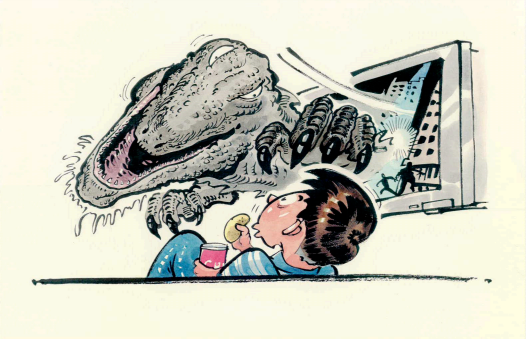
3DTV
based on integral method



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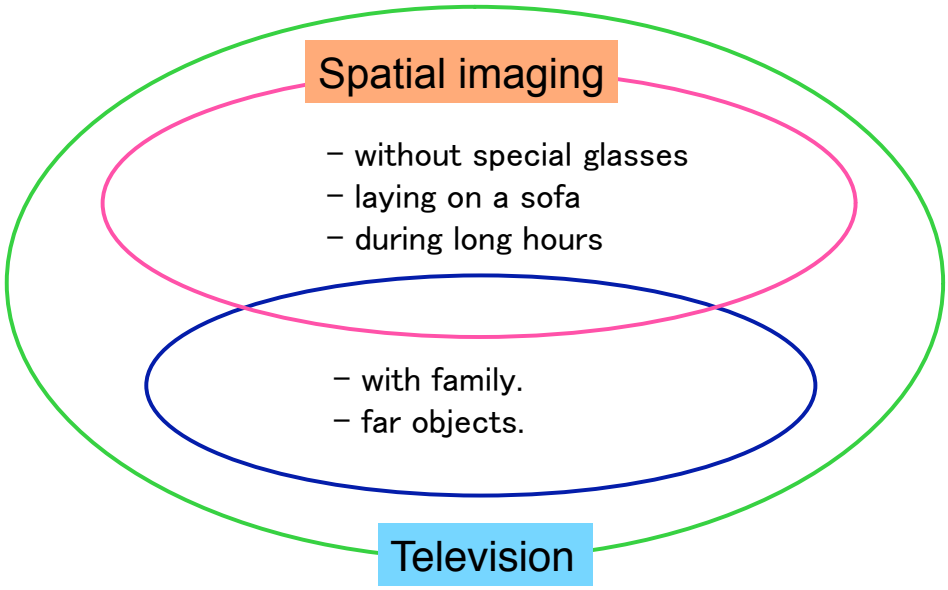
Japan Broadcasting Corporation (NHK)

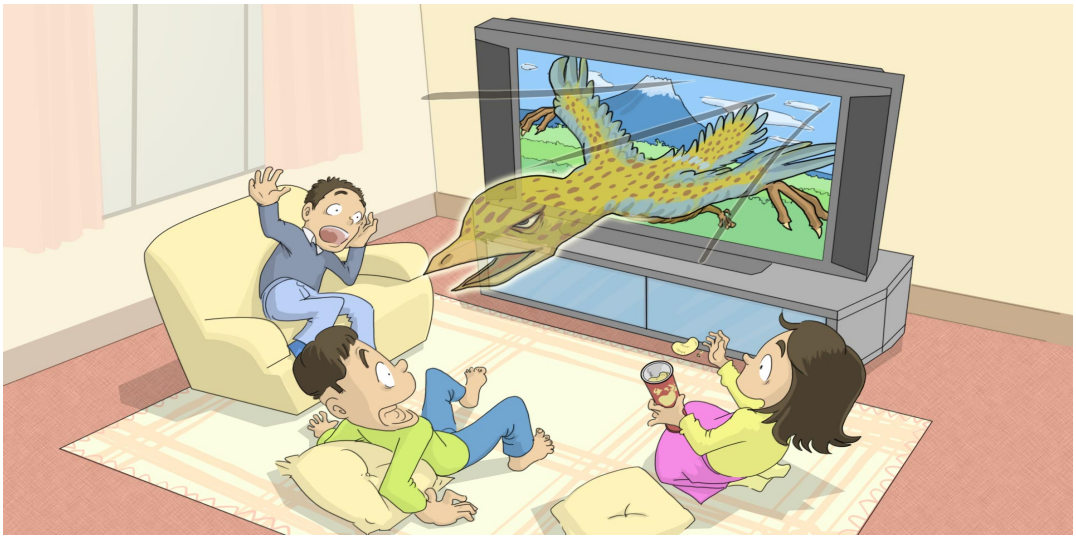
Contents

- Introduction
- Principle of integral method
- Experimental system
- Reconstructed 3D image
- Summary

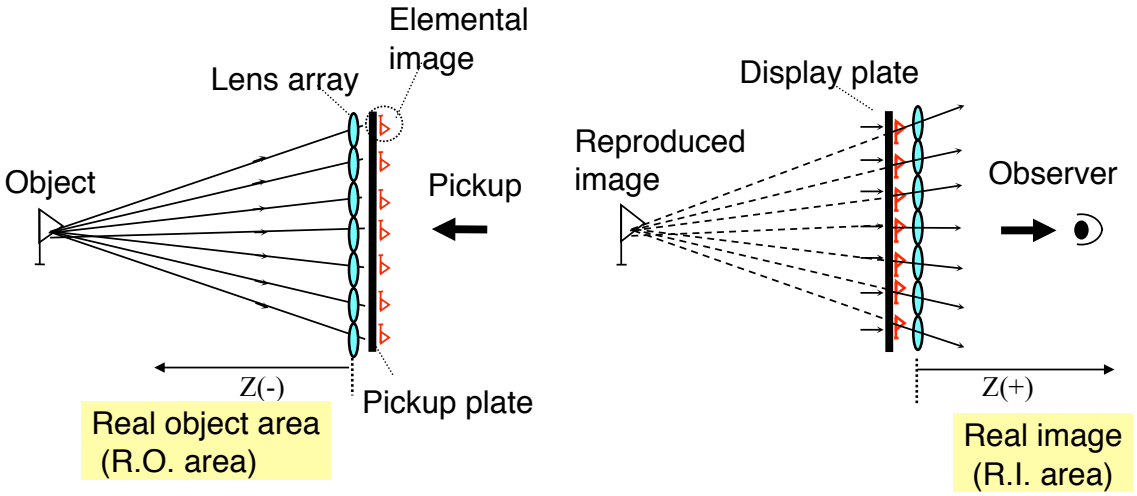
For enjoying 3D television



Enjoying 3D television



Principle of Integral method

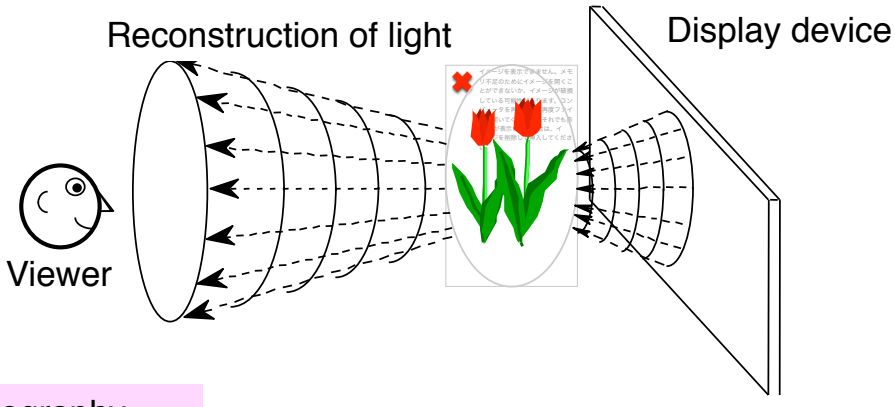


(a) Pickup stage

(b) Display stage

Spatial imaging type

Image's appearance changes as the viewer's position moves

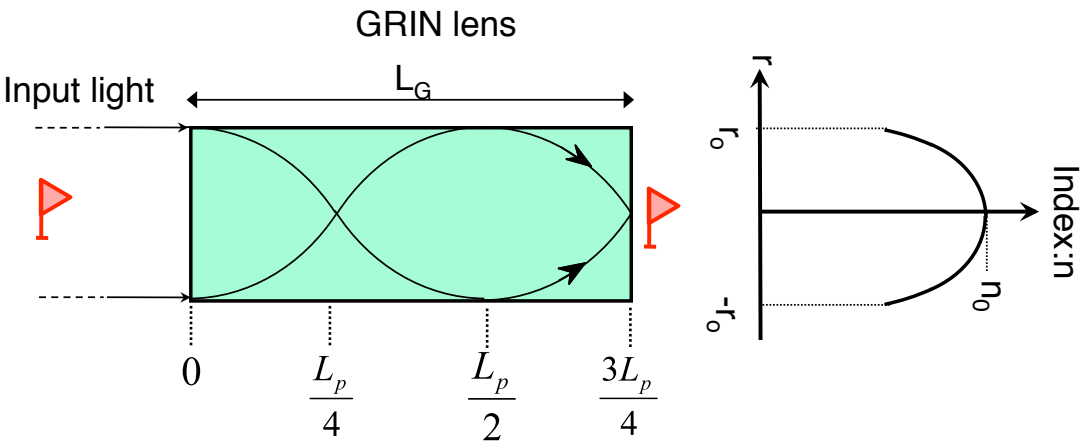


-Holography
-Integral Method

Object reconstructed as a spatial image

Gradient index lens (GRIN lens)

$$-\frac{3}{4}L_P-$$

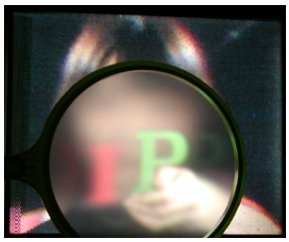


L_p : one period of ray path

Reconstructed images by integral method -Print version-

(a) Reconstructed spatial 3D image

(b) Projected image on diffuser set 10mm away from lens array.



(c) Projected image on diffuser set 40mm away from lens array.

Integral 3DTV in NHK STRL

Integral TV based on integral photography needs huge number of pixels

- Using HDTV
  - 1996: real-time, monochromatic, pseudoscopic
  - 1997: real-time, full-color, orthoscopic
    - Elemental lenses:54 (V) X 63(H), Viewing zone :20degree
- Using 2000 scanning lines TV system
  - 2001: real-time, full-color
  - 2004: improved system
    - Elemental lenses:125 (V) X 160 (H), Viewing zone :12degree
- Using 4000 scanning lines TV system
  - 2007: Bayer pixel arrangement. (Dual-G)
    - Number of elemental lenses:140(V) X 182 (H)
    - Viewing zone:24.5 degree (measured value)
  - 2009: Full pixel arrangement
    - Improved resolution

Major resolution factors

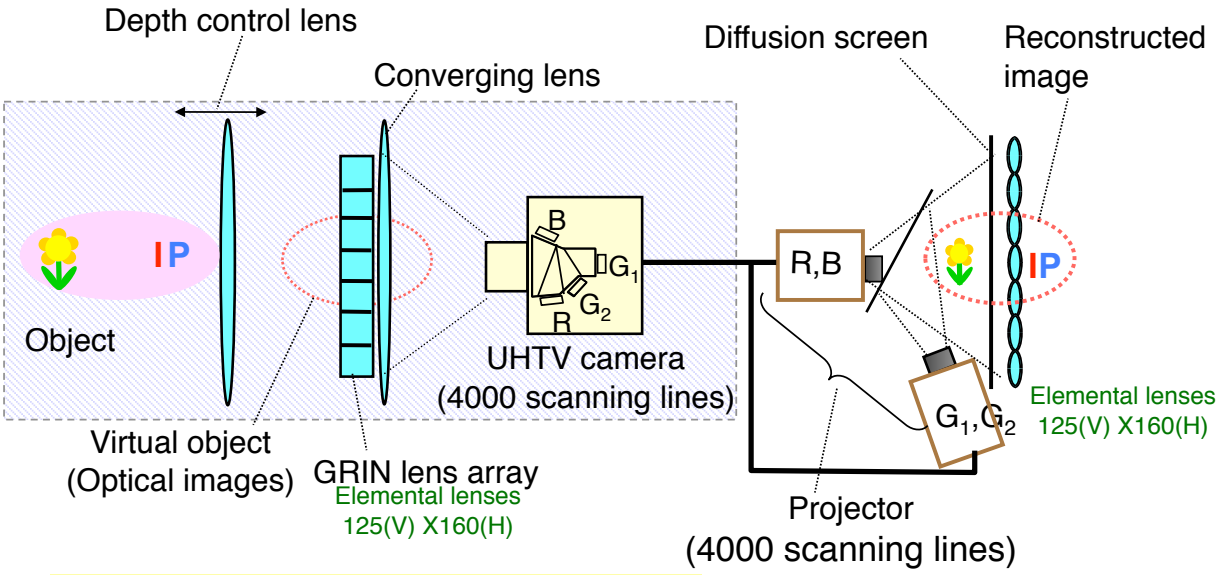
- Diameter of elemental lens
  - Small diameter degrades the resolution for distant object because diffraction affects the resolution.
  - Large diameter brings large pitch between adjacent elemental lenses.

Dominant in our system

- Pitch between adjacent elemental lenses
- Pixel pitch of elemental image
- Viewing zone angle

Experimental television system

Dual green UHDTV with 8milion pixel devices

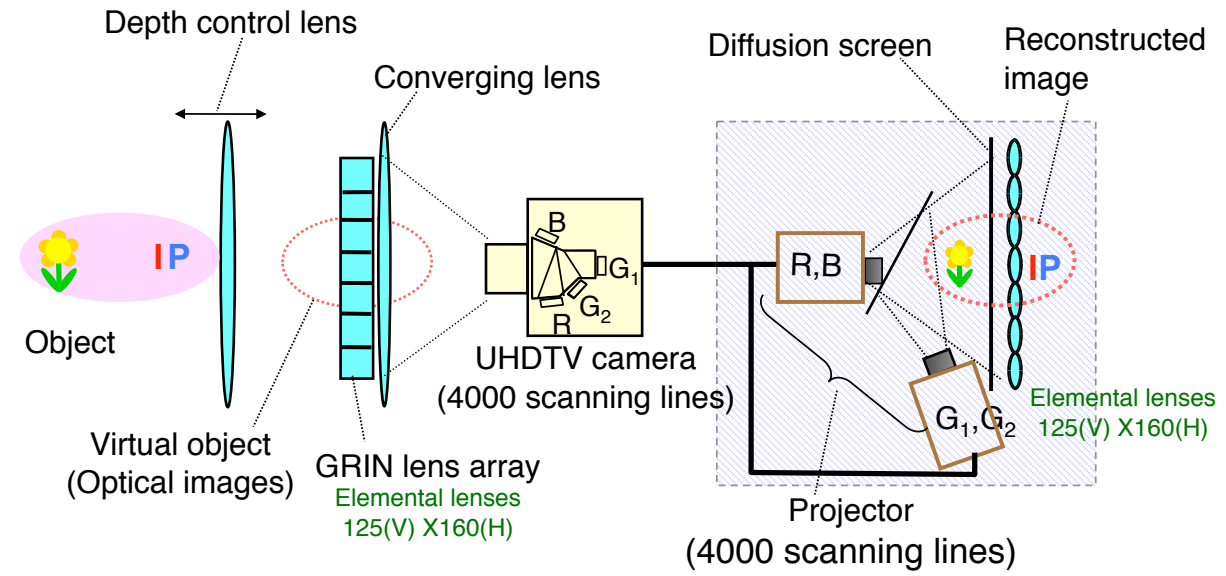


・Developed with Victor Company of Japan

・Supported by National Institute of Communications Technologies

Experimental television system

Dual green UHDTV with 8milion pixel devices



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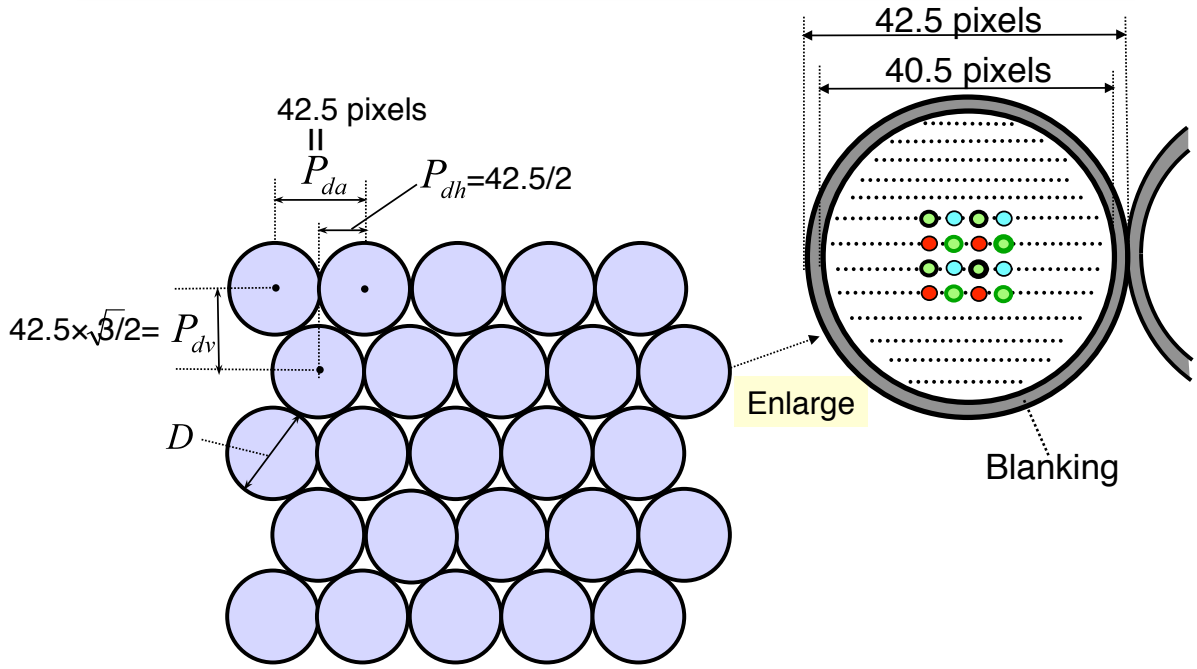
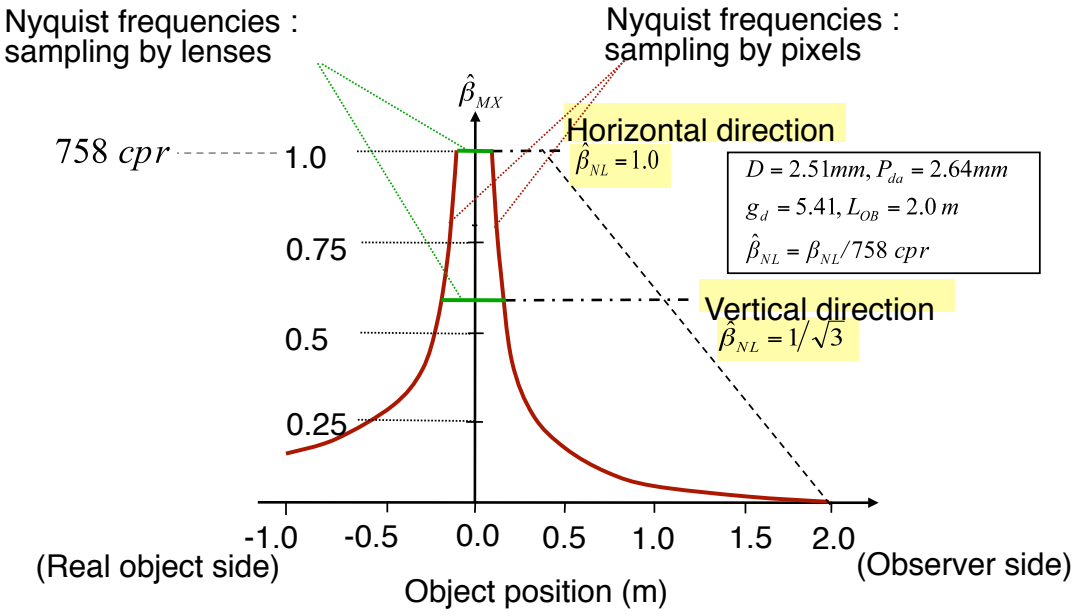
Elemental lenses alignment of lens array



Resolution characteristics

-Maximum visual-spatial frequency-

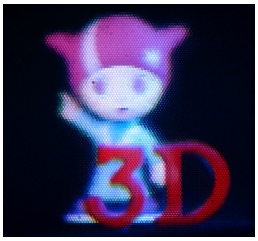
Calculated value



Reconstructed images with full parallax

Object: Real doll

(a) Upper viewpoint



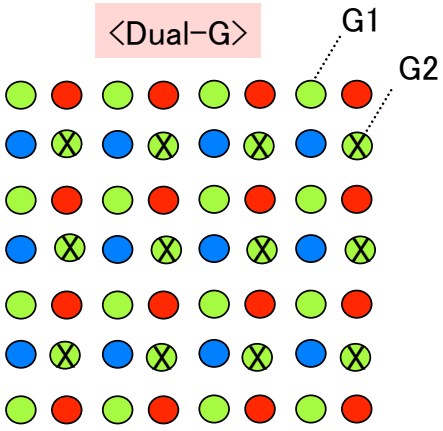
(c) Left viewpoint

(d) Right Viewpoint

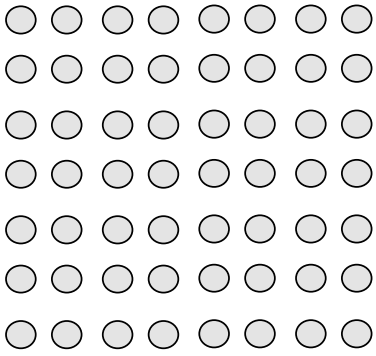
(b) Lower viewpoint

Pixel structure of Dual-G system

<Dual-G>



<Full-Pixel>

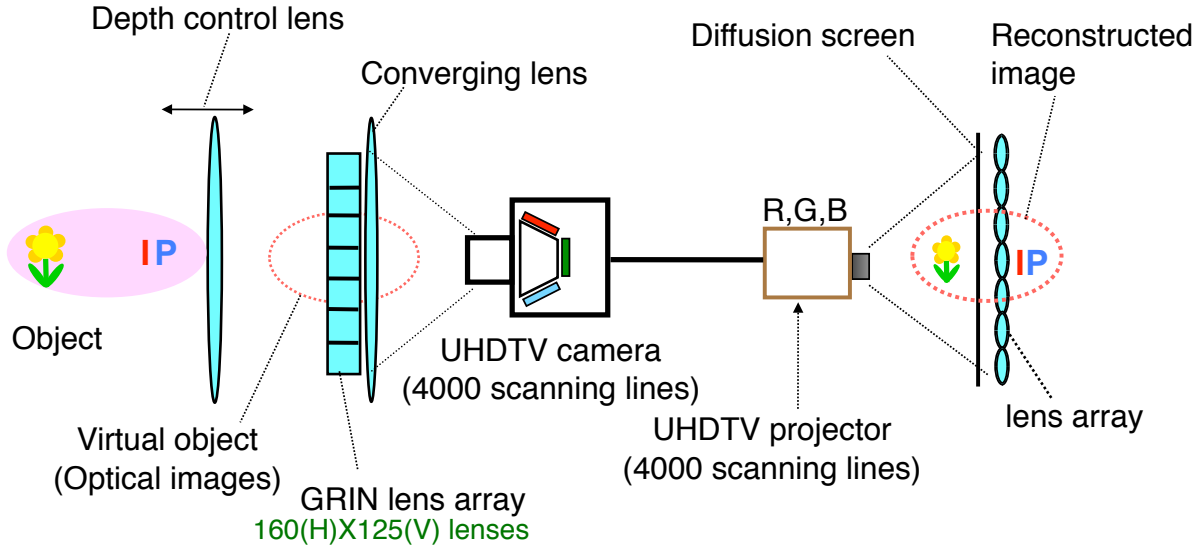


Each pixel has R or G or B signal.
G1 and G2 pixel are diagonally offset.

Each pixel has R, G,and B signal.

Experimental television system

Full pixel UHDTV with 33milion pixels



・Developed with Victor Company of Japan
・Supported by National Institute of Communications Technologies

Exhibited in NAB show, Las Vegas
(20-23, April)

Summary

- The 3DTV with integral method is based on extremely high resolution video.
- The experimental setup produces full-color and full-parallax 3D images in real-time, however, the setup has not reached practical level yet.
- To produce higher quality 3D images for television, it requires a larger number of pixels for the capture and display stages. Although this problem must be overcome, our experimental setup has been progressed one step for practical use.