FTV Seminar
~A Viewing Revolution in the Making~

Targets of MPEG FTV

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Outline

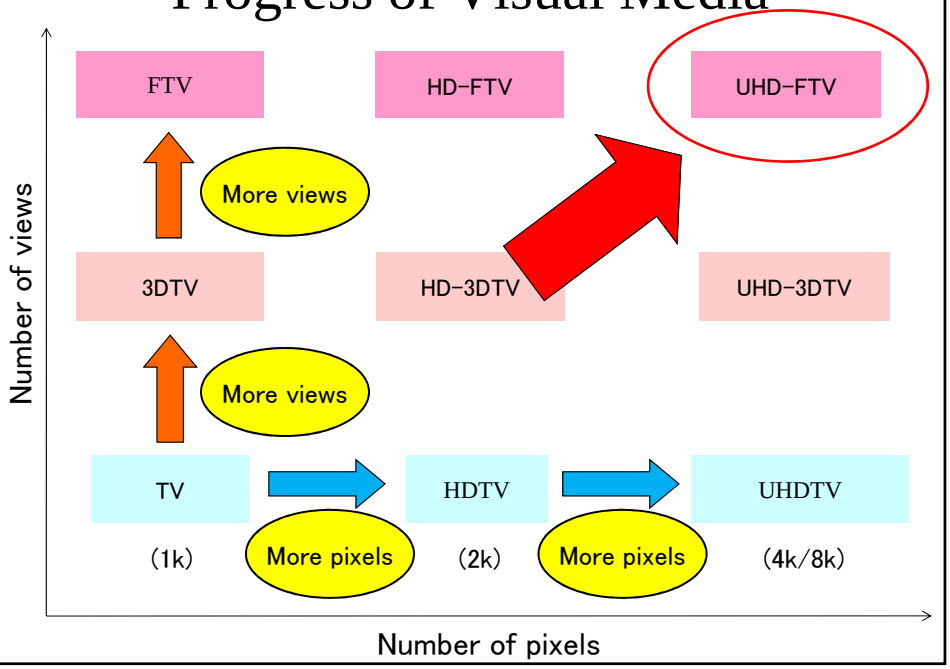
1. Introduction of FTV
2. FTV Technologies and Demo
3. History of FTV Standardization in MPEG
4. MVC and 3DV Standards
5. FTV Standardization
6. Conclusion

1. Introduction of FTV

FTV (Free-viewpoint TV)

A visual media that allows users to view a 3D scene by freely changing the viewpoint as if they were there.

Progress of Visual Media



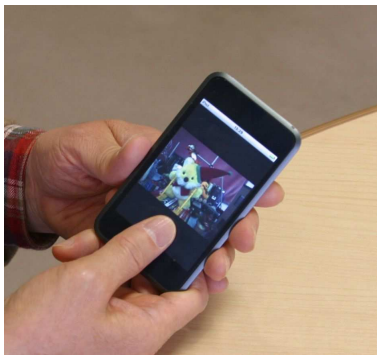
Number of Views in Visual Media

	2DTV	·	1
3DTV	Stereoscopic TV	· ·	2
3DTV	Auto-stereoscopic TV	·····	tens
	FTV		infinite

Significances of FTV

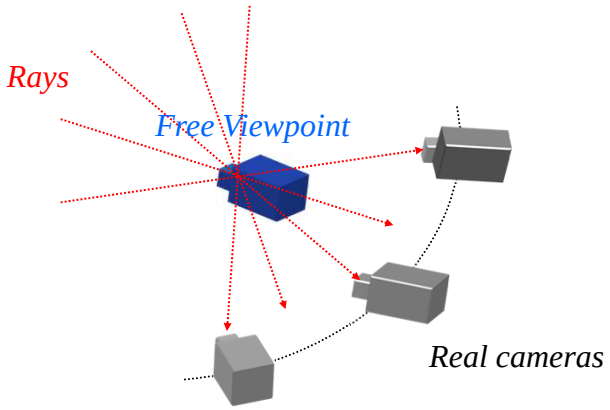
- Ultimate 3DTV that transmits all rays of a 3D space and ranked as the top of visual media.
- Best interface between human and environment
- Innovative tool to create new types of contents

2. FTV Technologies and Demo

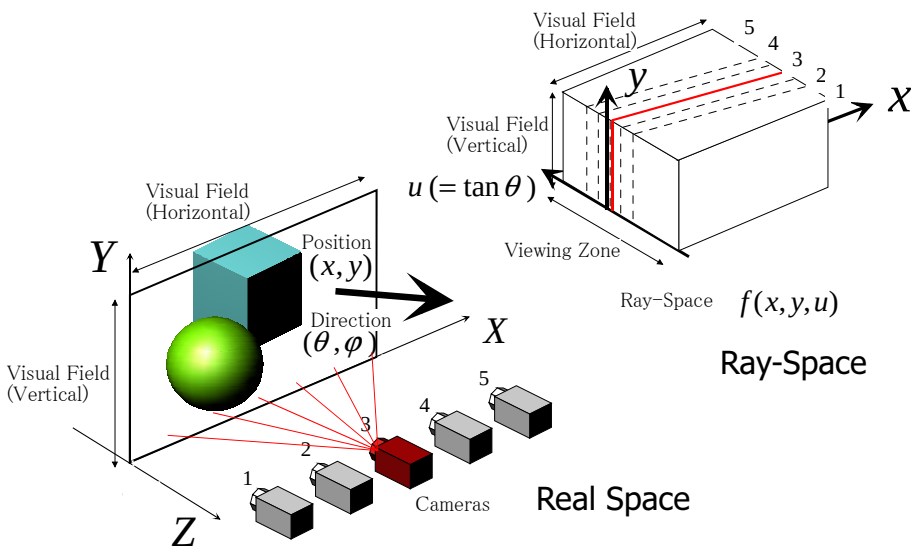


How to realize FTV

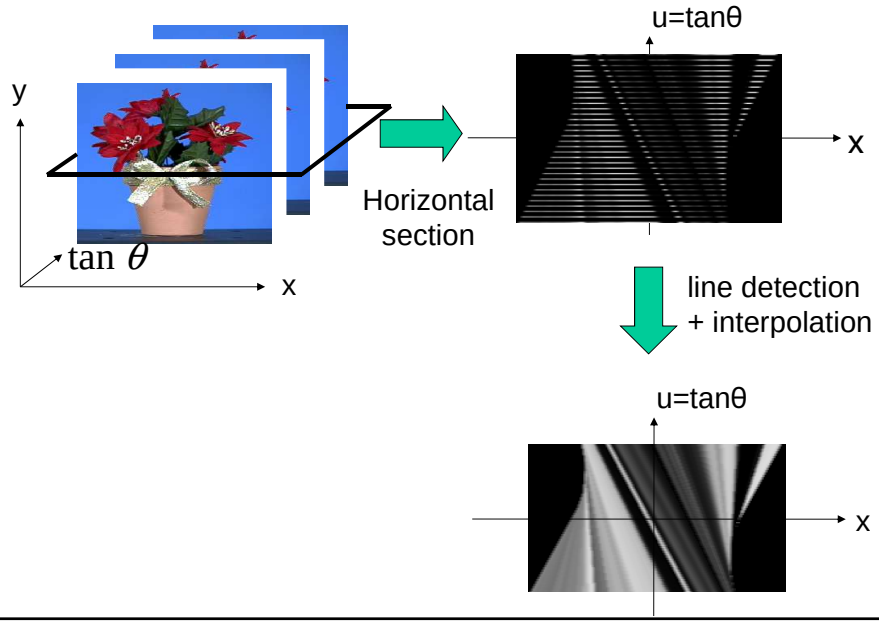
- Some views are captured by cameras.
- Other views are generated by the integration and interpolation of rays.



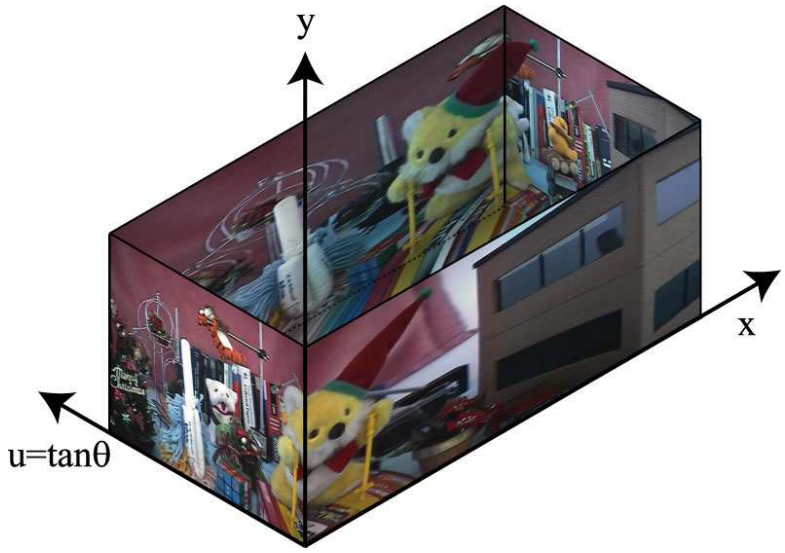
Capture of FTV



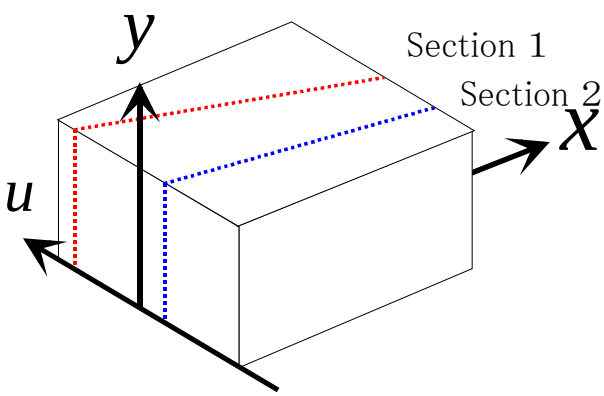
Ray-Space Interpolation



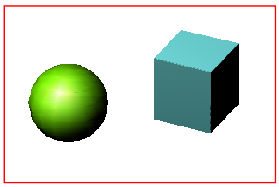
Ray-Space and Horizontal Cross-Section



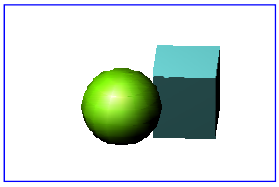
Generation of FTV Images



Ray-Space $f(x, y, u)$

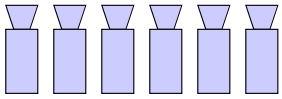


Section Image 1

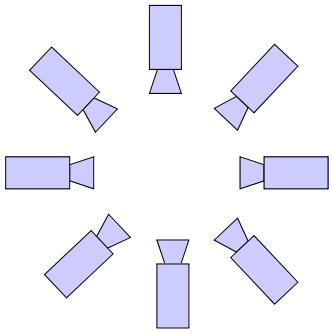


Section Image 2

Camera Arrangements for FTV

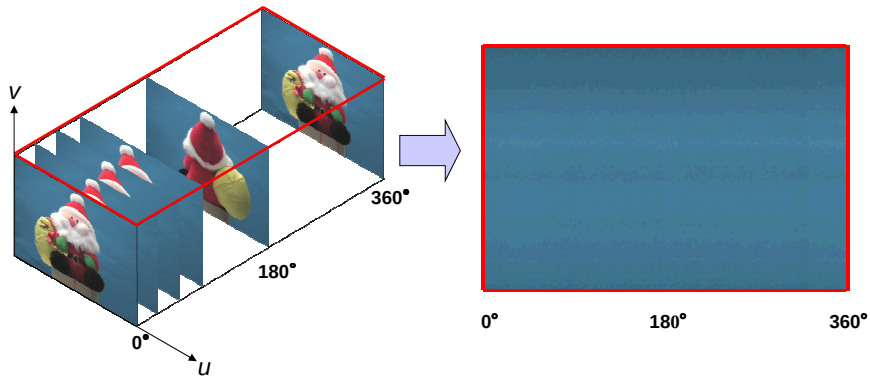


(a) Linear/planar arrangement for parallel view



(b) Circular/spherical arrangement for convergent view

Ray-Space in Circular Camera Arrangement



The horizontal cross-sections of spherical ray-space have sinusoidal structures.

100-Camera System

Linear

Planar

Circular

Geometry Correction

(Test sequence of MPEG-FTV : Pantomime)

Before correction

After correction

Color Correction

Geometry: on
Color: off

Geometry: on
Color: on

FTV Demo: Aquarium
Original Camera Views (15 Cameras)

FTV Demo: Aquarium
Generated Free Views

Original Views

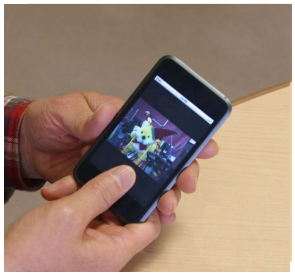
Generated Views - Interpolated -

Generated Views - Forward and Backward -

Interface of FTV

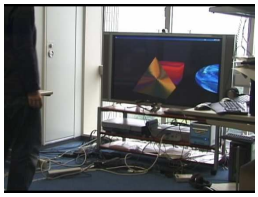
FTV on a laptop PC
with mouse control

FTV on a mobile player
with touch panel control



FTV on an all-around
3D display (Seelinder)

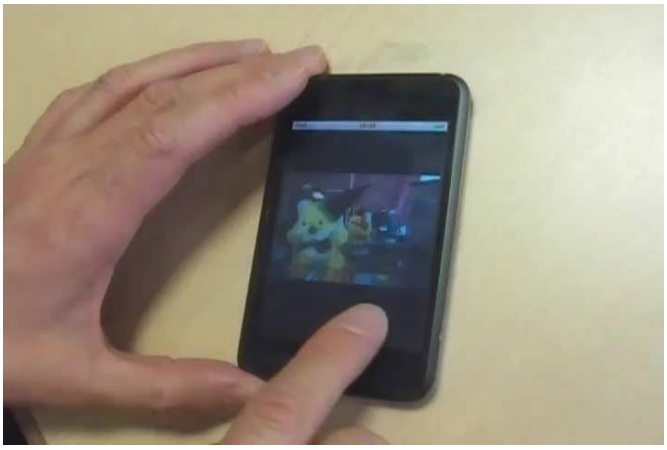
FTV on a 2D display
with head tracking



FTV on a multi-view 3D display
without head tracking

FTV on a multi-view 3D display
with head tracking

FTV on a Mobile Player



2D Display with View Control

Multiview 3D Display

without eye tracking

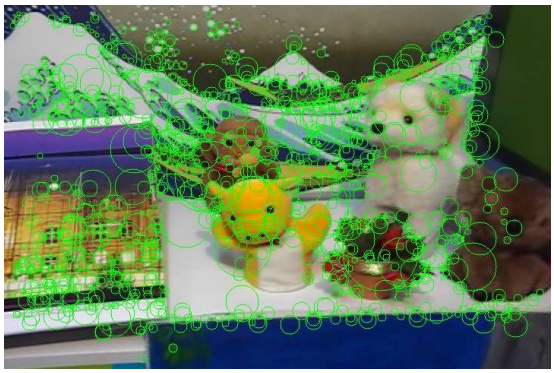
viewing zone: narrow, periodical
crosstalk: large

with eye tracking

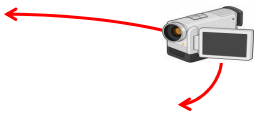
viewing zone: wide
crosstalk: eliminated

Super-Multiview 3D Display: The SeeLinder

FTV for Static Scenes



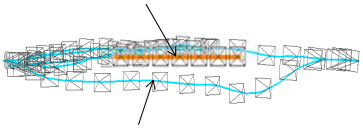
Handy Camera



Position and direction of a camera are detected by feature detection and “Structure from Motion” technology.

Demo 1 (Indoor Scene)

Virtual Camera Movement



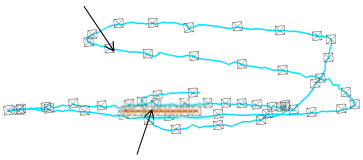
Actual Camera Movement

Generated Free-viewpoint Images

Demo 2 (Outdoor Scene)

Captured Video

Actual Camera Movement

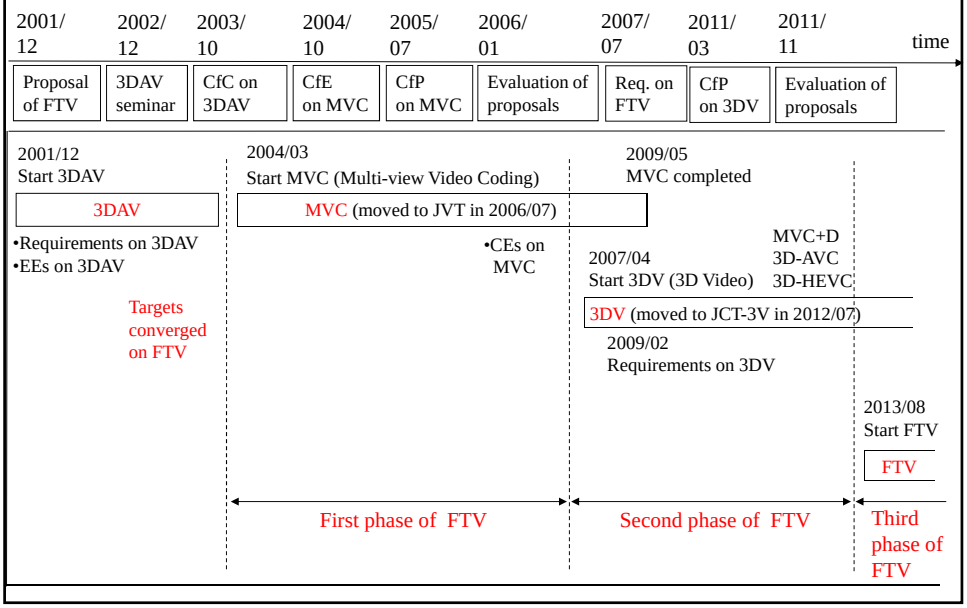


Virtual Camera Movement

Generated Free-viewpoint Images

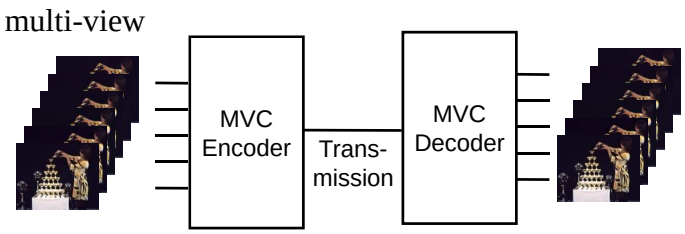
3. History of FTV Standardization in MPEG

History of FTV Standardization in MPEG



4. MVC and 3DV Standards

Framework of MVC
(First Phase of FTV)

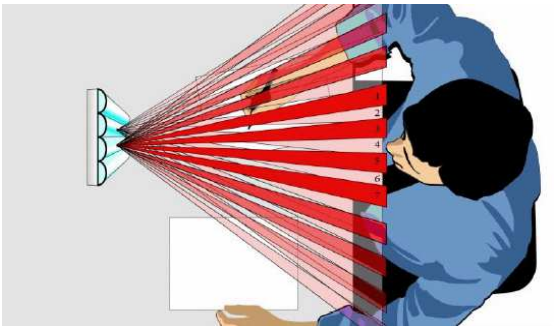


Coding of multi-camera views

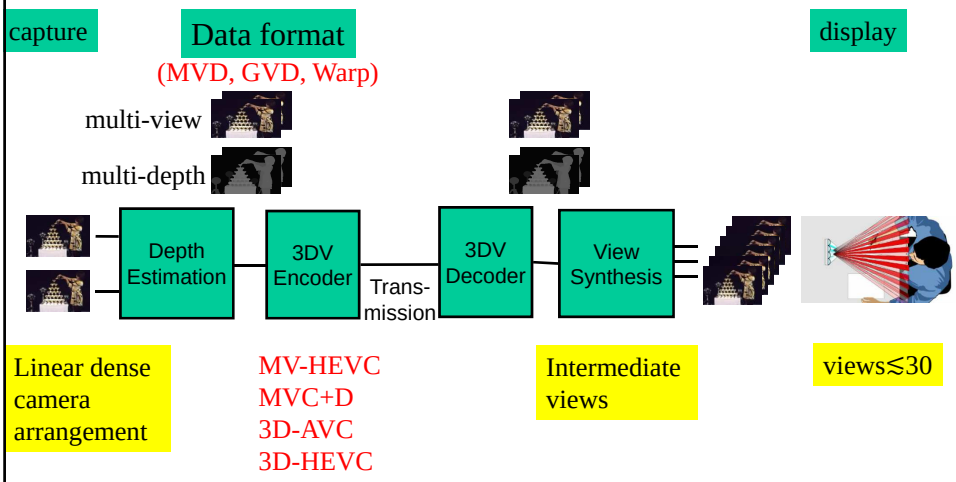
View synthesis is not included

Target of 3DV (3D Video)

Multiview display application
(views≲30)



Framework of 3DV
(Second Phase of FTV)



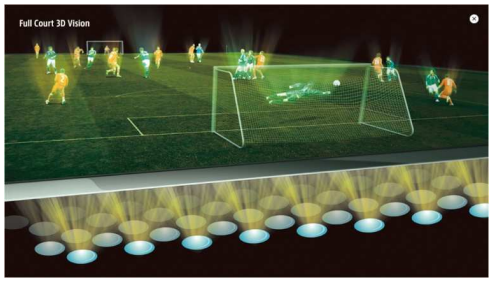
5. FTV Standardization

Free Navigation and Super Multiview Viewing by FTV

Free navigation viewing

Walk-through or fly-through experience in natural scenes

Super multiview viewing



Realistic 3D viewing

FIFA World Cup Japan Bid Committee Planed to Host the 2022 FIFA World Cup and Apply FTV to Soccer Games

“Revolutionising Football” produced by 2022 FIFA World Cup Japan Bid Committee

TV Asahi “Hodo Station” Introducing FTV on December 1, 2010

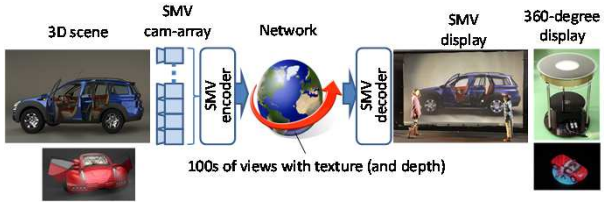
Report on the final situation on FIFA World Cup Voting in Zurich
The key of Japanese plan is application of FTV to the World Cup.

The 2020 Olympic Games comes to Tokyo

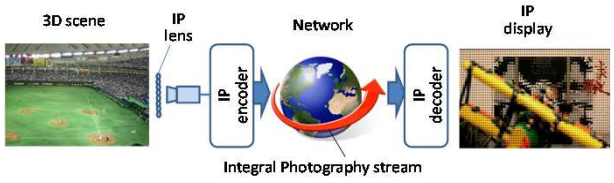
Buenos Aires, September 7, 2013

Target Applications of FTV

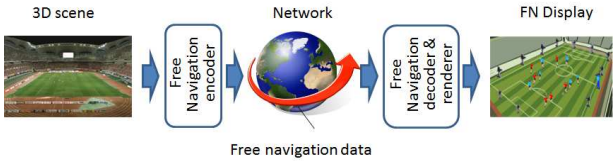
Super multiview with large horizontal parallax



Super multiview with full parallax



Free navigation



Super multiview technologies

Capture Technology

100 views, Nagoya Univ. (2002-2006)

CMU (2004)

Stanford Univ. (2005)

300 views, NICT (2011)

Display Technology

(1) Super multiview display with horizontal parallax

256-View Display (Tokyo University of Agriculture and Technology)

200-Inch 170-View Display (NICT)

(2) Super multiview all-around display

360-view All-Around Display (Nagoya Univ.)

Portable 500-view All-Around Display (3Dragons LLC)

(3) Super multiview display with full parallax

Integral 3DTV Display (400x250 views) (NHK)

256-View Display
(Tokyo University of Agriculture and Technology)

Hybrid of projection and flat-panel

Wide viewing zone

http://www.tuat.ac.jp/~e-takaki/research/display.html

Portable Super Multiview All-Around Display: Holo-Table (3Dragons LLC)

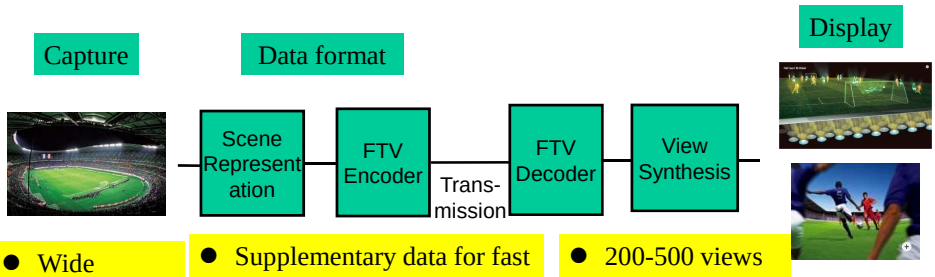
Number of views: >500

Projected image size: 1024x768 pixels

Video frame rate: 30~60 fps

Free Navigation for Sports Scene (KDDI)

Framework of FTV (Third Phase of FTV)



- Wide viewing area
- Flexible camera arrangement

- Supplementary data for fast and robust view synthesis
- Supplementary data for specular reflection, semi-transparency etc.

- 200-500 views
- Free navigation over a wide area
- Robust to misregistration

FTV needs higher specifications than 3DV

Challenging Issues of FTV

- Capture and calibration with flexible camera arrangement
- Data format and view synthesis robust to misregistration and reproducible specular reflection, semi-transparency etc.
- Real-time view synthesis of 200-500 views
- Free navigation over a wide area

6. Conclusion

- FTV revolutionizes viewing by super multiview and free navigation.
- Many super multiview technologies are available for FTV.
- MPEG has been developed useful standards for 3D.
- By using these technologies and standards and developing missing standards for FTV, we'd like to realize FTV applications by 2020.

FTV Reflector in MPEG

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