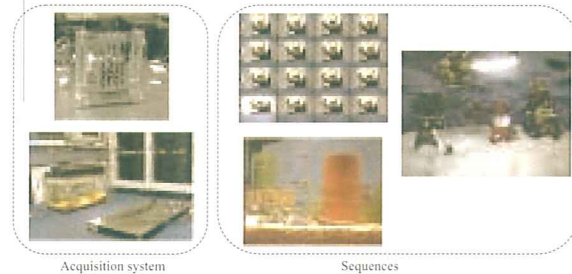
Acquisition system   Sequences

Further actions

- Functionalities are mostly understood
  - Since the initial proposal in December 2001, it had passed two years.

- Then, where 3DAV should go?

- Call for comments to ask for Industry

Call for Comments (Oct., 2003)

- FTV was widely supported from Industry
- Further direction of 3DAV activity
  - Image base (FTV)
    - → Multiview Video Coding
    - Interpolation
  - Model base
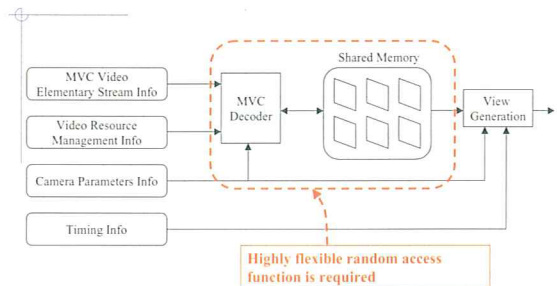   - Finalized
    - (Mostly achieved by existing MPEG tools)

FTV = Image base free viewpoint video

- View interpolation in Ray-Space domain
- → representation format = multiple videos + geometry info
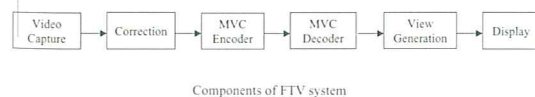
Components of FTV system

Possible relation of MVC and FTV

Highly flexible random access function is required

Multi-view video coding(MVC)

- Key technologies
  - View interpolation applying camera parameters
  - Satio-temporal prediction
- Applicable to FTV and 3DTV
  - Final goal of 3DAV is FTV

FTV

Call for Evidence (Oct., 2004)

- Evaluation of coding efficiency
  - Comparison with MPEG-4 AVC simulcast
- Conclusion
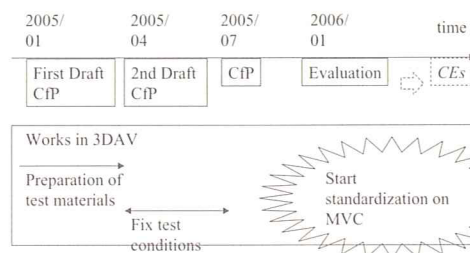 - Sufficient evidence for almost all test sequences

- Examples of test sequences

Aquarium

Call for Proposal (Jul., 2005)

- Proposals will be evaluated in MPEG meeting next January

Test sequences for CfP

- Multiple views and camera parameters

100 camera system
In Nagoya University

Akko&Kayo

Rena

Conclusion

- FTV (image based free viewpoint video) is an expected, brand-new visual media
  - MPEG will continue standardization activity on FTV
- MVC
  - Concrete standardization activity, e.g. CE, will start next January
  - View interpolation is a key technology
- Open issue
  - Representation format
  - Camera parameters
  - Evaluation criteria / evaluation method