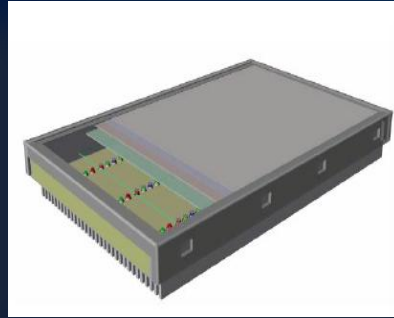


‘3D Display Analysis’







Crosstalk Analysis for Parallax Barrier type by using Optical Simulation



2011.10.13

Chungnam Displaycenter

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-  **6 Future Work**.....●

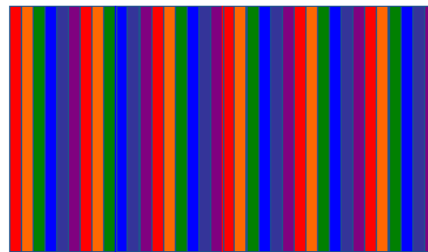
Introduction of 3D Display

■ Definition and Meaning

- ▶ Expanded Meaning : Both **H/W** & **S/W** tech. (Image acquisition, Reality, Evaluation etc.)
- ▶ General Meaning: Only focuses on **H/W technology** for 3D reality

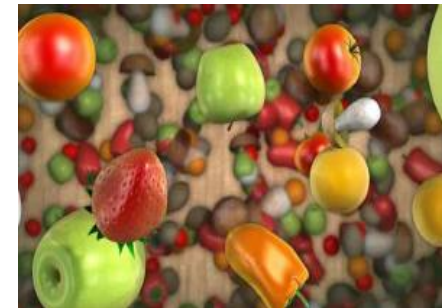
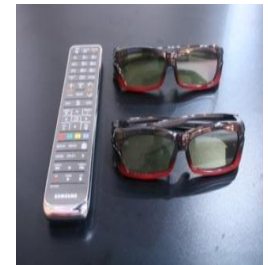


<Imaging Equipments>



(L1, L2, L3, R1, R2, R3)

<A kind of Frame Mixing Process>



<ex: 3D Reality>

Classification of 3D Display

■ Types of 3D Display (Based on development & Marketing)

► Usually, classified by the needs of Glasses to see a 3D images.

Wearing Glasses (Stereoscopic)	Anaglyph type
	Polarization type
	Time Sequence type
	Head Mount Display
Glassless type (Autostereoscopic)	Parallax Barrier
	Lenticular
	Integral Imaging

Stereoscopic type

■ Needs a Glass to make a 3D image at the brain

▶ Severe fighting for image quality between Polarization and Time sequence type.

<Anaglyph type>



<Polarization type>



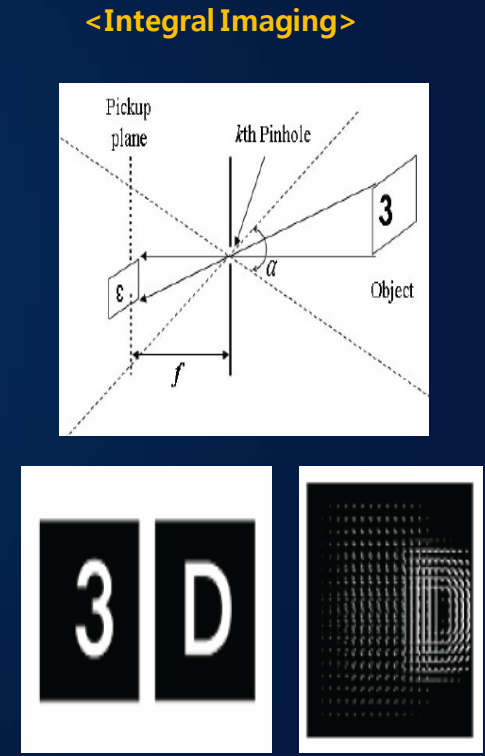
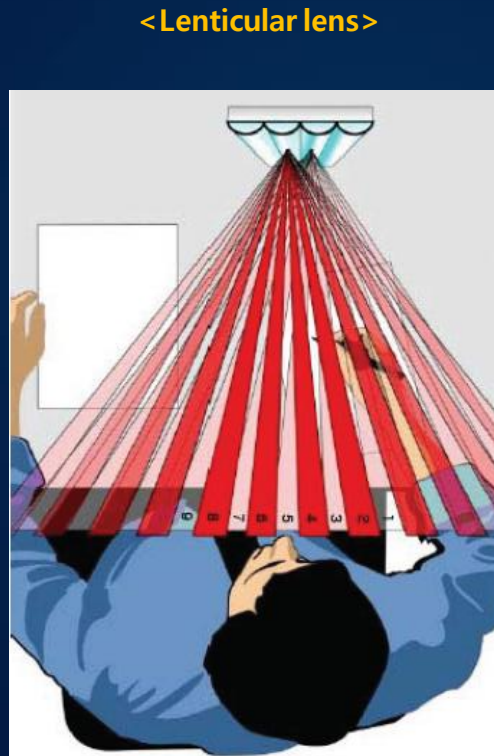
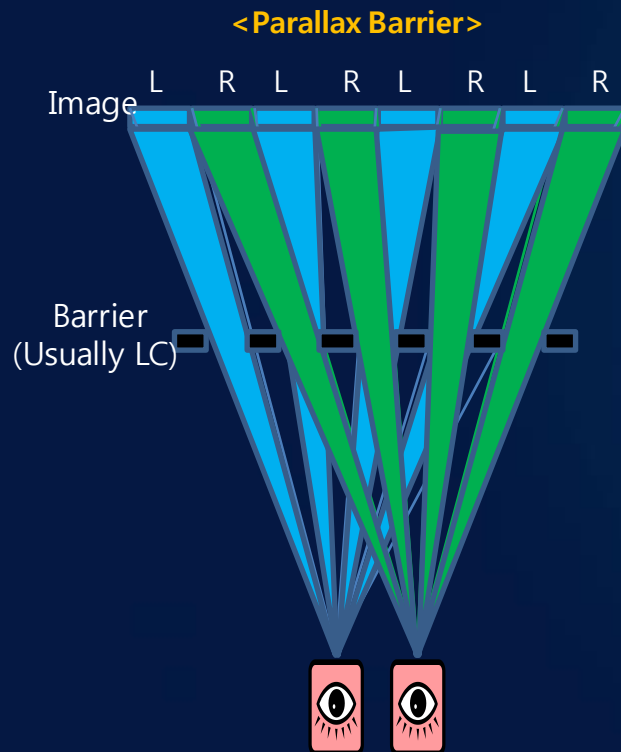
<Time Sequence type>



Auto-stereoscopic type

■ No Need to wear a Glass to feel a 3D image

- ▶ Expected to be a main display in near future.
- ▶ Image separation by additional optical components such as Barriers, Lens arrays.



Factors for Visual Fatigue

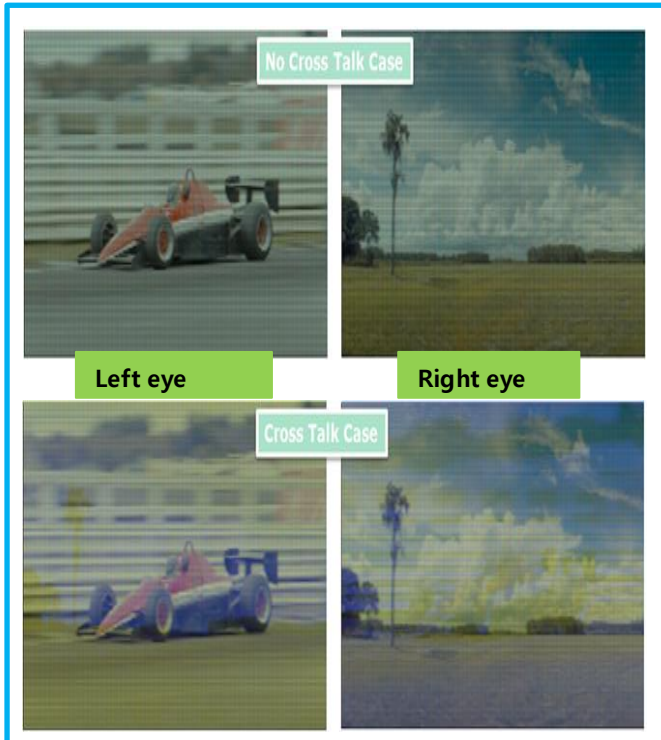
■ Nowadays, 3D displays mainly use **Convergence** and **Binocular Disparity**.

► These cause **imperfect 3D images** and finally result in some physical symptoms.

(Eyestrain, Heavy Eyes, Double Vision, Dry Eyes, Dizziness etc.)

Factors

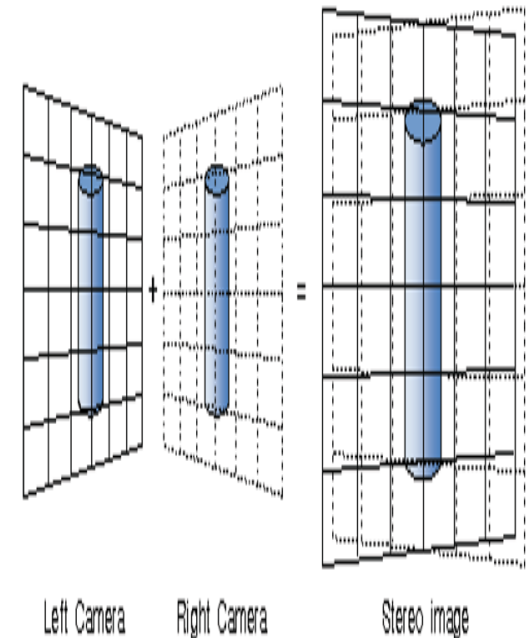
< Crosstalk Effect >



< Cardboard & Puppet theater Effect >



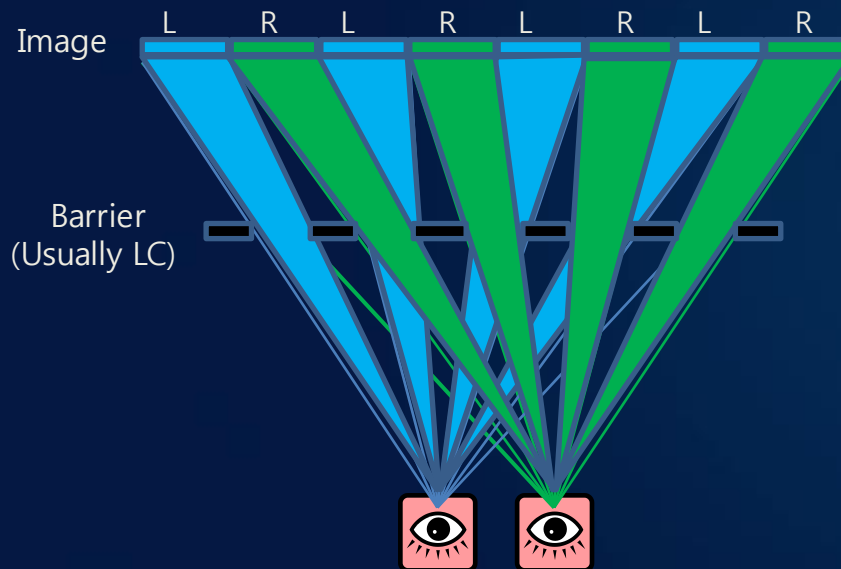
< Keystone distortion >



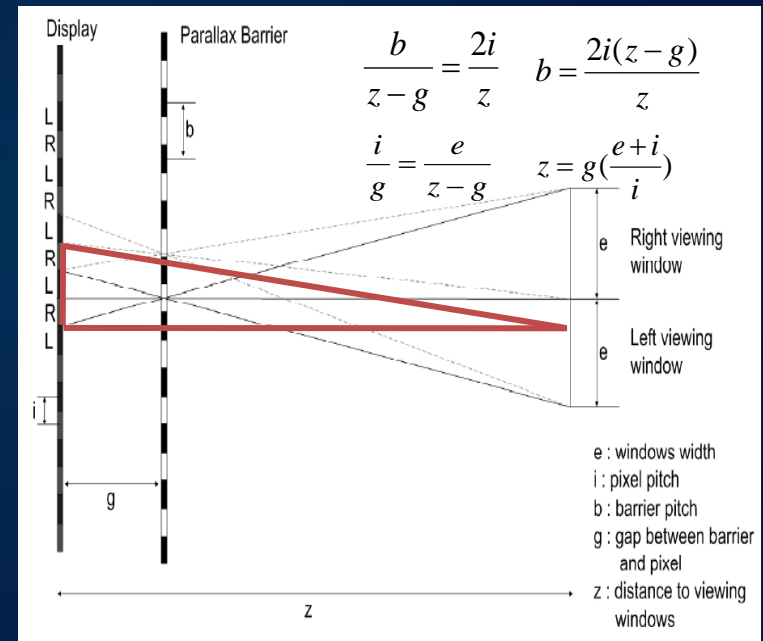
Parallax Barrier type

■ Principle & Design Parameters

- By setting a Barriers(usually LC is used) from a proper position, each left and right eye can see a divided image.



<Operating Principle of Parallax Barrier type>



<Design Parameters>

Optical Simulation & Analysis

■ Design & Simulation Process

- We used commercial optical design s/W, **RayWiz**, to **trace a great # of rays** to realize the lower error. (※ Errors are necessarily happened as long as using Monte-Carlo Method.)

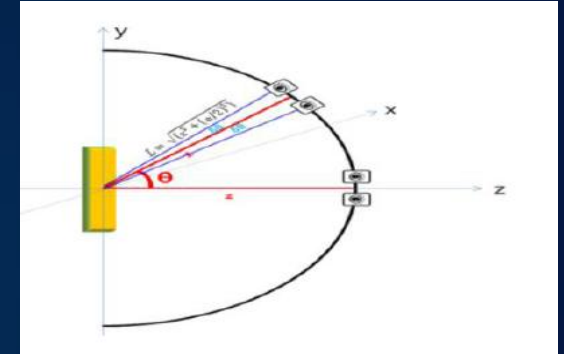
<Coding the parameters>







```

00231 Parallax 3D Display 기본 설정
00232
00233 //----- ㉓ BLACK BARRIER 배열 -----//
00234
00235 //----- ㉔ LED 배열 -----//
00236
00237 #macro BB()
00238   declare i=0;
00239   Monitor1(<NumberofBB)
00240   object{
00241     BB
00242     translate<-Monitor_X/2,BH<-b-1,0,g>
00243     //scale(1,BH<-1,1) //크기는 바꾸지 않음
00244   }
00245   declare i=i+1;
00246   Bend
00247 Wend
00248
00249 BB()
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```



<Positioning & Analysis>



Angle Eye	-2°	0°	2°
Left eye			
Right eye			

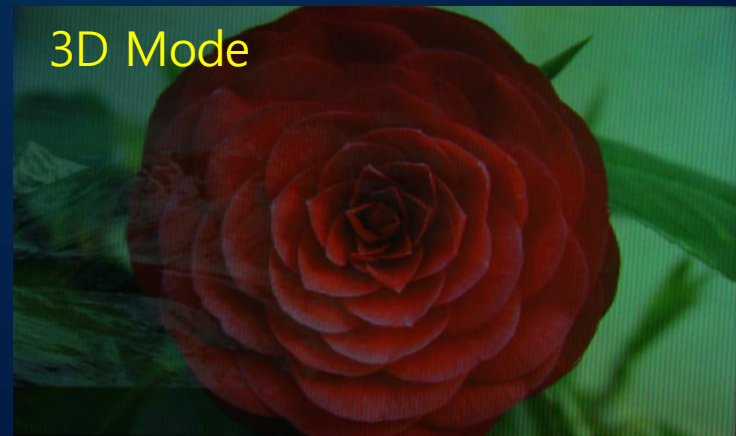
Test Result

■ Pictures by a general digital camera in exact front of display

- ▶ We control the barriers on and off by clicking the switch to make 2D/3D convert.
- ▶ At 2D mode, no changes are arised, but at 3D mode only flower is seen without mountain.











Test Result














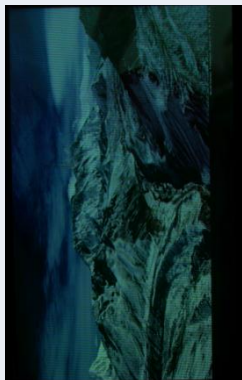
Test Result (image change by camera rotation)

2D Mode

Angle Direction of rotation		Normal	1°	2°	3°	4°	5°
Left							
Right							



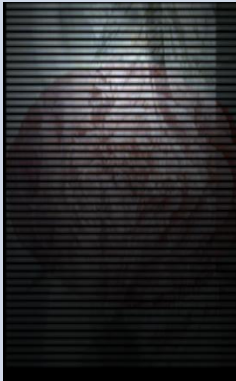
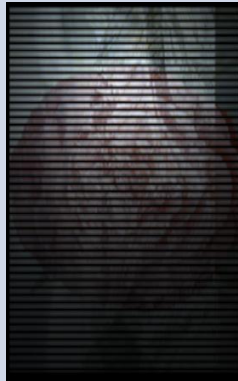
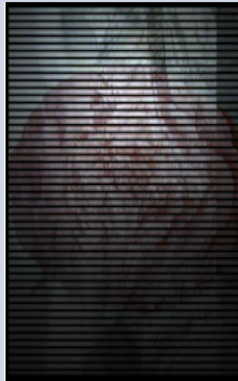



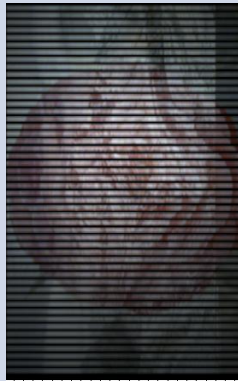
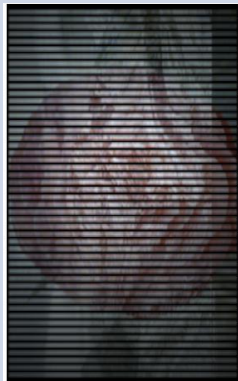
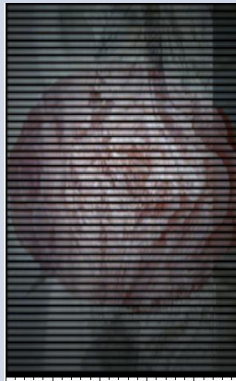
Test Result (image change by camera rotation)

3D Mode

Angle Direction of rotation	Normal	1°	2°	3°	4°	5°
Left						
Right						

Simulation Result

3D Mode

Angle eye	Normal	-25°	-20°	-15°	-10°	-5°
Left Eye						
		5°	10°	15°	20°	25°
						

Future Work

■ Matching and Fitting the result between test and simulation

- ▶ Need to input exact configuration for development.

(Resolution, Material indices, Reflectance & Transmittance, Barrier Pitch etc.)

■ System Optimization

- ▶ By changing some parameters to get a least crosstalk data

- It's very tedious work !

■ Expand the designing to Lenticular and Integral Imaging type

- ▶ Putting Lenticular and Lens array in front of the image plane
- ▶ Same process will be applied



Thank you !