

# Free viewpoint TV : FTV

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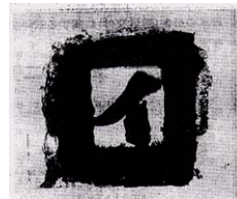
## Outline

1. Introduction of FTV
2. Principle of FTV
3. FTV Demo
4. FTV in MPEG
5. Ray-Reproducing FTV
6. Conclusions

## 1. Introduction of FTV

### Great Progress of Television in 80 Years

40 scanning lines



“イ” was displayed on the world's first electronic TV display developed by Dr. Takayanagi Kenjiro in 1926.

4000 scanning lines



Super HDTV demonstrated at the World Expo 2005 in Nagoya (provided by NHK Science & Technical Research Laboratories)

### Next Challenge for Television


To transmit only a partial information  
 (**single view**) of 3D space



To transmit all information (**all views**)  
 of 3D space

**FTV (Free viewpoint TV)**

### Number of Views to be Transmitted

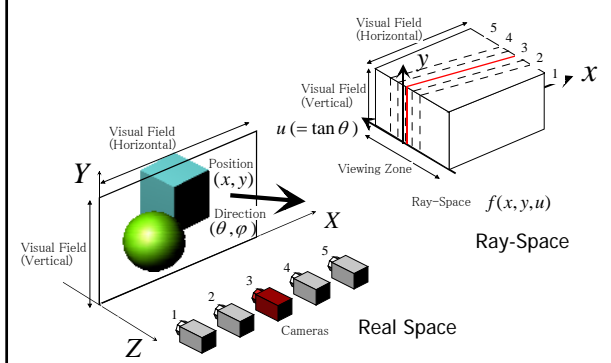
	2DTV	•	1
3DTV	{	Stereoscopic TV	•• 2
		Auto-stereoscopic TV	••••• several
	FTV		infinite

## Significance of FTV

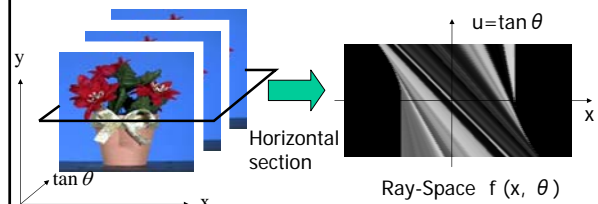
- Ultimate 3DTV that transmits all views of 3D scene.
- Best interface between human and environment
- Innovative tool to create new types of content and art

## 2. Principle of FTV

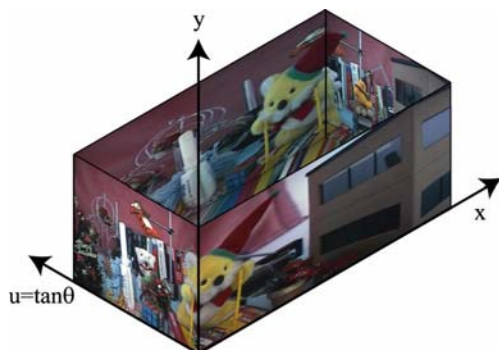
### Capturing of FTV Signal



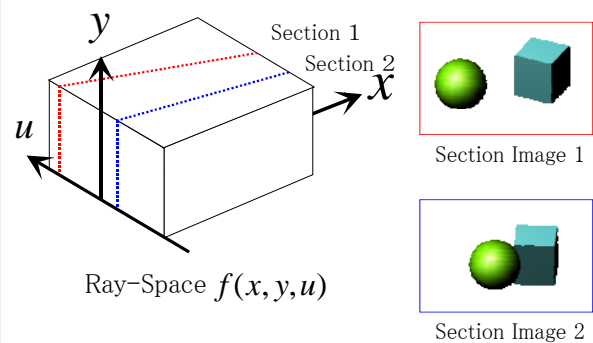
### An Example of Ray-Space



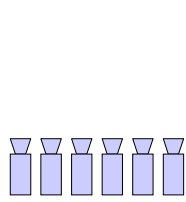
### Ray-Space and Its Horizontal Cross-Section



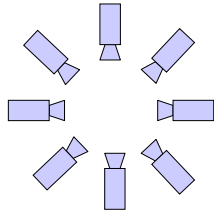
### Generation of FTV Images



## Camera Arrangements for FTV

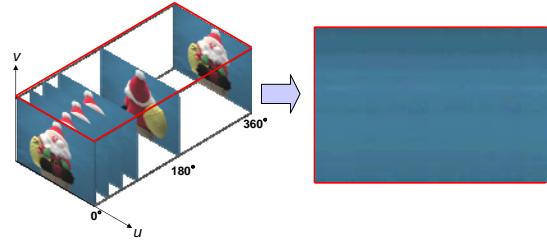


(a) Linear/planar arrangement for parallel view



(b) Circular/spherical arrangement for convergent view

## Ray-Space in Circular Camera Arrangement



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

## 3. FTV Demo

## Capture and Processing Parts of FTV



## 100-Camera System (Nagoya University IMI-COE, Tanimoto Lab.)



Linear alignment of 100 cameras

MPEG test sequence "Rena"

## 100-Camera System (Nagoya University IMI-COE, Tanimoto Lab.)



Semicircular alignment of 100 cameras

captured scene

## 100-Camera System (Nagoya University IMI-COE, Tanimoto Lab.)



Planar alignment of 100 cameras



MPEG test sequence  
"Akko & Kayo"

## 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 -



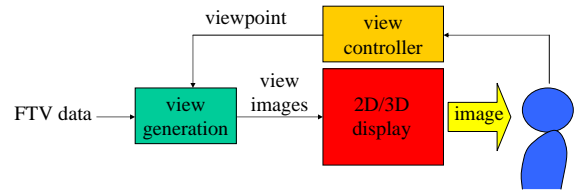
Generated Views - Forward and Backward -



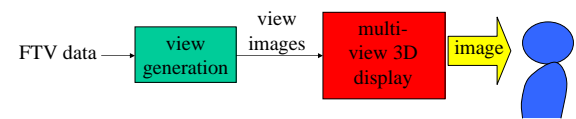
Demo of FTV on PC  
(Real-Time FTV on a single PC)

Display of FTV

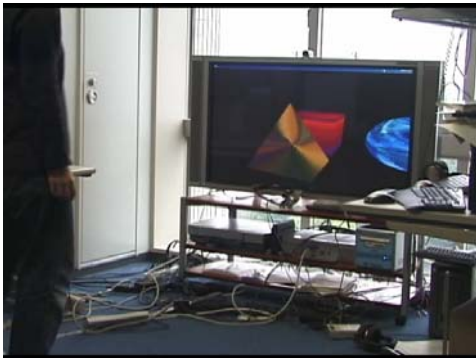
(1) 2D/3D display with view control



(2) 3D display without view control



2D Display with View Control



Multi-view 3D Display

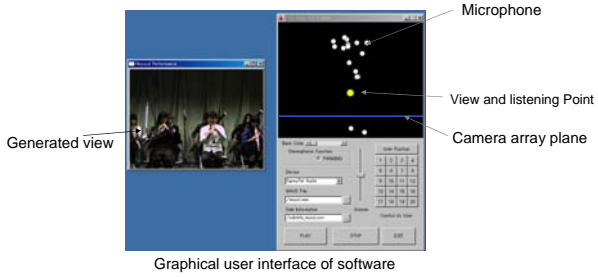


without eye tracking

with eye tracking

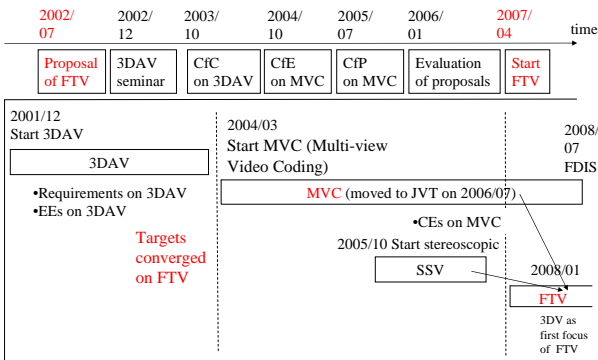
Viewing zone is extended and crosstalk is eliminated.

## Demo of FTV with Audio

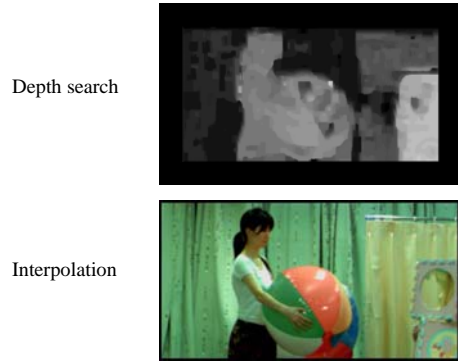


## 4. FTV in MPEG

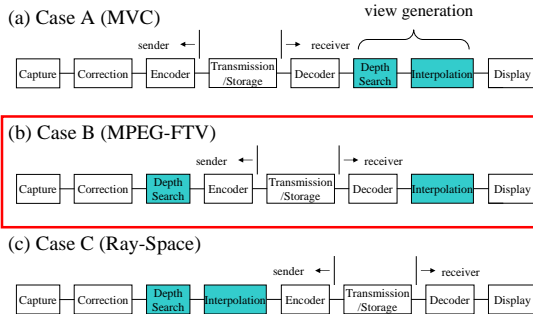
### History of FTV Standardization in MPEG



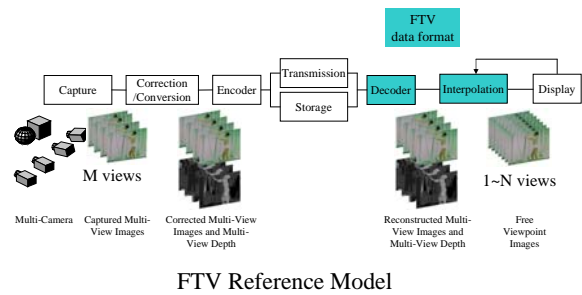
View generation of FTV consists of depth search and interpolation.



### 3 Types of FTV Configuration Based on the Positions of Depth Search and Interpolation

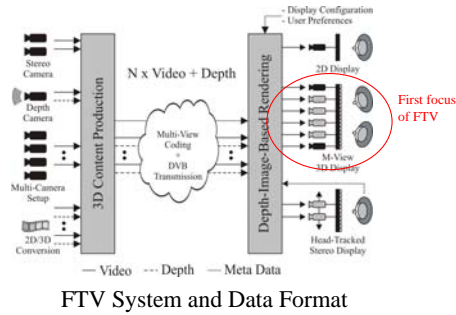


### MPEG-FTV Established in April 2007



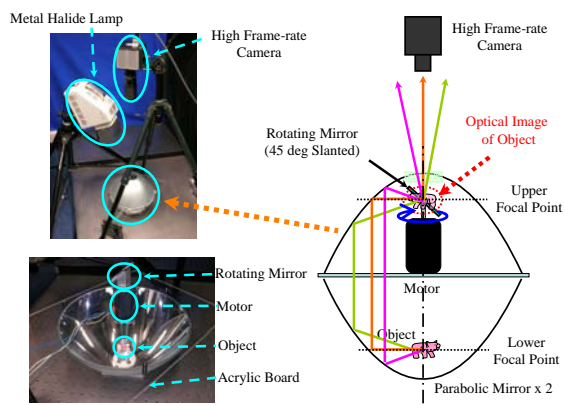
## MPEG-FTV

3DV is the first focus of FTV and targets 3D display application.

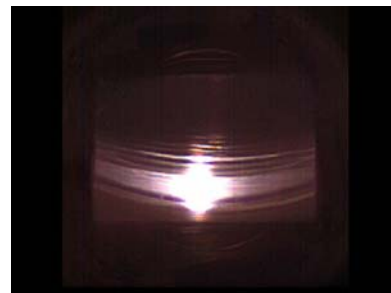


## 5. Ray-Reproducing FTV

### Mirror-Scan 360-Degree Ray Capturing System



### View Images Captured by Mirror-Scan 360-Degree Ray Capturing System



Milk drop into water

### 360-Degree Ray Reproducing Display: The SeeLinder



## 6. Conclusions

- MPEG has been supporting FTV, regarding it as the most challenging 3D application.
- The first in this line of FTV coding standards is MVC, started in 2004 and finalized in July 2008.
- MPEG has started the new activity of FTV in 2007 and 3DV as the first focus of FTV in 2008.