



4

1

1.

가.

21 가가 3
(high risk)

가 Source Multi-Use One
Source Multi-Use One

가 ()CCR

가 , Palm, J2ME/MIDP, PocketPC TV
(Multiple Operating System)

가 PC, PDA,
(Multiple Device)

가 (Multilingual environment)

가 PC

가

가 , PC (1)
(가 PC, PC)

NC

가 PC
PC

가 PC
가 PC

< 5-4-1-01>



(Tomb Raider), (Turok),
(Quake), (Diablo),
(Starcraft)

가

가 가

가 PC

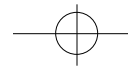
(Playability)
(consde experience)

가

가

가 PC

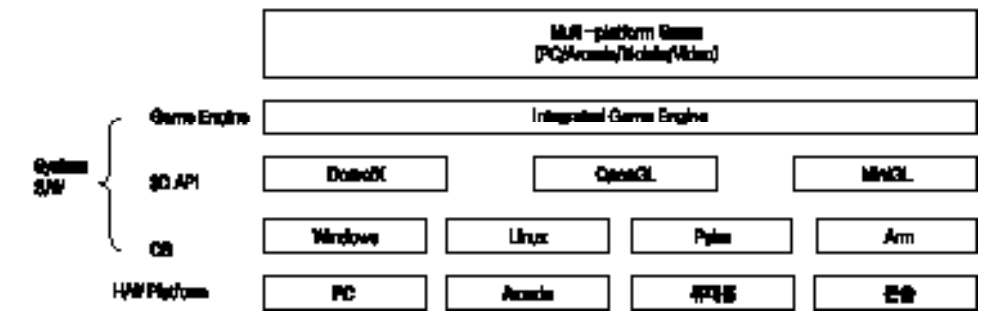
5



4

가 , PS2, XBOX
 PC
 PC
 PC
 가
 10~15
 가
 PC
 PS2 가 32Mbyte
 XBOX 가
 64Mbyte 가 artwork 가
 가
 PC
 DPI
 가
 가
 XBOX
 PS2
 PS2
 가
 가
 (2)
 가
 가
 가
 가
 가
 , PC
 PC
 가
 가
 PC

< 5-4-1-02>



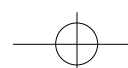
2, MDK 2, EA
 EA NBA , NHL
 , FIFA , NFL , API 3

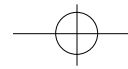
2.

5

< 5-4-1-01>

Drop - Out	<ul style="list-style-type: none"> Graceful handling AI
Drop - in Spectator	
	AS
	S/W
	DB





4

가. OpenGL ES

(2) DirectX
DirectX Windows

API . DirectX 2D 3D
가 ,

가

API

DirectX Graphics (DirectDraw, Direct3D)
: 2D 3D

DirectInput :

DirectX Audio (DirectSound, DirectMusic) :
, DirectSound

DirectMusic
DirectPlay :

DirectShow : AVI MPG

(3) SDL(Simple DirectMedia Layer)
SDL(Simple DirectMedia Layer)

API .
SDK,
, MPEG player,
. Linux, BSD,
MacOS, Win32, BeOS

OpenGL ES 가

, CD-ROM, ,)

3 , ,
GUI
Allegro

가 .

(4) Allegro (portable) , DJGPP
Allegro C/C++ C
, DOS, . Dos, Unix, Windows, BeOS, MacOS,
Unix (Linux, FreeBSD, Irix, Solaris), QNX
Windows, QNX, BeOS MacOS 가
. Allegro , , , ,

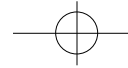
< 5-4-1-02> 3 API

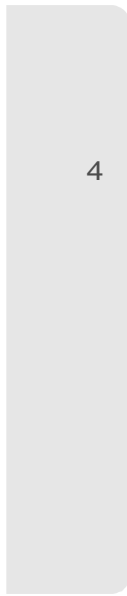
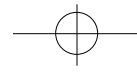
	OpenGL	DirectX	SDL	Allegro
		Windows	API	
	Windows, Mac, Unix	Windows	Linux, BSD, MacOS, Win32, BeOS	DOS, Unix, Windows, QNX, BeOS, MacOS
		2D 3D 가 ,	SDK, , MPEG player, (, ,)	

5

< 5-4-1-03>

		PC	PS2	XBOX	GC	Linux
NetImmerse	- PS2 GameCube - Bone LOD, SceneImmerse - Havok					x
Intrinsic Alchemy	-					
RenderWare	-					
Quake	- OpenGL					x
Unreal	- MIPS CPU - C++					x
LithTech	- 2			x	x	x





4

“ (1) ”

PC

가

가 (PC,)

(1)

/

/



가 Bluetooth

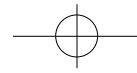
, PC, USB, IrDA, RF,

(,)

3.

가

(2)



가

. PC,

가

가

, 가

API

One Source Multi-Use API

2

3D

1.

3D

3D

가

(Quake) 3D

, 가

가

“

가 ”

가 “

3D

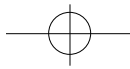
가

가

, 3D



5



4

< 5-4-2-01> 2() ()



2 , 2

3D

가

가

가.

가

3D

가

가

가

가

가 가

가

가.

가

가

3D

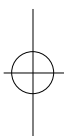
가

가

3D

(OS)

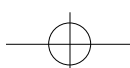
?

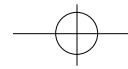


< 5-4-2-01> 3D

S/W			
Animation	Keyframe Animation	Hierarchical Animation	가 가 .
		Forward Kinematics	
		Inverse Kinematics	
		Interpolation	
	Motion blending		
	Skinning Animation	Physique	
		Biped Animation	
		Bone Animation	
	Mesh Animation	Morpher	가
		Cloth Simulation	
LinkAnimation			
Texture Animation	Image Sequence		
	Alpha		
Rendering	Texturing & Material	Texture Coordinate	
		Bump mapping	
		Opacity mapping	
		Reflection mapping	
		Environment mapping	
		Mip mapping	
	Multi - pass rendering	Billboard	
		Combining rendered images	
		Blending	
		Z - buffer	
Accumulation buffer			
Stencil buffer			
Shader	Back to front transparency		
	Planar reflections		
Shading	Multi - pass shadow volumes		
	Vertex shader	GPU Programming	
Lighting	Pixel shader	GPU Programming	
	Flat shading		
	Gouraud shading		
	Phong shading		
Shadows	Mixing Phong and Gouraud shading		
	Light maps		
	Dynamic lighting effects with light maps		
	Dynamic lights		
Shadows	Fog map		
	Projected shadows		
	Adding shadows to a light map		
	Self - shadowing		
	Soft shadows		
	Dynamic shadows		
Shadow Volumes			

5

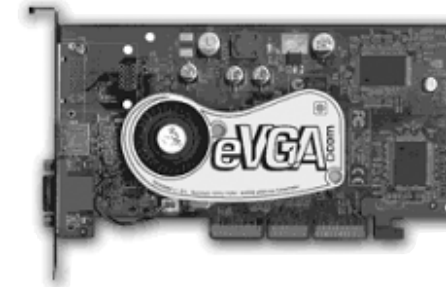




4

		S/W	
Spatial sorting	Indoor	BSP	Binary Space Partitioning
		PVS	Possibly Visibility Set
		Portal & Cell	
	Outdoor	Quadtree	4
		Octree	8
		View Frustum Culling	Culling
Special Effects	Cloud		
	Fire		
	Lens flare		
	Lightning		
	Particle systems		
	Water		
Level of Detail	Terrain	CLOD	
		ROAM	
	Mesh	Progressive Mesh	
Intersection Test	Collision detection	Sphere	
		AABB (Axis aligned bounding box)	
		OBB (Oriented bounding box)	
		K-DOP	
		(Discrete orientation polytope)	

< 5-4-2-02> GPU 가 Video Card.



NVVIDIA Geforce4 () ATI Radeon()

, NVIDIA GPU 가 API
CG Hardware
3D

< 5-4-2-02> DirectX OpenGL

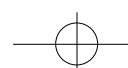
	OpenGL	DirectX
Draw		
	Column Matrix	Row Matrix
	C	COM

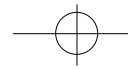
5

GPU(Graphic Processing Unit)가 3D Graphics GPU CPU
CPU
CPU
가 3D
(1) 3D
(가) 가 3D ? Hardware Shader
2D GPU가
. 3D Graphics
가 가
CPU DirectX 9.0
HLSL(High-Level Shader Language)

(2) API

(가) OpenGL DirectX
가 3D API
OpenGL
DirectX가 API
API
OpenGL
1.4 , DirectX
9.0 . OpenGL API
가 API
DirectX Microsoft
Windows 가





4

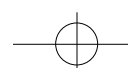
(3) () 3D
 3D
 (가) PC
 가 PC
 2, , XBOX 가
 PC
 C C++ 가
 3D
 C C++ 가
 3D
 () 3D
 (5)
 가
 (가)
 3D 가 3D 가 3D
 3DS Max, Maya,
 Lightwave
 가
 () 3D
 (4) (OS) 3D 3D
 Export
 (가) (OS)
 PC MS Windows
 , 3D
 Export
 ()

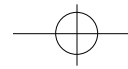
가
 3
 가가
 1
 () 3D 가 가
 가
 , Programmable Shader
 3D Language가
 가 3D
 가
 (6) 3D
 가

5

< 5-4-2-03>

Engine	Genre	Platform	Developer	Game Title
Unreal Engine	Action	PC	Ubi Soft	Unreal Tournament 2003
	Action	PC	Legend Entertainment	Unreal 2 : The Awakening
	Action	PC	Legend Entertainment	The wheel of time
	Action	PC	U.S.Army	America's Army
	Action	PC	Ubi Soft	Rain bow six: Raven Shield
	Action	PC	Ubi Soft	Splinter Cell
Quake Engine	Action	PC	KnowWonder	Harry Potter
	Action	PC	id Software	Quake
	Action	PC	id Software	Quake 2
	Action	PC	2015	Medal of Honor : Allied Assault
	Action	PC	Rogue Entertainment	American McGee's Alice
	Action	PC	Raven Software	Soldier of Fortune 2
Lith TecK	Action Adventure	PC	Monolith	No One Lives Forever
	Action	PC	Monolith	Shogo
	Action	PC	Monolith	Blood
	Action	PC	Monolith	Alien v Predator 2
	Action	PC	Zombi	Atlantis : The Lost Empire : Trial by Fire





4

< 5-4-2-04> 3D

	Genre	Platform	Developer	Game Title
Render Ware	Action	PS2	Ubi Soft	Rayman Revolution
	Adventure	PS2	THQ	Scooby Doo! Night of 100 Frights
	Sports	PC	Gearbox Software	Tony Hawk's Pro Skater 3
	RPG	PC	Sony Online Entertainment	Everquest: The Shadows of Luclin
	Adventure	PC	Revolution Software	Broken Sword: The Sleeping Dragon
	Driving	PS2	Criterion	Burnout 2
	Sports	PS2	KCET	Pro Evolution Soccer 2
	Sports	PS2	Criterion	Airblade
	Action	PS2	Kodiak Interactive	Monsters Inc
NetImmerse	RPG	PC/XBOX	Bethesda Softworks	Elder Scrolls III: Morrowind
	Action	PC	Totally Games	Star Trek: Bridge Commander
	Sports	PC	Microids	Tennis Masters Series
	Sports	PC	Cenzoic	Zero Cup Soccer
	MMORPG	PC	Mythic Entertainment	Dark Age of Camelot
	Racing	PS2	Bethesda Softworks	IHRA Drag Racing
	Puzzle	PC/PS2/Gamecube/XBOX	Blue Planet	Tetris Worlds
	Adventure	PC	Headfirst Productions	Call of Cthulhu
	Racing	PC (PS2 in 2002)	Microids	Open Karts
	Action	PC	Irrational Games	Freedom Force
	Action	XBOX	Oddworld Inhabitants	Munch's Oddysee
	Racing	PC (PS2 in 2002)	Davilex	USA Racer
	Adventure	PC	Gameone Systems	Eternal Saga

< 5-4-2-05> GI3D

	1.0	2.0	3.0
	2002 4	2003 4	
	OpenGL 1.3 Renderer	DirectX9.0 Renderer	XBOX
		CG & HLSL shader	Havok
	3D	Terrain Editor	
	3ds Max 4	3ds Max 5	
		API	
	OS	Shader	

3.

가. 3D 가 가 가 8
 (1) 5 가 (Geforce 4) 가
 3 5 가 3D 가
 가 Vertex & Pixel Shader 가 가
 5 128 가 가
 .5 가

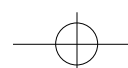


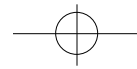
GI3D ver1.0
 3D 1 MMORPG
 3
 3D 가 1
 ()
 2002 4 GI3D ver1.0 2.5
 가 GI3D ver1.0
 가 GI3D ver2.0 DirectX 9.0 가
 , OpenGL API 가 API 가
 가 API
 가 3.0 XBOX

< 5-4-2-06> 5 Geforce FX

	Nvidia Geforce Nvidia Geforce	Quadro FX 2000 Quadro FX 1000
AGP	8X	8X
Graphics	128 - bit	128 - bit
Pipeline	37.71	32.24
proe - 01	38.98	30.15
ugs - 01	23.63	21.17

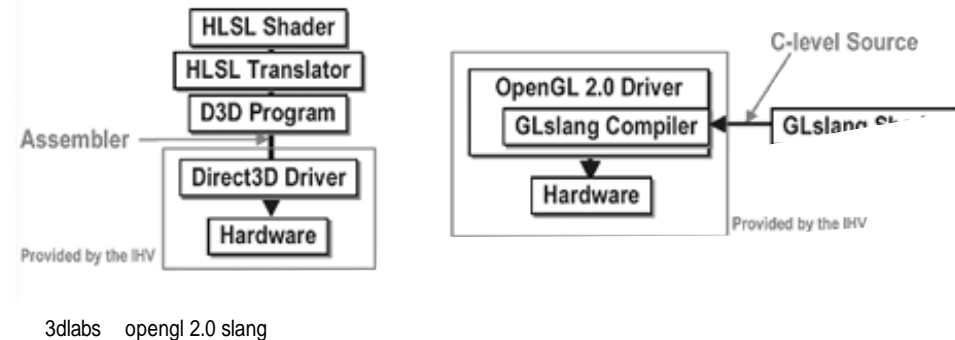
(2) 3D 가
 5 가





4

< 5-4-2-03> DirectX HLSL OpenGL 2.0 GLslang



(1) DirectX OpenGL Shader Language

DirectX 9.0 HLSL 가 가
 High Level Shader Language
 . OpenGL HLSL가
 , OpenGL ARB
 GLslang OpenGL 2.0 3D

(2) DirectX OpenGL High-Level Shader language

DirectX HLSL C GPU Shader
 DirectX GPU
 . OpenGL GLslang C
 OpenGL 가

4.

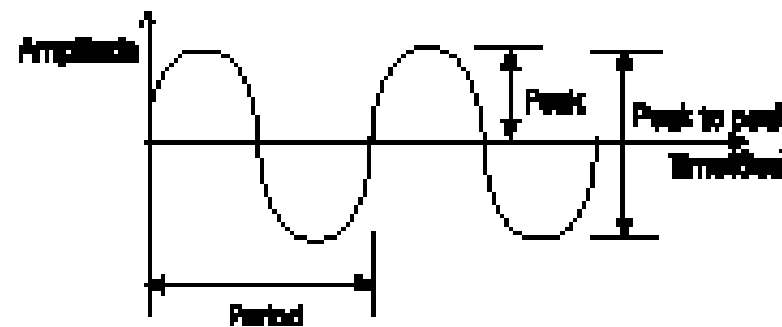
가 . 3D

3

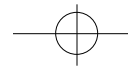
1.

가 . 가 가
 가 . 가 가
 가 2 가
 가
 , 340 m/s
 가
 가 . 가
 가 , 1 (sampling) 8000 Hz
 가 (200 - 8000 Hz)
 (Amplitude) , 1 / 8000 1
 (Period) 가 , 가 가
 (Frequency) 가 . Hz 8 22100 sample
 가 PC

< 5-4-3-01>



5



4

가 , (1)

가

가 가

가

(2)

가 가

가

가

가

가

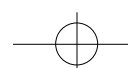
$$10 \log_{10} 2$$

$$3.01\text{dB}$$

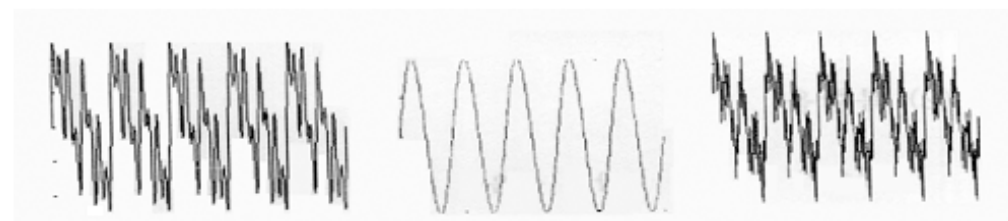
< 5-4-3-01>

(: Hz)

	0	1	2	3	4	5	6	7	9
C	16.352	32.703	65.406	130.81	261.63	523.25	1046.5	2093.0	4186.0
C#	17.324	34.648	69.296	138.59	277.18	554.37	1108.7	2217.5	4434.9
D	18.354	36.708	73.416	146.83	293.66	587.33	1174.7	2349.3	4698.6
D#	19.445	38.891	77.782	155.56	311.13	622.25	1244.5	2489.0	4978.0
E	20.602	41.203	82.407	164.81	329.63	659.26	1318.5	2637.0	5274.0
F	21.827	43.654	87.307	174.61	349.23	698.46	1396.9	2739.8	5587.7
F#	23.125	46.249	92.499	185.00	369.99	739.99	1480.0	2960.0	5919.9
G	24.500	48.999	97.999	196.00	392.00	783.99	1568.0	3136.0	6271.9
G#	25.957	51.913	103.83	207.65	415.30	830.61	1661.2	3322.4	6644.9
A	27.500	55.000	110.00	220.00	440.00	880.00	1760.0	3520.0	7040.0
A#	29.135	58.270	116.54	233.08	466.16	932.33	1864.7	3729.3	7458.6
B	30.868	61.735	123.47	246.94	493.88	987.77	1975.5	3951.1	7902.0



< 5-4-3-02>



(a)

(b)

(b)

(3)

가 가

가

가

가

가

가

가

가

(2)

가

가

가

가

가

가

가

가

가

가

가

(1)

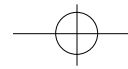
가

가

가

5





4

API
Direct Audio DirectSound
DirectMusic
DirectSound wave
가 (

Audio API EAX, DirectX
가
DirectX Audio 가

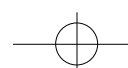
EAX
가
DirectX
DirectMusic
DirectSound DirectMusic
가 DirectMusic
가

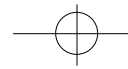
CPU
DirectX Audio
CPU
DirectSound DirectMusic
DirectMusic
DirectSound
DirectMusic
DirectSound

DirectX Audio
DirectX Audio
DirectSound DirectMusic
DirectSound DirectMusic
가
API (1) DirectSound
DirectSound DirectX
API DirectX Audio 가 Audio DirectSound
가 가
가 (Primary Buffer)
DirectX Audio
DirectX Audio DirectX waveform

DirectSound
가 가
MacroFX)
2D CPU 가
가
DirectSound가
, DirectSound
DirectSound 2D 3D
2D 3D 3 가 , (
3D CPU
가 "Listener"
3D 2D 3D
DirectSound가 3D
DirectSound가 가
DirectSound
DirectSound 가
DirectSound 가
DirectSound
DirectSound 가
wave
, DirectMusic
DirectMusic
DirectSound DirectMusic
DirectSound API
DirectMusic MIDI
(Creative Labs EAX Sensaura

5





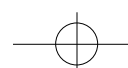
4

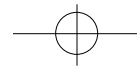
DirectSound DirectMusic
 . MIDI ,
 DirectMusic DirectMusic
 API ,
 DirectX Audio , DirectMusic DirectMusic DirectSound
 가 .
 DirectMusic DirectSound
 DirectSound ,
 DirectMusic Microsoft (1) 가
 가 .
 DirectMusic
 DirectMusic ,
 가 .
 가 " 가
 DirectSound ,
 DirectMusic 가 " .
 DirectMusic ,
 DirectSound ,
 DirectMusic (, , ,)
 DirectMusic ,
 DirectMusic
 Windows Audio 가
 가 .
 DirectSound 가 (2) 3D
 , DirectSound wave

가
 PC , 가
 3D 가
 3D ,
 3D , 가
 HRTF ,
 (가) (HRTF : HEAD
 RELATED TRANSFER FUNCTION)
 3D (DirectSound
 가
), CPU
 가 ,
 가 가 (3) DirectX Audio
 HRTF(Head Related Transfer
 Functions) (가) DirectSound 3D
 DirectSound 3D
 HRTF DirectSound
 , 가 DirectX DirectSound
 Play3DSound 가
 가
 100% 가 DirectSound
 (crosstalk) .
 가 3D
 DirectX8.1

5

```
// - 가
CSoundManager* g_pSoundManager = NULL;
CSound* g_pSound = NULL;
LPDIRECTSOUND3DBUFFER g_pDS3DBuffer = NULL;
```





4

```

DirectSound
( )
Reverb
SDK SoundFX DirectX
Reverb CSoundFXManager가
Reverb
3D
2.
Reverb
가 DirectSound

```

```

// Sound
hr = g_pSoundManager->Create( &g_pSound, g_tszFilename,
    DSBCAPS_CTRLFX, GUID_NULL );
// g_pFXManager CSoundFXManager
// g_pFXManager
g_pFXManager->Initialize( g_pSound->GetBuffer( 0 ), FALSE );
// , 7 Reverb
g_pFXManager->SetFXEnable(7);
//
hr = g_pFXManager->ActivateFX();
Reverb 가
가 , . Reverb
4
g_pFXManager->m_paramsReverb.fInGain //Gain
g_pFXManager->m_paramsReverb.fReverbMix //Mix

```

```

g_pFXManager->m_paramsReverb.fReverbTime //
g_pFXManager->m_paramsReverb.fHighFreqRatio //
4 . 3D
가
g_pFXManager->m_pReverb->SetAllParameters(
    &g_pFXManager->m_paramsReverb );

```

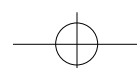
```

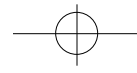
DirectSound 가
3 : 가 가
Direct Sound 가 가
: 가
: 가
가
3D
< > 가
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