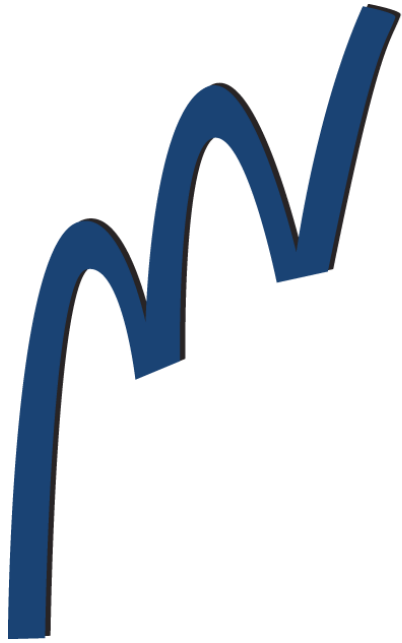


**PC에서
3D 입체 영상 게임
개발하기**

마이에트 Ent. 오지현

Who am I ?

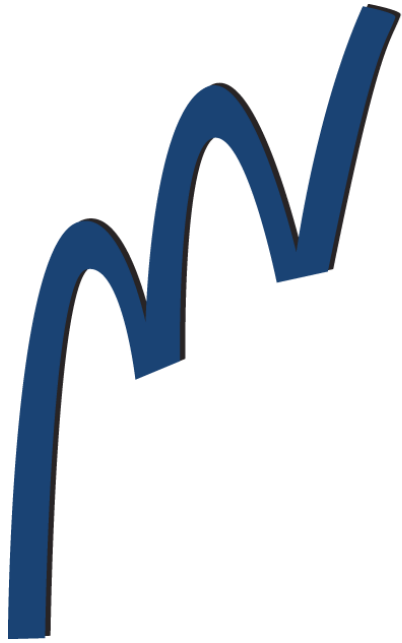


MAIET
entertainment

선임연구원 오지현

ozlael.egloos.com

@ozlael



MAIET
entertainment

자체엔진 **RealSpace3**

건즈2

레이더즈



OUTLINE

입체 영상의 개론

PC 게임의 적용



입체 영상의 개론

입체 영상 & 게임 전망

입체 영상 인식 및 구성 요소

디스플레이 기술

PC 게임의 적용



대세는 3D

이미지 출처 : 아바타, 2009

“ 2012년까지 자사의
신작 게임 중 절반 이상이
3D 입체를 지원할 것이다 ”



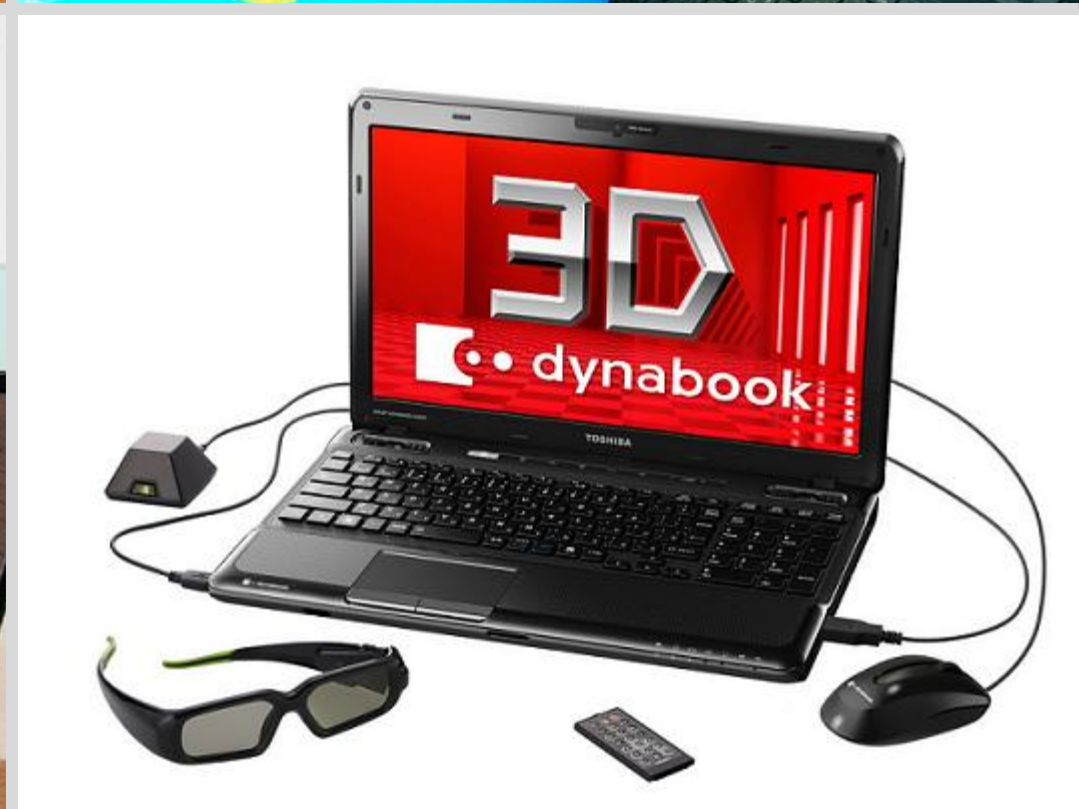
UBISOFT™

500

입체 지원 PC 게임 수







하지만...

국내 게임 시장은? **?**



이미지 출처 : 재미있는 레이더즈

그러니까



넘하 관심좀

줍줍

WHY GAME ?

몰입도





깊이 정보

R



깊이 정보

이미지 출처 : 신나는 건즈2

물리적 제작 비용





입체 영상의 개론

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디스플레이 기술

PC 게임의 적용

“

입체시

”

Stereo vision

양안시차, 양안부등

binocular disparity

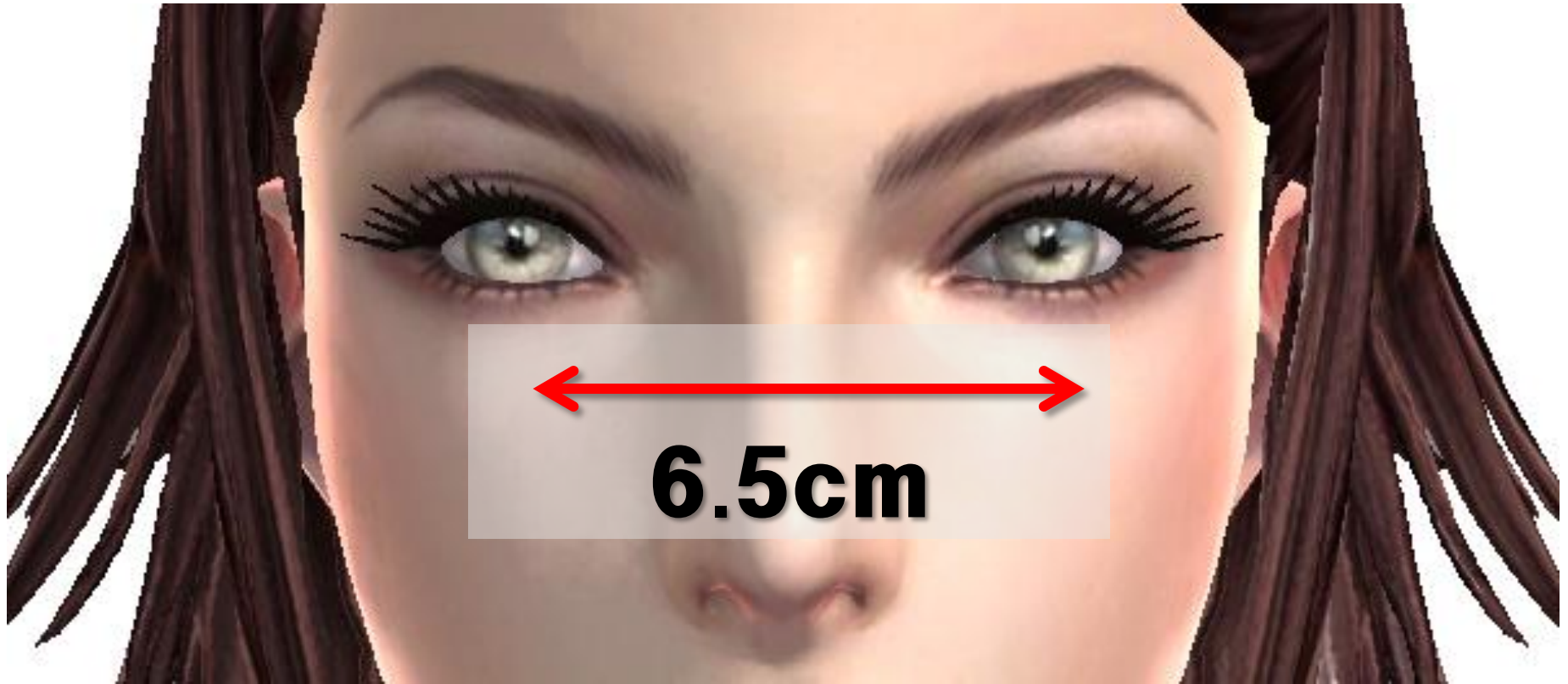
좌안
left-eye
영상



우안
right-eye
영상



안간 interocular



Interaxial

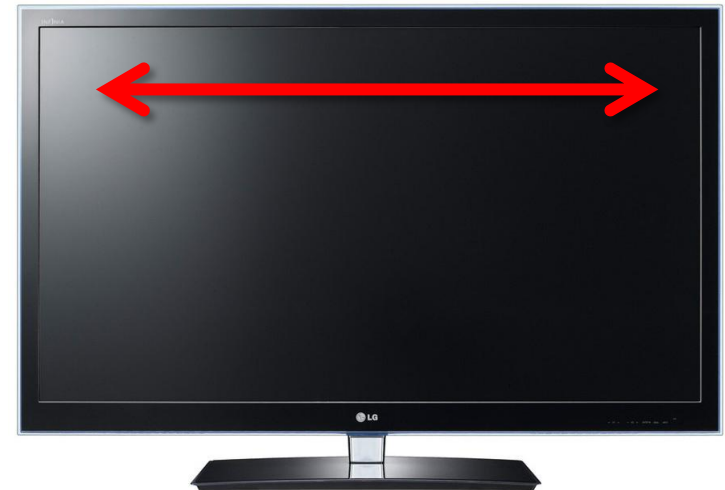


Separation

= Interaxial / Screen Width



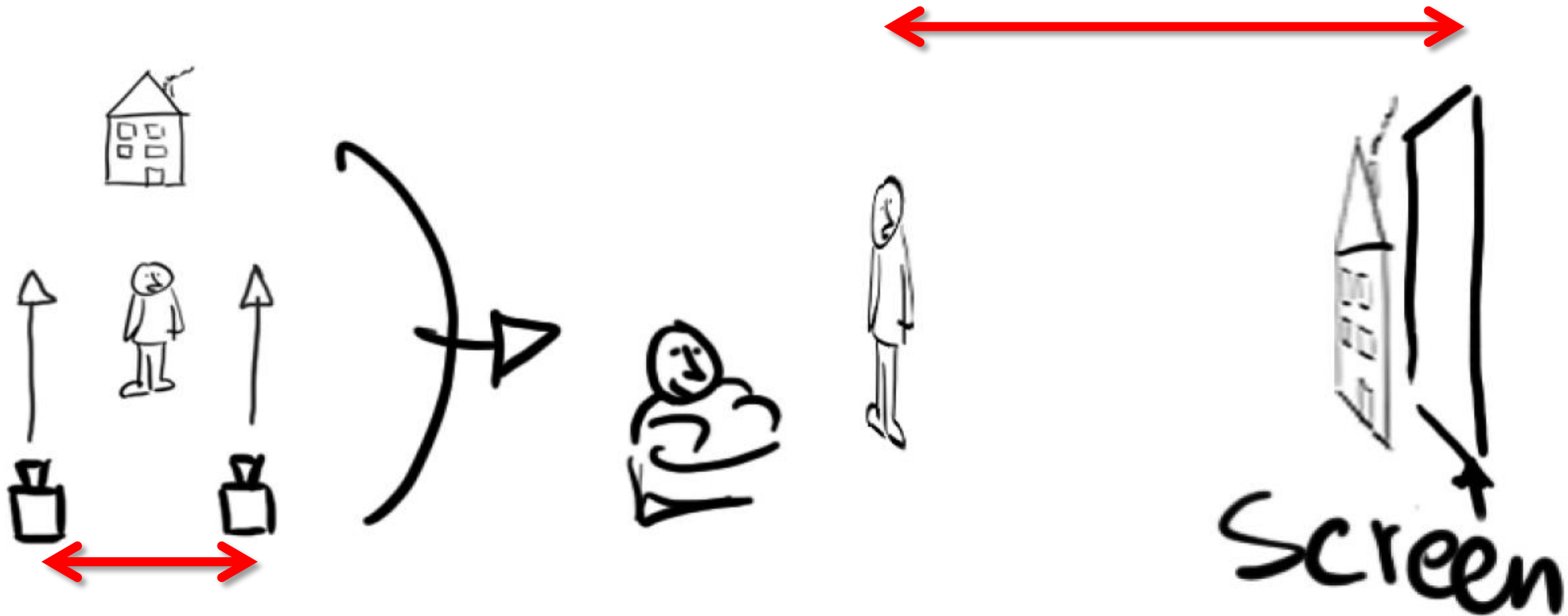
/



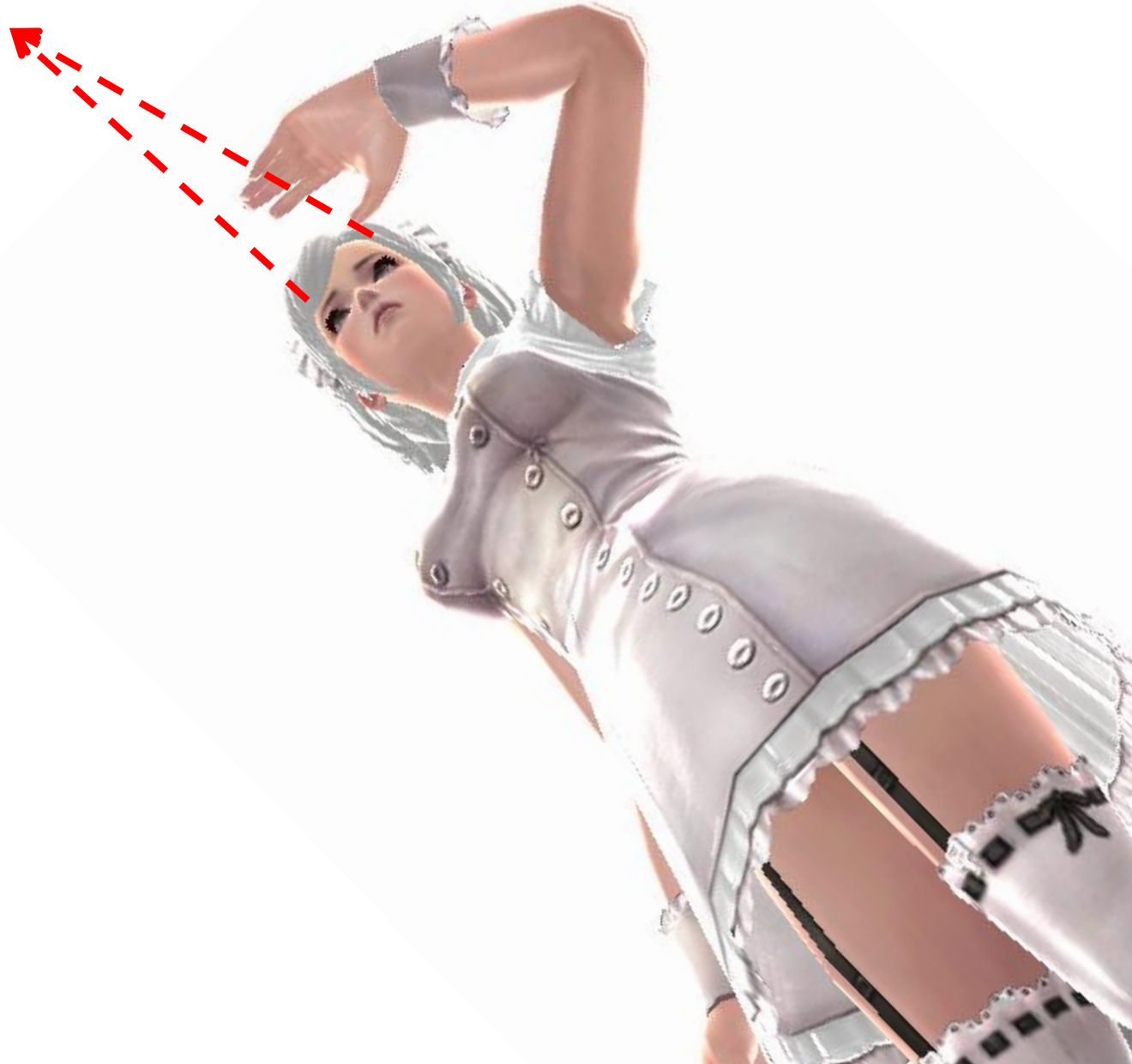
Separation



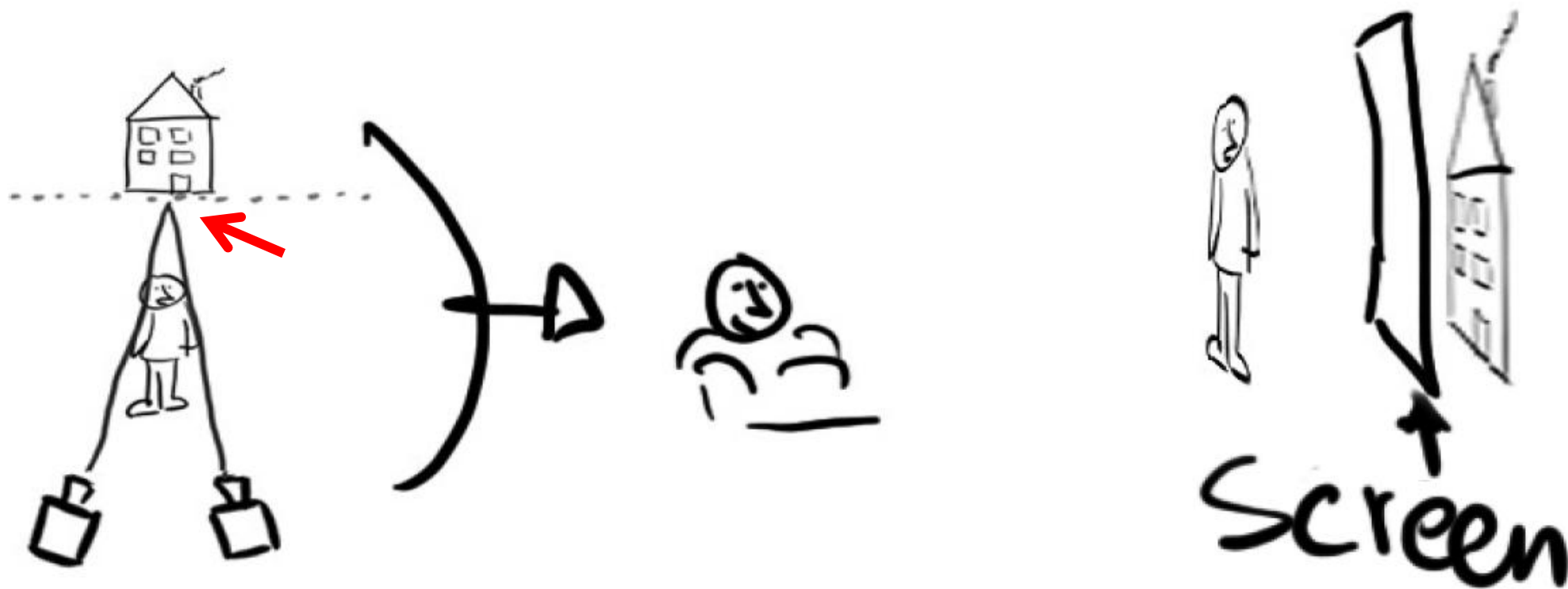
Separation



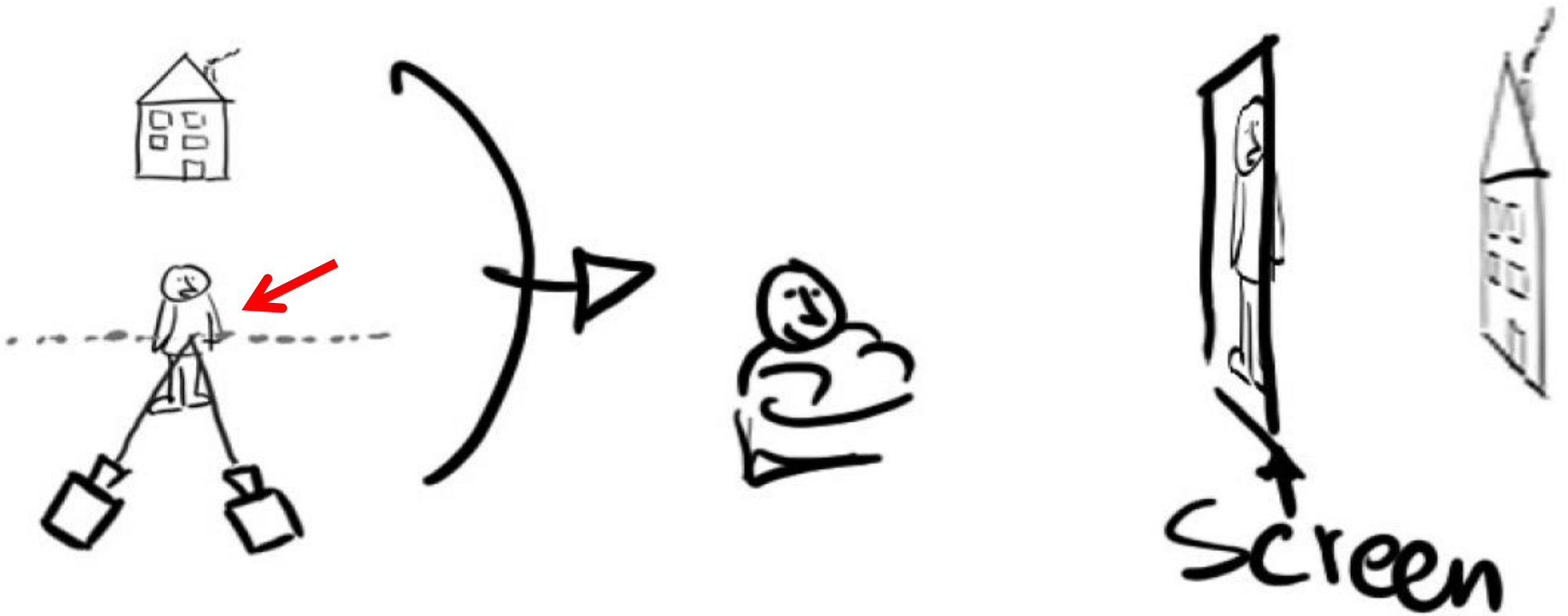
폭주, 수렴 convergence



Convergence



Convergence



Parallax



Parallax



THEATER SPACE
NEGATIVE PARALLAX

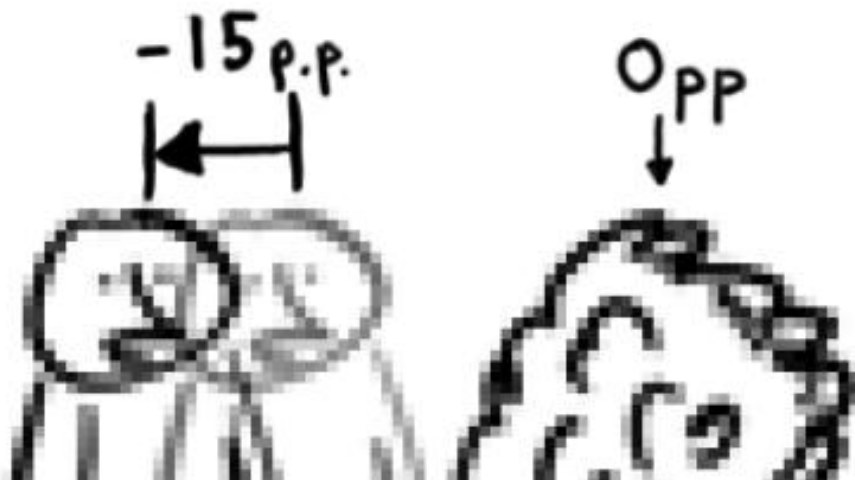


Parallax



THEATER SPACE
NEGATIVE PARALLAX

SCREEN PLANE
ZERO PARALLAX



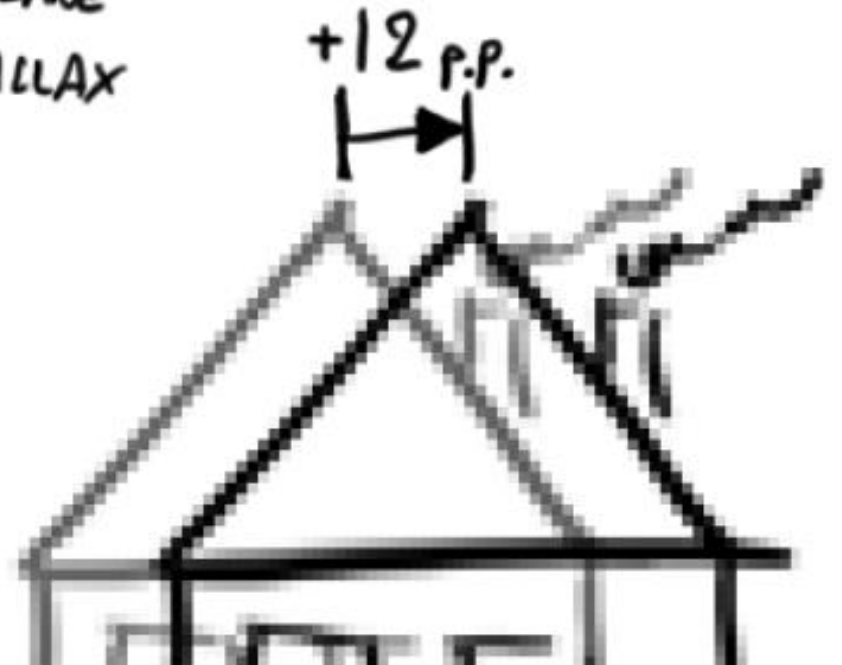
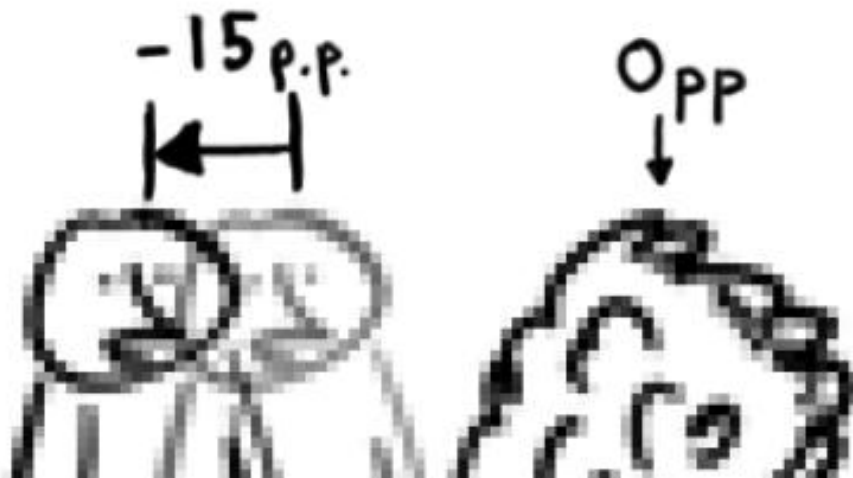
Parallax

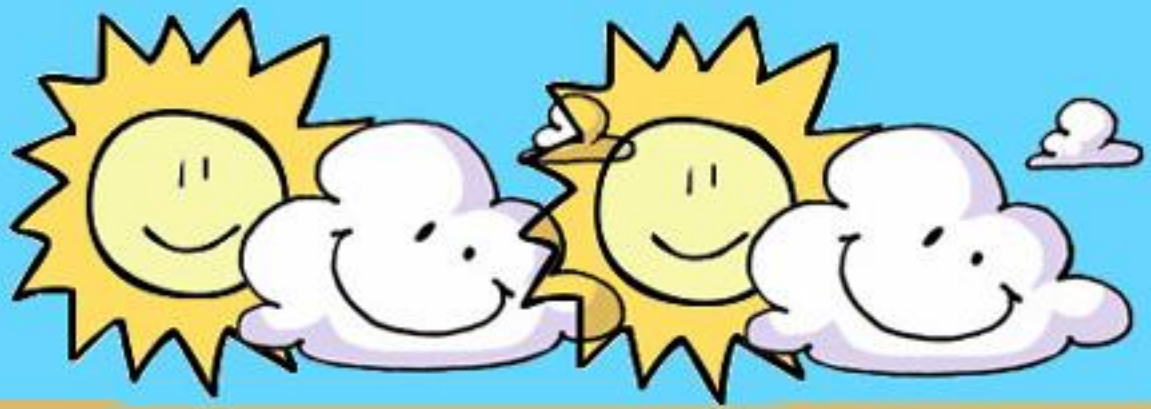


THEATER SPACE
NEGATIVE PARALLAX

SCREEN PLANE
ZERO PARALLAX

BEHIND THE SCREEN
POSITIVE PARALLAX

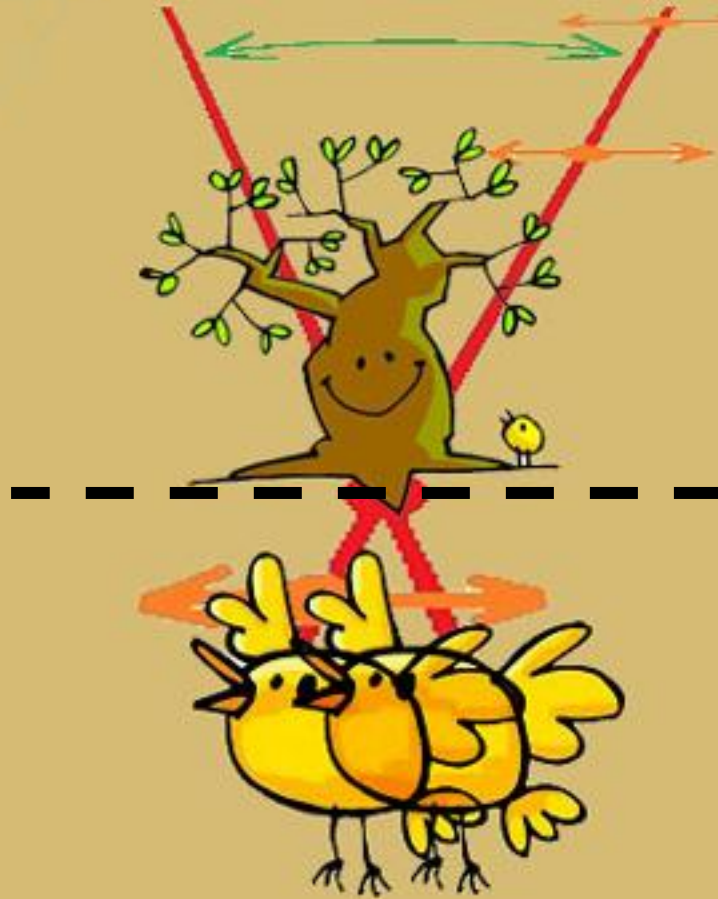




Positive

**Convergence
Point**

Negative





입체 영상의 개론

입체 영상 & 게임 전망

입체 영상 인식 및 구성 요소

디스플레이 기술

PC 게임의 적용

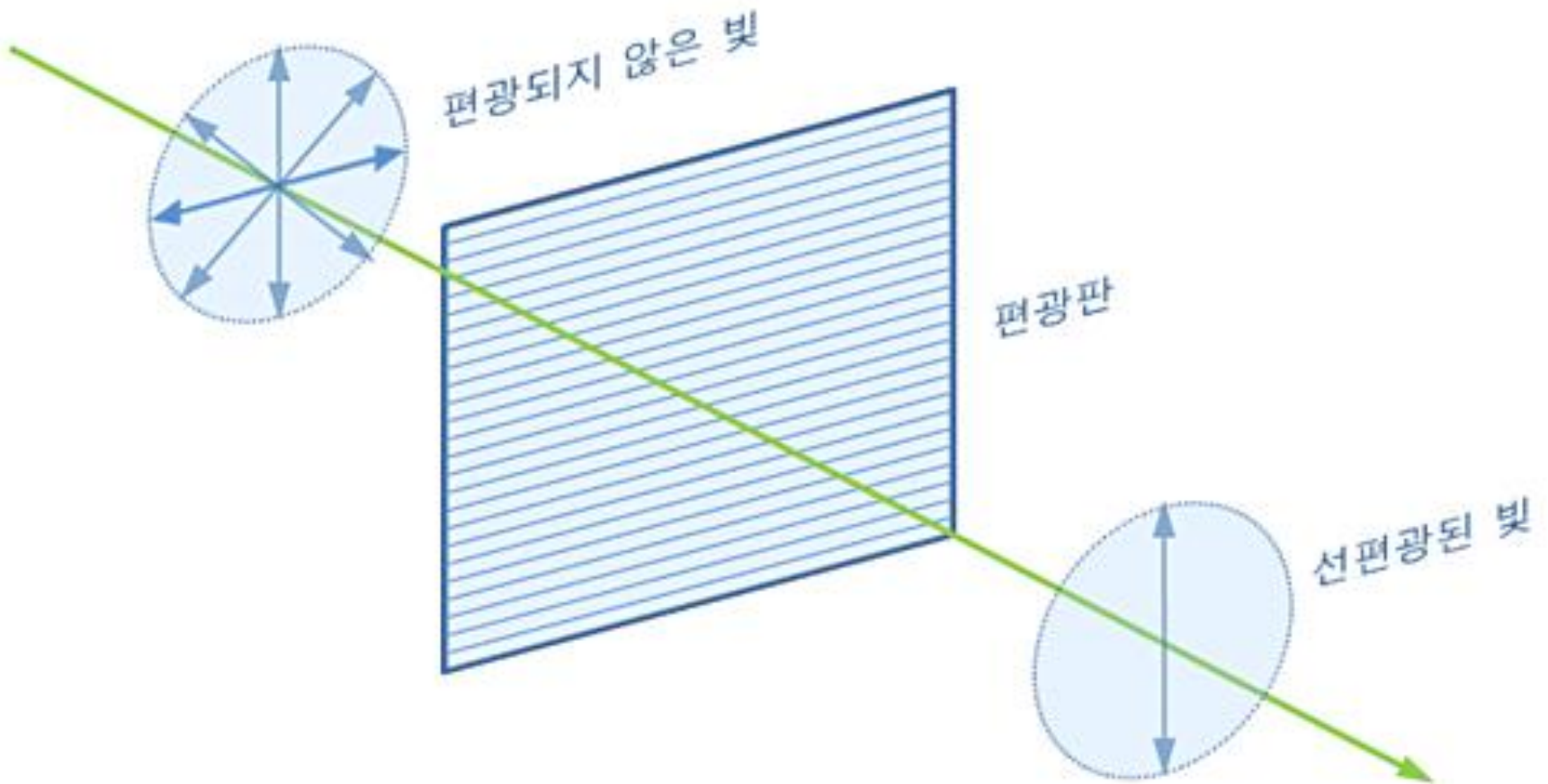
셔터 shutter

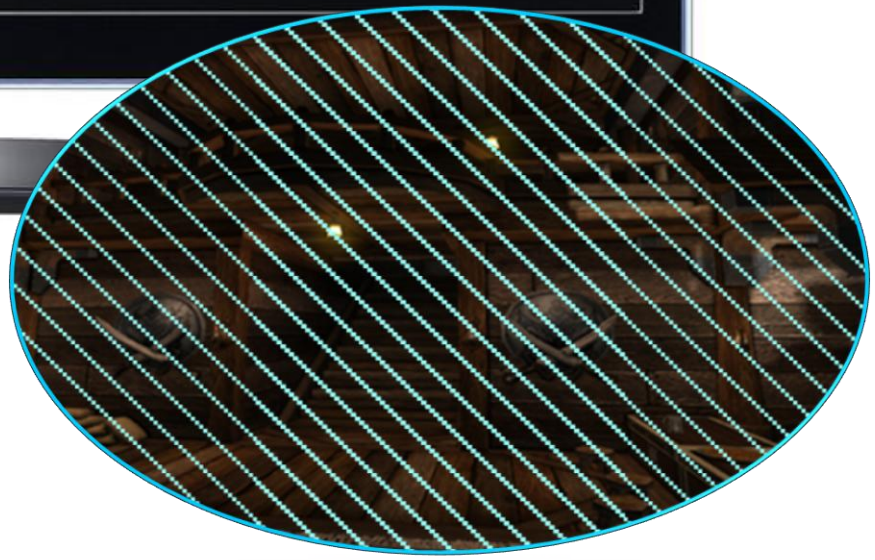
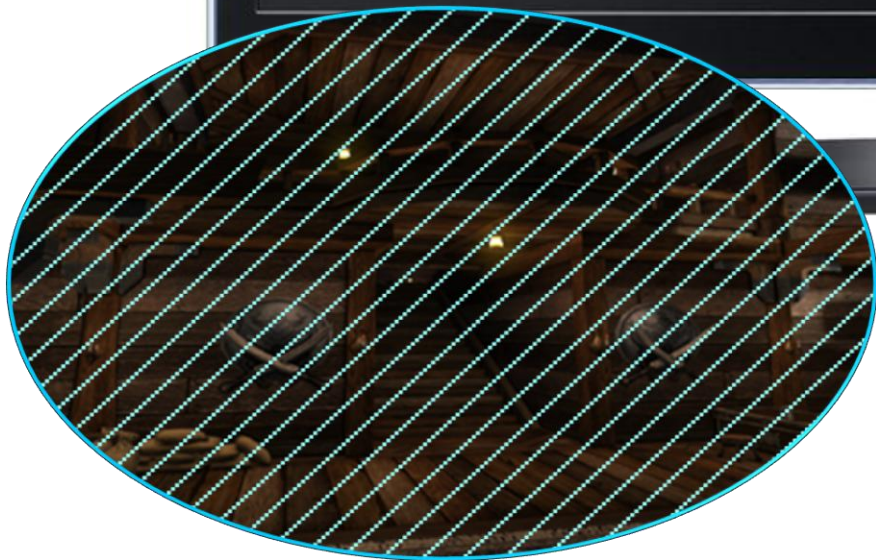
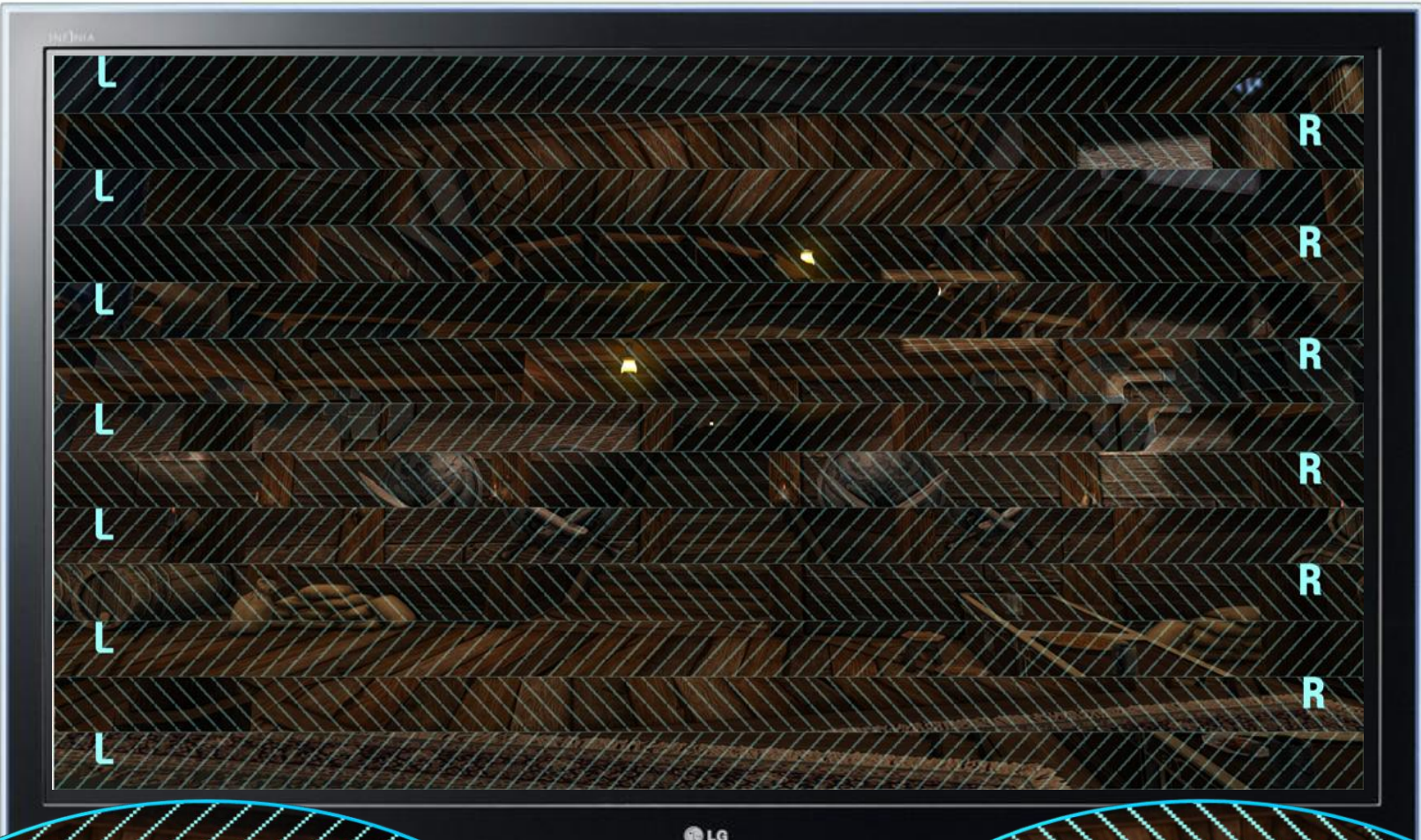




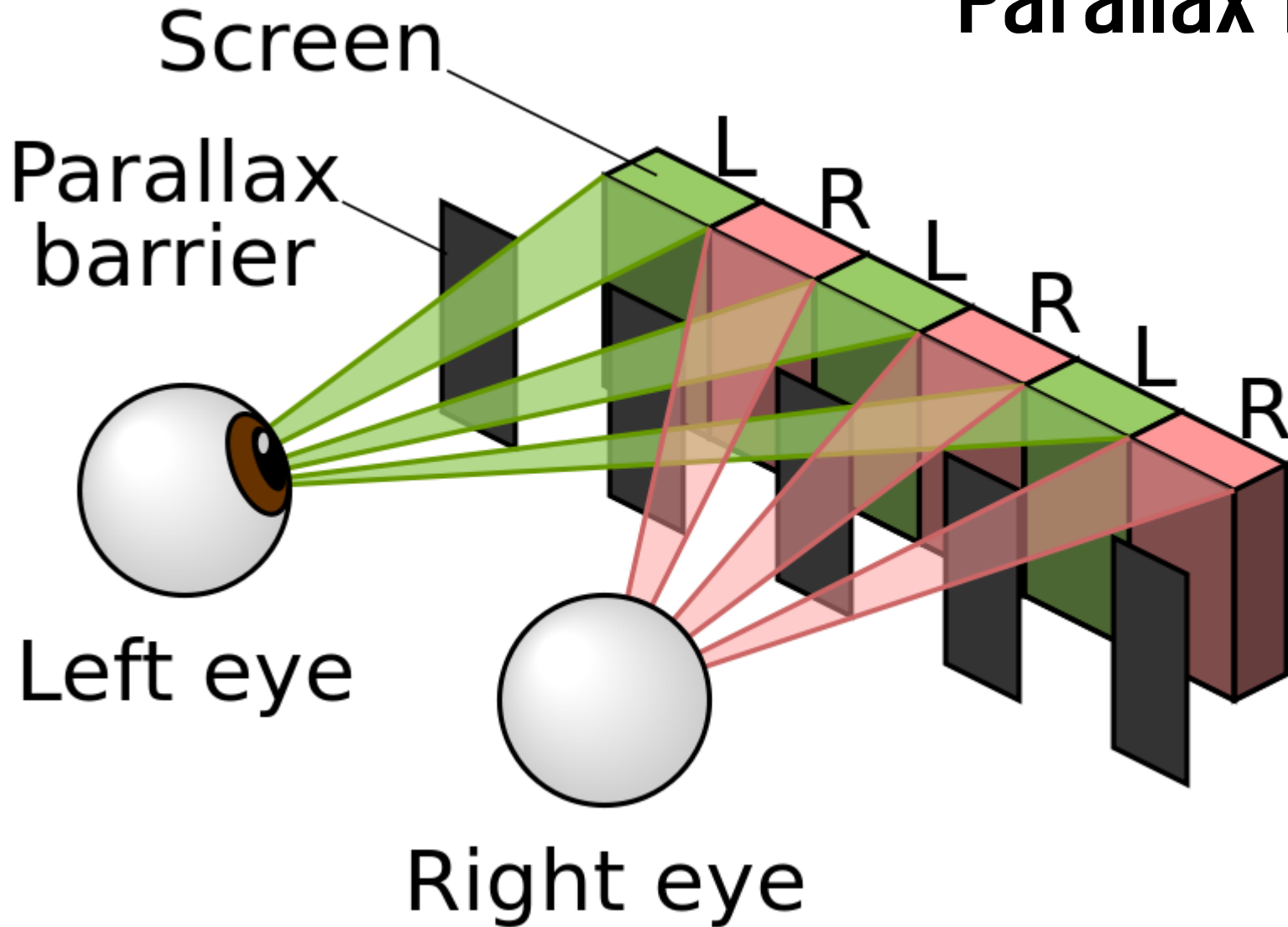


편광 polarization





시차방벽 Parallax barrier



**BREAK
TIME**





PC 게임의 적용

미들웨어 이용

입체 영상 생성 룰

포워드 방식 고려 사항

디퍼드 방식 고려 사항

한계 및 주의점

HOW ON PC ?

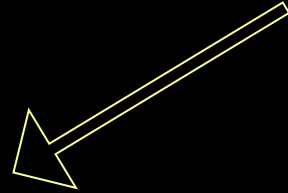
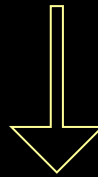
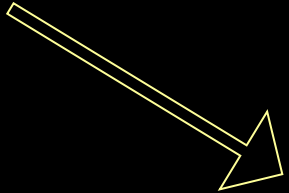


이미지 출처 : 3D world runner, nintendo

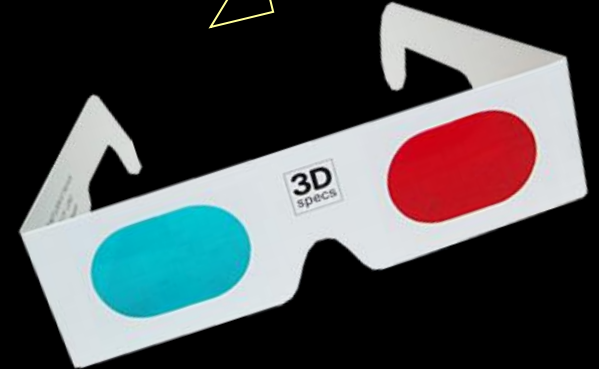
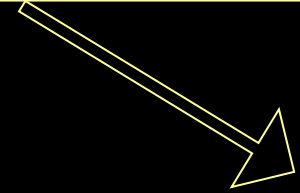
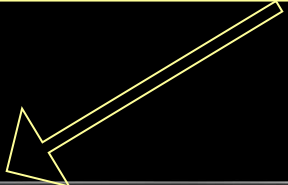


MIDDLEWARE !





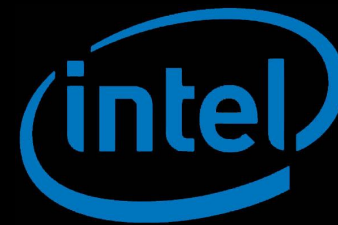
A central box containing four logos. From left to right: the NVIDIA 3D VISION logo, a green triangle with a white jet flying through it, a stylized purple and white 'Z' logo with '3D' written below it, and a stylized orange and yellow 'D' logo.



 **nVIDIA**®
3D VISION™



Windows 7



 **nVIDIA**[®]
3D VISION[™]



AUTOMATIC !

D3D9 Vsync on (640x480), X8R8G8B8 (D24X8)
Device: AMD Radeon HD 6250 Graphics

Preset 1

Convergence = -2.2027

Separation = 7.50

AutoFocus OFF

- Toggle full screen
- Toggle REF (F3)
- Change device (F2)



- Add Instance
- (N)ext View
- (P)revious View
- (R)eset view
- Enable sound
- Auto-control all
- Reset time

시연



PC 게임의 적용

미들웨어 이용

입체 영상 생성 툴

특수 효과 고려 사항

디퍼드 방식 고려 사항

한계 및 주의점



DX Draw Call

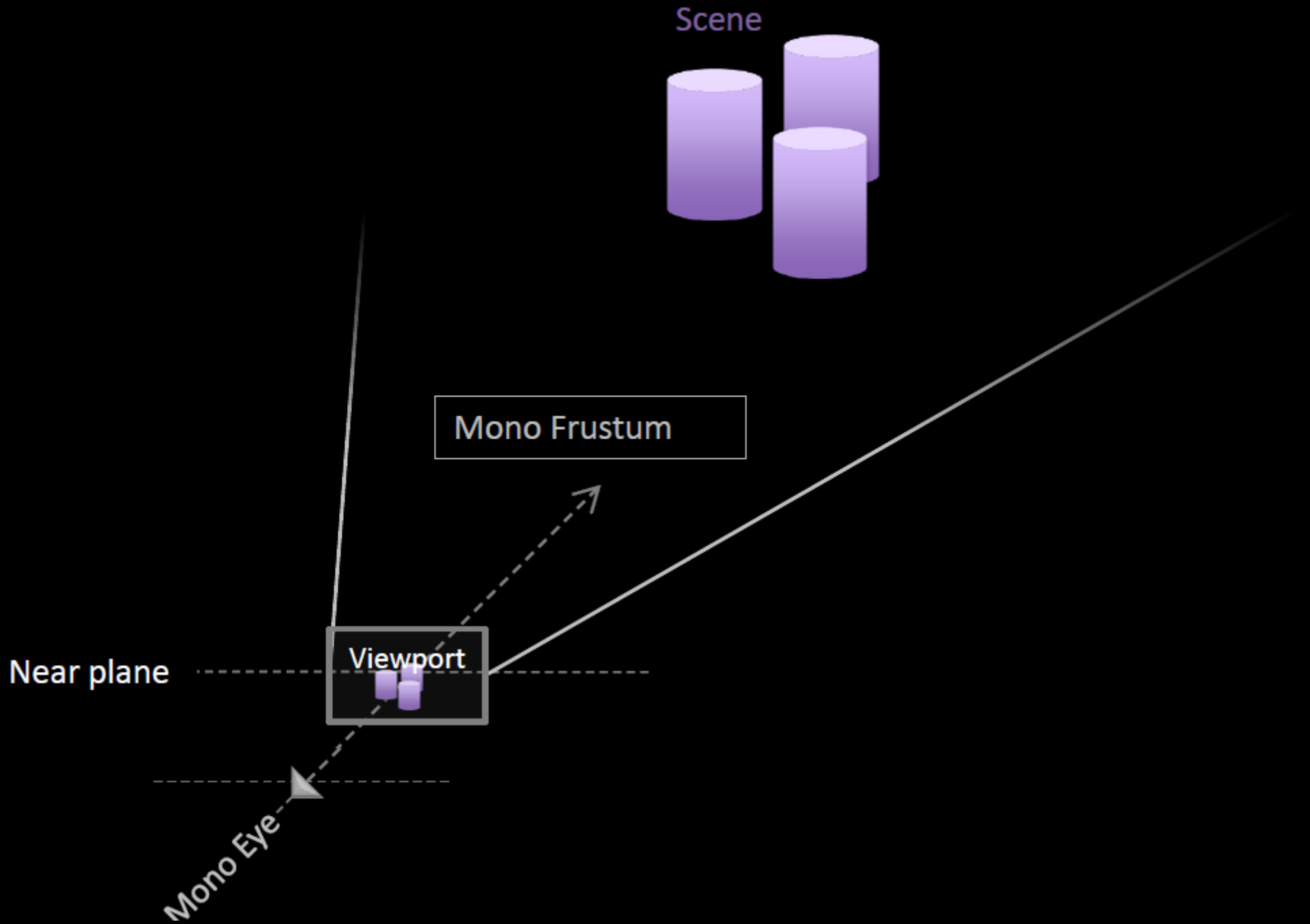


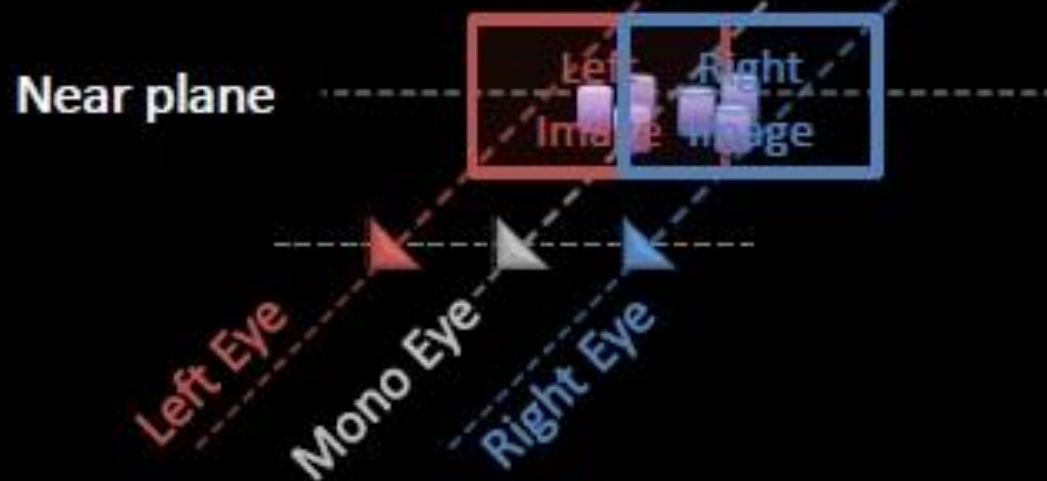
Middleware

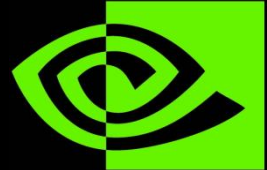


Left Eye

Right Eye



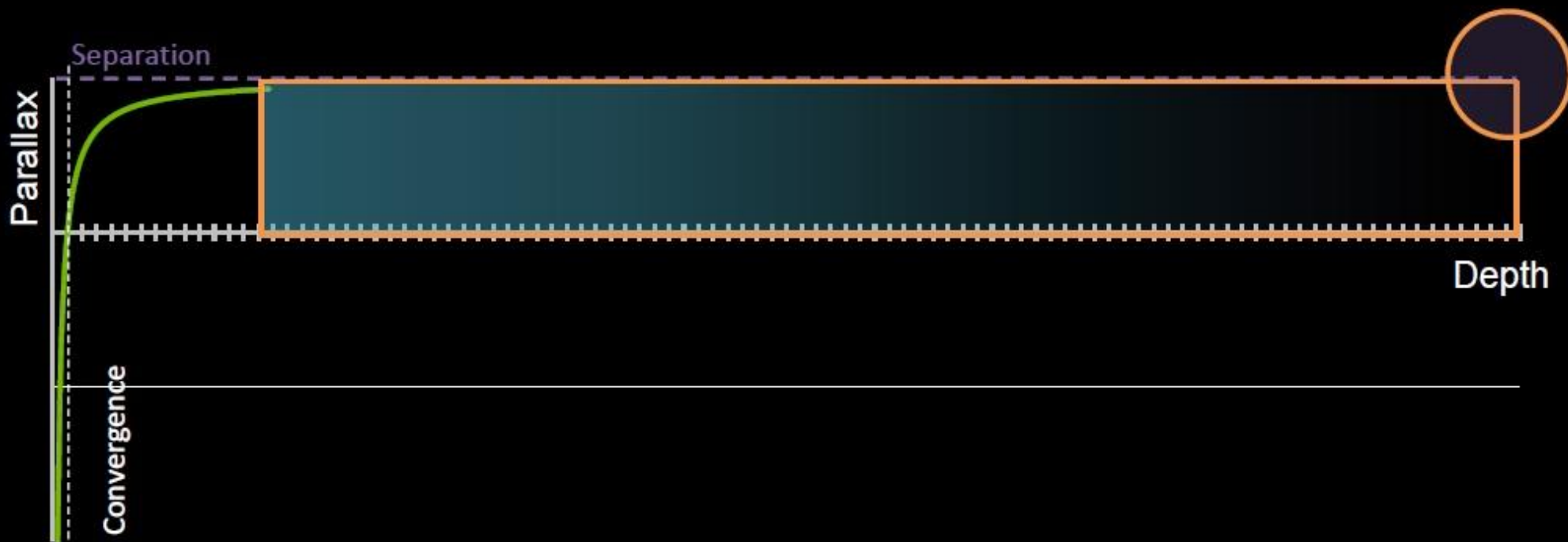




Convergence * 10

: 깊이감 90%

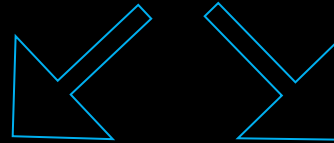
10~100 : 9%



Create RT



Middleware



Create Left RT

Create Right RT

분리 대상

렌더타겟

 NVIDIA®
3D VISION™



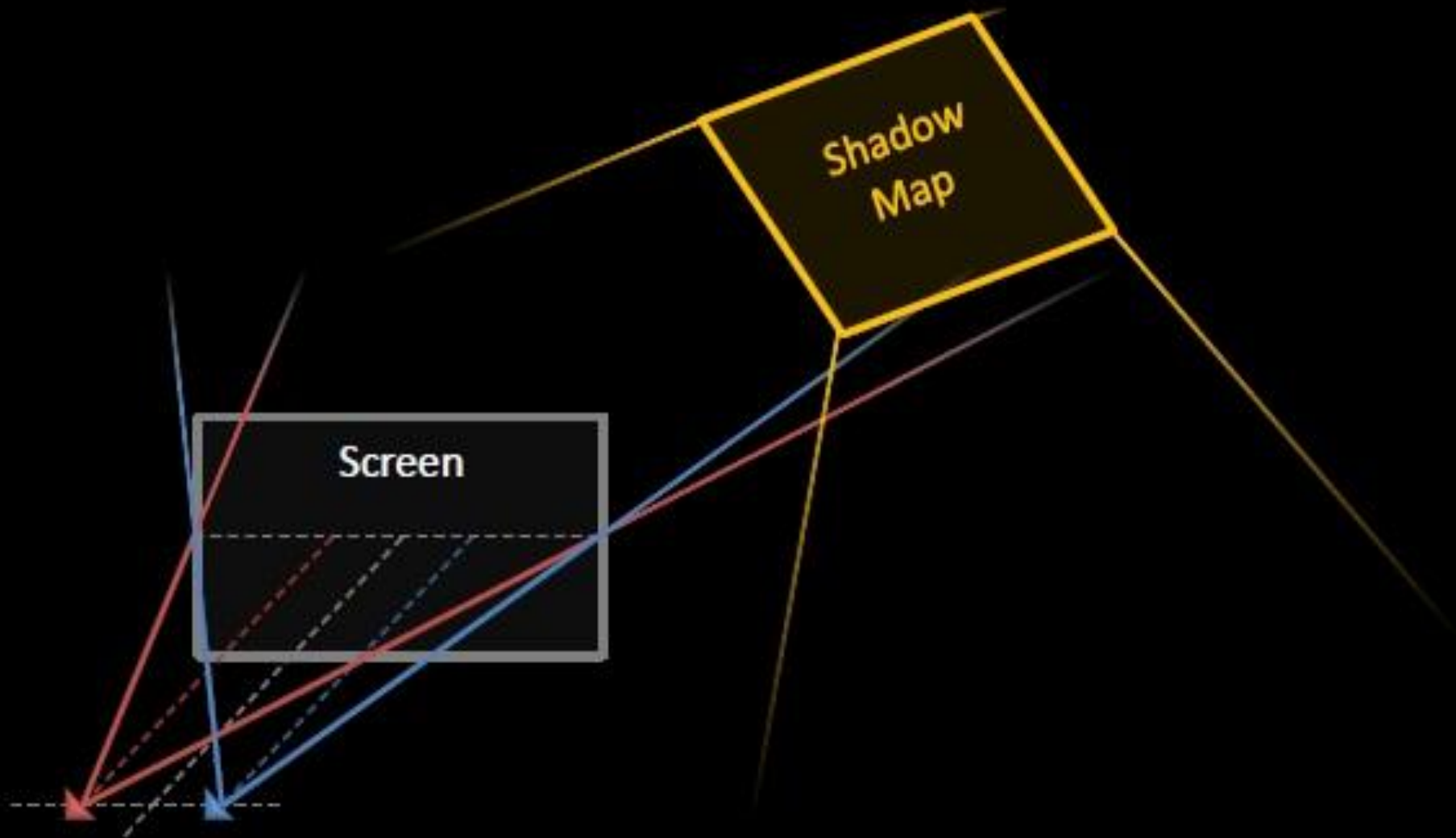
크기

비율

백버퍼 이상

비정사각형

그림자맵



VS

```
vPosLight =  
mul( vPos, g_mViewToLightProj );
```

PS

...

```
float2 ShadowTexC =  
    0.5 * vPosLight.xy / vPosLight.w  
    + float2( 0.5, 0.5 );
```

...

```
sourcevals[0] =  
    (tex2D( g_samShadow, ShadowTexC ) +
```

...



비율

비 정사각형



조건 없음

API 통해서만 제어 가능

분리 제외 : UI, HUD

스크린 깊이

$$W = 1$$

D3DFVF_XYZRHW

포인터

크로스헤어, 마우스커서, 캐릭터명



에보스 족장 아스꾸
<에보스 원주민>

부채득 기변
<부력신 옷데>

전체

- 당신은 258의 피해를 입었습니다.
- 당신은 67의 피해를 입었습니다.
- 소레나(이)가 죽었습니다.
- 3375의 경험치를 획득했습니다.
- 레벨 3이 되었습니다.
- T키를 눌러서 새로운 탭렌트를 배울 수 있습니다.

Lv 10. 에보스 족장 아스꾸(2.59m) ★

E키를 눌러 대화를 할 수 있습니다.

생명력	420 / 595
정신력	299 / 849
리력	259 / 719

1	2	3	4	5	6	7	8	9	0	11
---	---	---	---	---	---	---	---	---	---	----

R



에보스 족장 아스꾸
<에보스 원주민>

부채도 키린
<부러진 돌대>

전체

- 당신은 258의 피해를 입었습니다.
- 당신은 67의 피해를 입었습니다.
- 소레나(이)가 죽었습니다.
- 3376의 경험치를 획득했습니다.
- 레벨 3이 되었습니다.
- T키를 눌러서 새로운 탭렌트를 배울 수 있습니다.

Lv.10.에보스 족장 아스꾸(2.59m) ★

E키를 눌러 대화를 할 수 있습니다.

생명력 420 / 595
 정신력 299 / 849
 마력 259 / 719

레이저 사이트

미들웨어 자체 기능 제공

D3D9 Vsync on (640x480), X8R8G8B8 (D24X8)
HAL (mixed vp): AMD Radeon HD 6250 Graphics

Time: 21.326
Number of models: 9

Quit: Esc

- Toggle full screen
- Toggle REF (F3)
- Change device (F2)



- Add Instance
- (N)ext View
- (P)revious View
- (R)eset view
- Enable sound
- Auto-control all
- Reset time

시연

No problem ?



PC 게임의 적용

미들웨어 이용

입체 영상 생성 룰

특수 효과 고려 사항

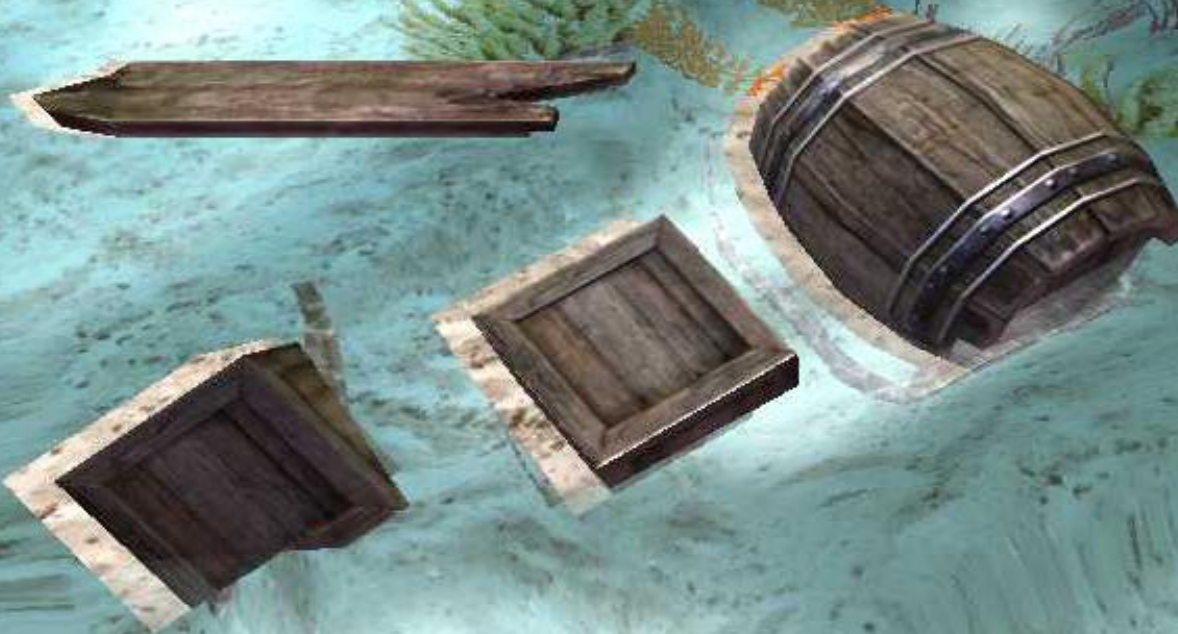
디퍼드 방식 고려 사항

한계 및 주의점

Screen Position

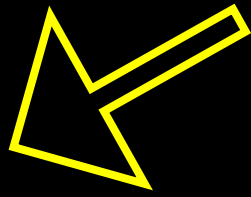
Soft Particle
Distortion

WRONG

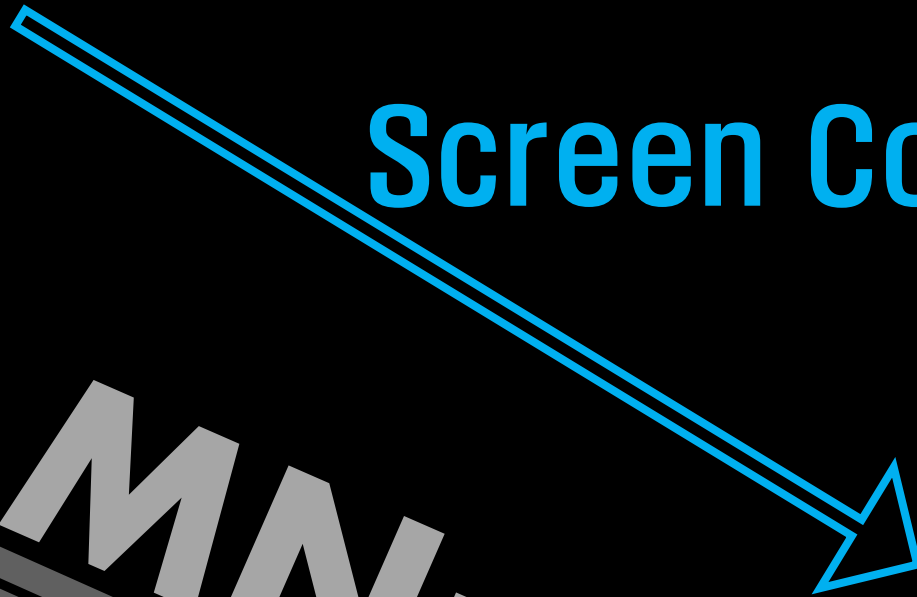


World to Screen matrix

VS



Screen Coord



PS



VS

```
vPosScreen =  
mul( vPos, g_mWorldToScreen );
```

PS

```
...  
float2 ScreenTexC =  
    vPosScreen.xy / vPosScreen.w;  
float4 d =  
    (tex2D(samShadow, ShadowTexC ) +  
...  
...
```

VPOS

PS 3.0



L

CORRECT

R

CORRECT





PC 게임의 적용

미들웨어 이용

입체 영상 생성 툴

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디퍼드 방식 고려 사항

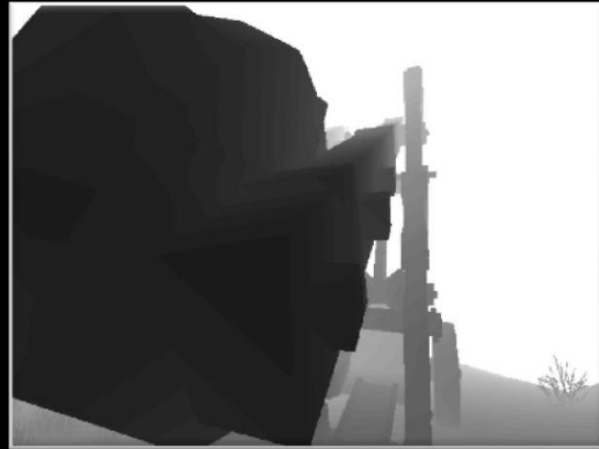
한계 및 주의점

“

Unprojection problem

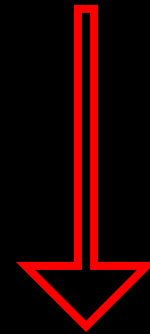
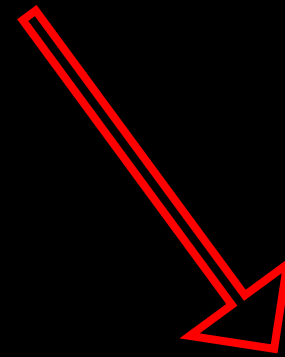
”

Deferred Shading
Post Processing
Screen Space



Depth map

View
Projection
Inverse
Matrix



PS

DAMN!

PS

```
//reconstruct original view-space pos
```

```
...
```

```
float4 position =
```

```
    mul(float4(x, y, z, 1.0/*w*/), InvViewProj);
```

```
position.xyz =
```

```
    position.xyz / position.www;
```

```
position.w = 1.0f;
```

L

WRONG



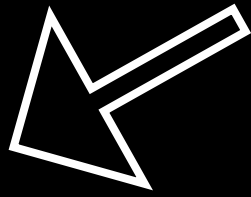
R

WRONG



VS

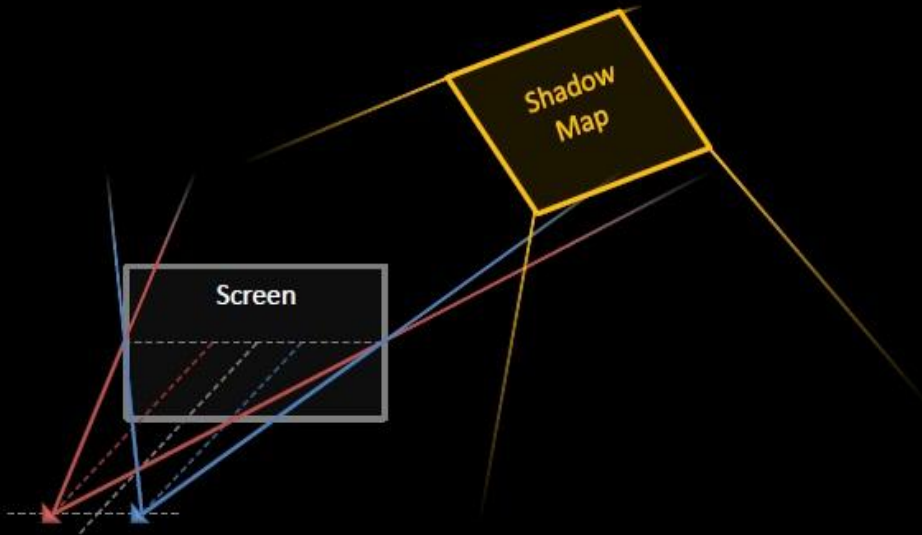
View to Light matrix



Position on Light



PS

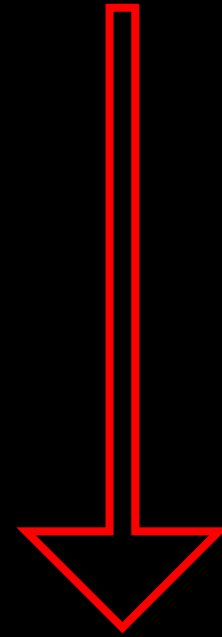


View to Light matrix

MONO

!=

STEREO



PS

DAMN!

L

WRONG



R

WRONG



L

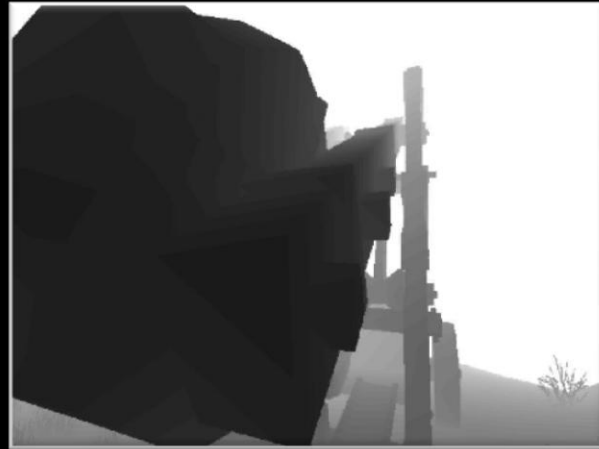
CORRECT



R

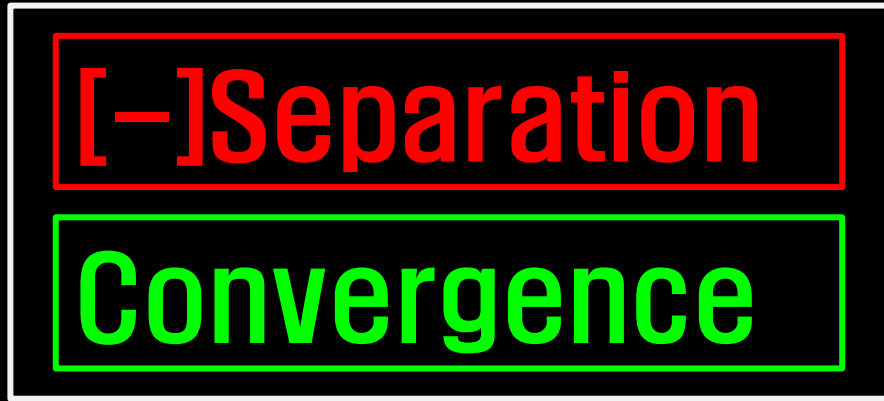
CORRECT



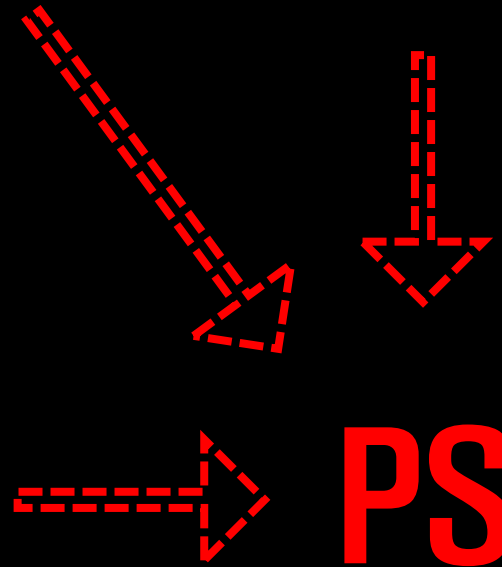


Depth map

View
Projection
Inverse
Matrix



Stereo Texture



PS

NVAPI

<http://developer.nvidia.com/nvapi>

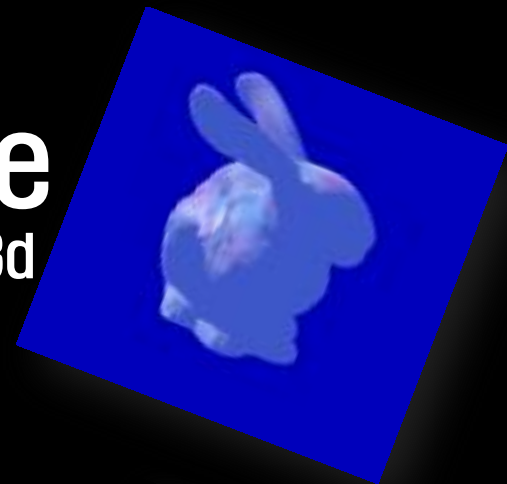
nvstereo.h

NVIDIA Graphics SDK 11에 포함

참고 샘플

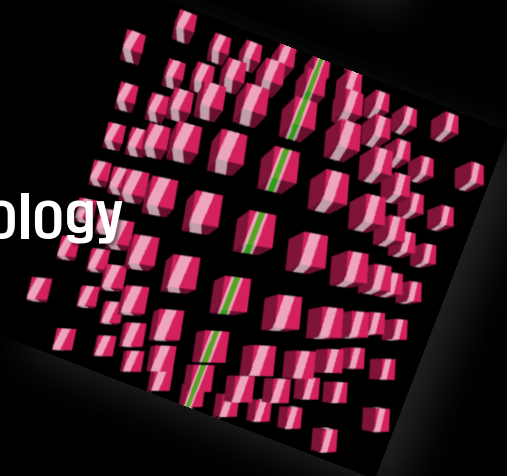
NVIDIA SDK 11 3D Vision Sample

<http://developer.nvidia.com/nvidia-graphics-sdk-11-direct3d>



Stereo Unprojection Sample

<http://developer.nvidia.com/3d-vision-and-surround-technology>



초기화

...

```
NvAPI_Status status = NvAPI_Initialize();
```

...

```
NvAPI_Status status =  
NvAPI_Stereo_CreateHandleFromUnknown  
(m_D3D9Device , &m_StereoHandle);
```

...

초기화

```
nv::StereoParametersD3D9
```

```
  m_StereoParamD3D9;
```

```
...
```

```
  m_StereoParamD3D9.createGraphics
```

```
  (m_D3D9Device );
```

```
...
```

```
  m_StereoParamD3D9.
```

```
  makeStereoSideMap( m_D3D9Device );
```

```
...
```

← nvstereo.h

파라미터 취득

...

```
NvAPI_Stereo_GetConvergence(,,);  
NvAPI_Stereo_GetSeparation (,,);  
NvAPI_Stereo_GetEyeSeparation (,,);
```

...

```
m_StereoParamD3D9.  
    getStereoParamMapTexture();
```

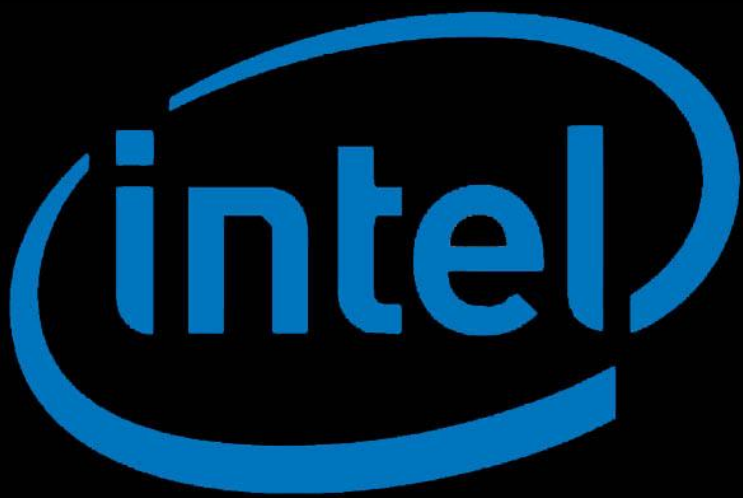
Shader

```
...  
float getStereoSide()  
{  
    return tex2Dlod  
        (g_StereoParamMap,  
         float4( 0,0,0,0)).x;  
}  
...  
-1: 좌안  1: 우안
```

우왕ㅋㅋ~







유지보수 ?



양안 직접 렌더

Explicit 3D rendering

Stereo 3D rendering in DX11

Nvidia's 3D Vision drivers is a good and *almost* automatic stereo 3D rendering method

- > But only for forward rendering, doesn't work with deferred shading
- > Or on AMD or Intel GPUs
- > Transparent surfaces do not get proper 3D depth

We instead use *explicit* 3D stereo rendering

- > Render unique frame for each eye
- > Works with deferred shading & includes all surfaces
- > Higher performance requirements, 2x draw calls

Works with *Nvidia's 3D Vision* and *AMD's HD3D*

- > Similar to OpenGL quad buffer support
- > Ask your friendly IHV contact how





NVAPI

NDA version

양안 지정 렌더

...

NvAPI_Stereo_SetActiveEye

(StereoHandle, **NVAPI_STEREO_EYE_RIGHT**);

...

mProj._31 += Separation;

mProj._41 -= Separation*Convergence;

...

DPCall();

좌안 역시 마찬가지로



IZ3D API

www.iz3d.com/api

초기화

```
IStereoAPI* g_StereoAPI;
```

```
...
```

```
D3D 디바이스 생성
```

```
...
```

```
if (HMODULE hMod = LoadStereoLibrary()) {  
    CreateStereoAPI( hMod, &g_StereoAPI );  
};
```

```
...
```

파라미터 취득

...

```
separation =  
  pStereoAPI->GetSeparation();  
convergence =  
  pStereoAPI->GetConvergence();
```

타겟 생성

pStereoAPI->

SetRenderTargetCreationMode(0);

...

무조건 모노

좌안 타겟 생성;

우안 타겟 생성;

...

pStereoAPI->

조건 스테레오

SetRenderTargetCreationMode(2); ...

렌더

...

```
pStereoAPI->BeginMonoBlock();
```

...

leftRT와 rightRT에 직접 렌더

...

```
pStereoAPI->EndMonoBlock();
```

...

렌더 타겟 복사

```
...  
pStereoAPI->SetBlitDstEye( 1 );  
pD3DDevice->  
    StretchRect( rightRT,,pBackbuffer,,);  
...  
pStereoAPI->SetBlitDstEye( 0 );  
pD3DDevice->  
    StretchRect( leftRT,,pBackbuffer,,);  
...
```



API

COMING SOON



DEMO

On

REALSPACE 3.0



PC 게임의 적용

미들웨어 이용

입체 영상 생성 툴

포워드 방식 고려 사항

특수 효과 고려 사항

한계 및 주의점

Fake 3D

범프맵 빌보드

Out of Screen

VS

2D UI

Performance

컴빨

휴먼팩터

Human Factor

적절한 기본 값



와아~ 밥먹장~

마무리

레퍼런스(1/4)

- ✓미국 3D콘텐츠 산업구조 분석과 진출방안 연구 - KOCCA
- ✓글로벌 주요국 3D 산업 현황과 진출방안 - Kotra
- ✓스마트TV의 등장에 따른 미디어산업 구조변화에 관한 연구 - kovaco
- ✓3DTV 3차원 입체 영상 정보처리 - 두양사
- ✓3D 입체 영상 표현의 기초 - 성안당
- ✓3D멀미 발생 메커니즘과 그 대책 - 게임비평
- ✓Fundamentals of Stereoscopic Imaging - Bernard Mendiburu
- ✓Image Distortions in Stereoscopic Video Systems - Andrew Woods

레퍼런스 (2/4)

- ✓ **A Beginner's Guide to Shooting Stereoscopic 3D – Tim Dashwood**
- ✓ **The Past, Present, and Future of 3D Gaming – S3DGA**
- ✓ **The History of Stereoscopic 3D Gaming – Benj Edwards**
- ✓ **Stereoscopic viewing – Jim Blanchard and Reiko Tsuneto**
- ✓ **NVIDIA 3D Vision Automatic Best Practices – nVIDIA**
- ✓ **Stereo Unprojection – nVIDIA**
- ✓ **SIGGRAPH Asia 2010: Stereoscopy, from XY to Z – nVIDIA**

레퍼런스 (3/4)

- ✓ GTC 2010: Implementing Stereoscopic 3D in Your Applications – nVIDIA
- ✓ The In and Out: Making Games Play Right with Stereoscopic 3D Technologies – nVIDIA
- ✓ 3D Stereoscopic Game Development: How to Make Your Game Look Like Beowulf 3D – nVIDIA
- ✓ Stereoscopic 3D Demystified: From Theory to Implementation in Starcraft2 – nVIDIA
- ✓ Practical 3D Vision in Games: Principle, Implementation and Optimization – nVIDIA
- ✓ Game Developers Guide for TriDef 3D – TriDef
- ✓ Guig's separation and convergence guide – iZ3D
- ✓ How to use Stereo API – iZ3D

레퍼런스 (4/4)

- ✓ DirectX 11 Rendering in Battlefield 3, DICE
- ✓ Rendering in Cars 2, Disney/Pixar
- ✓ Making 3D Games on the Playstation 3, Sony
- ✓ Bringing stereo to consoles, Crytek
- ✓ The Past, Present, and future of 3D gaming, S3DGA

BLAZER

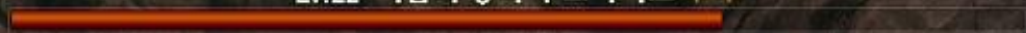


MAIET
entertainment

Game 2

THE SECOND DUEL





아사다마오 22Lv.

pyoo 20Lv.
오프라인

버릴건버리자 22Lv.

보스전재있다 20Lv.

어둠의 종속자 크라시스

전체

- ings\venister\My Documents\Raiderz\Screen-Shot\Raiderz092.jpg
- 어둠의 종속자 크라시스(이)가 '강미한 출혈' 효과를 얻었습니다.
- 어둠의 종속자 크라시스(이)가 '빛의 족쇄 2' 효과를 얻었습니다.

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to



nVIDIA



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질문 ?

<http://ozlael.egloos.com/>

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