

Developing Next-Generation Games with Flash 11

Speakers:

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frima



ICEFIELD
3D ENGINE

GDC
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Game Developers Conference® Online
October 10-13, 2011 | Austin, TX
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CRYISIS



UNCHARTED 2
AMONG THIEVES



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More Than a Year





NEZEMA



Deferred Lighting



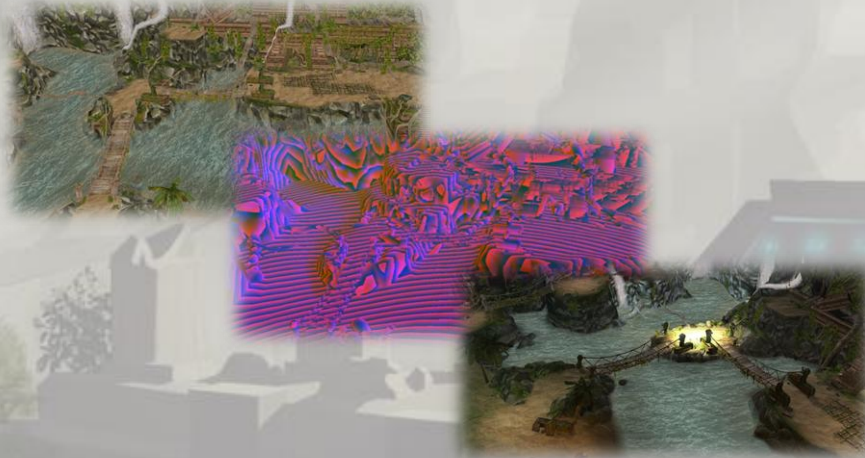
S.T.A.L.K.E.R



Killzone 2

Technique

- Render all lights to a light buffer
- Apply the light buffer on the back buffer
- MRT
 - Depth
 - Normal
 - Specular



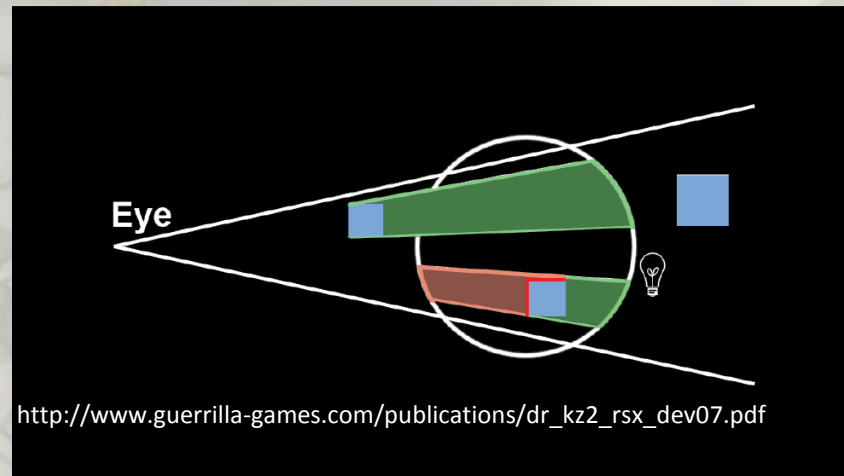
Flash

- We do not have MRT
 - Must use a single 8-bit texture
 - Normal and depth encoding

Red	Green	Blue	Alpha
Depth	Depth	Normal	Normal

Flash

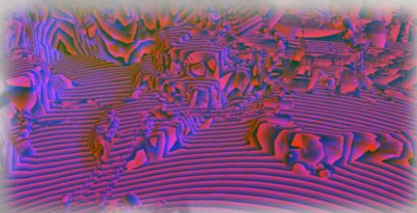
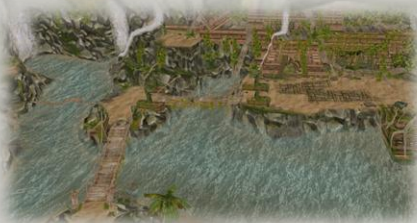
- Stencil optimization is important



- Stencil testing is also available in Flash 11

Technique Overhead

- Render all object with encoding
- Render two sphere for each light

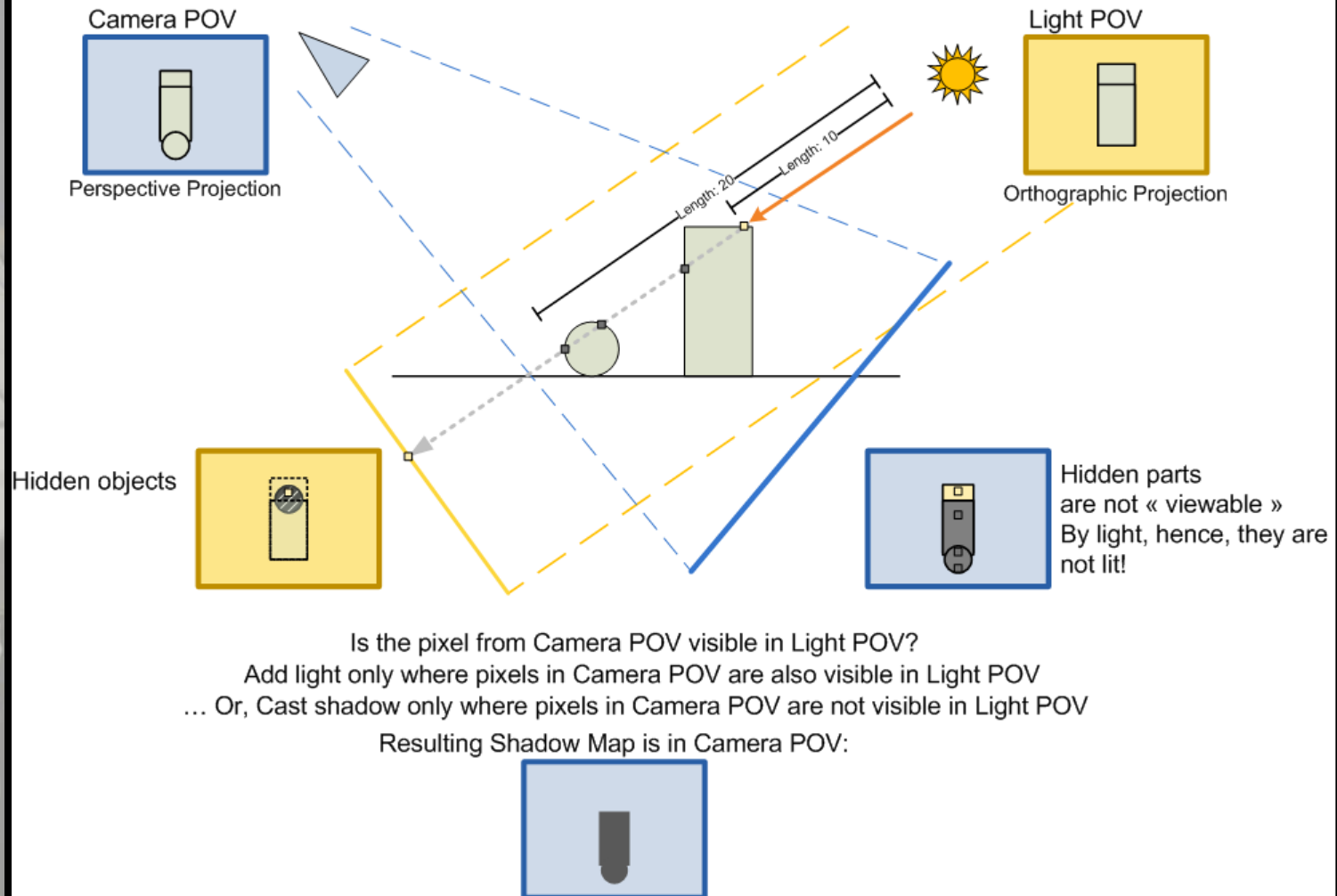




Shadow Mapping



Shadow Mapping



In Flash?

- context3d.setRenderToTexture(**DistanceFromLight**, aUseDepth,aAliasing);
- context3d.clear();
- Render scene from directional light and write depth
- context3d.setRenderToBackBuffer();
- context3d.setTextureAt(0, **DistanceFromLight**);
- Render scene, compare depth and apply shadow

Adobe Flash Player 10

Fichier Afficher Contrôle Aide



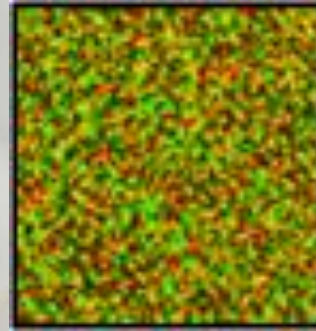
Adobe® Flash® Player 10 (32,64-bit) (Creative™) (64-bit)



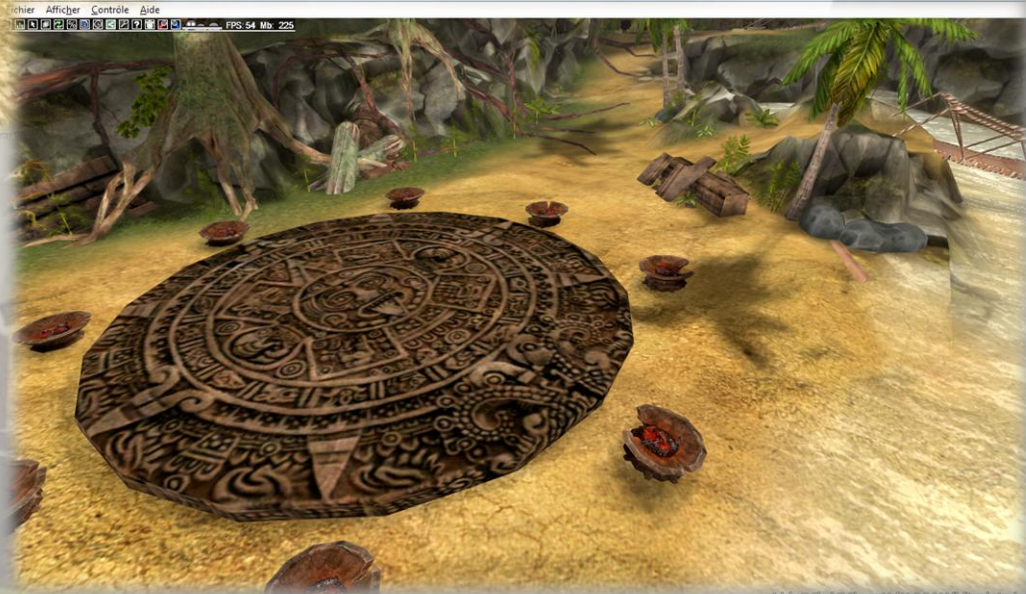
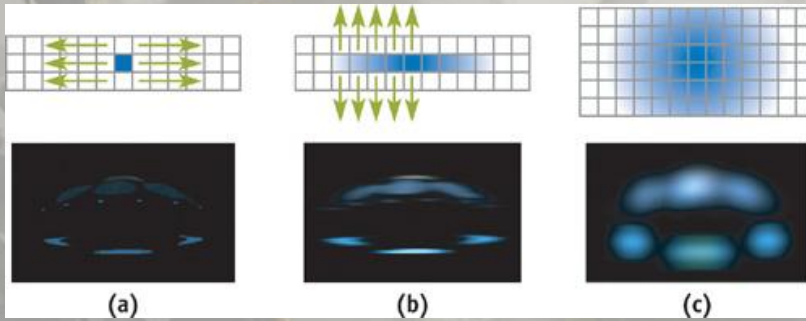


Adobe® Flash® Player 11 (11.0.0.144d) (Incubator build)

Finding Next-Gen CryEngine2 [Siggraph07]



GPU Gems Convolution Blur

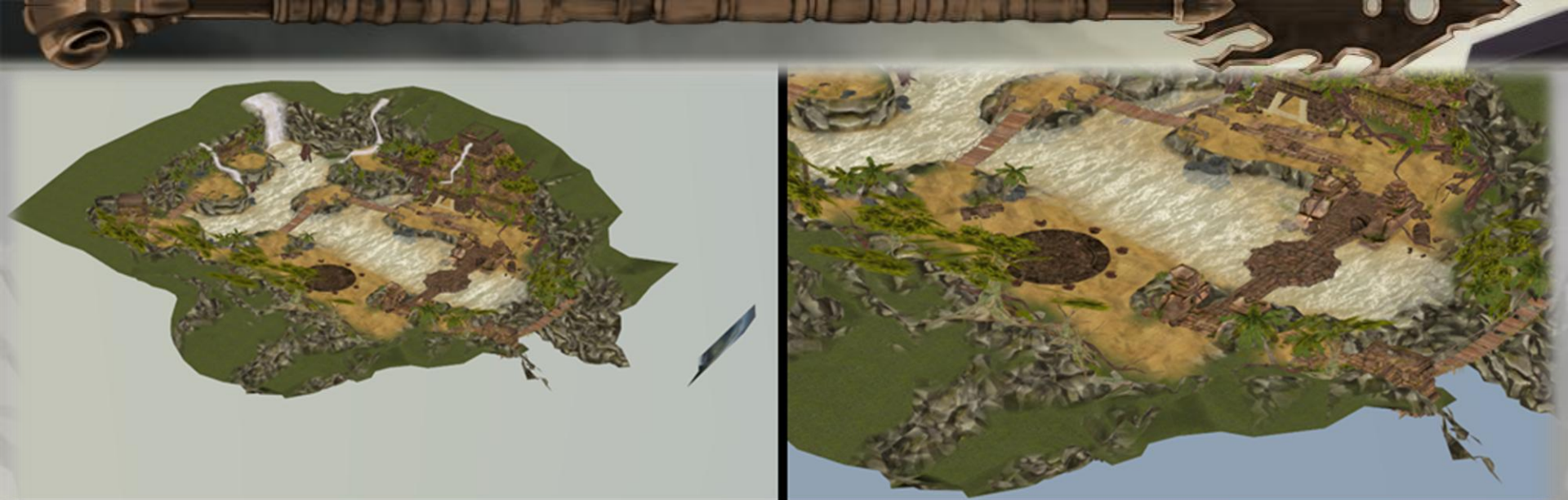






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50m

20m



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50m

20m



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Cascade Shadow Map

```
_context3D.setScissorRectangle(new Rectangle(300, 100, 360, 240));
```







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SSAO off





SSAO on





SSAO



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Screen Space Ambient Occlusion

- Requirement
 - Depth
- Technique
 - Sample multiple times from depth
 - Determine which pixels are occluded

Uncharted 2: HDR Lighting

John Hable
Naughty Dog



NAUGHTY DOG



Adobe® Flash® Player 31 (11.0.0.144) © 2010 frima



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SSAO Comparison

Frame Overview

Details

Texture

State

Shaders

Experiments

Pixel History

API Log

Note: The sum of the selected erg metrics will not equal the total frame measurements. See help for more information.

Metric	Old Value	New Value	Delta
<input checked="" type="checkbox"/> Main	200 Instructions	163 Instructions	
... GPU Duration (Microseconds)	895.2 (890.3 to 902.7)	1 105.2 (1 099.4...	
... PS Duration (Microseconds)	700.0 (695.9 to 700.4)	897.2 (876.3 to ...	
... VS Duration (Microseconds)	12.1 (5.9 to 17.9)	2.9 (0.0 to 9.6)	
	Technique 1	Technique 2	
		0.120 ms slower	





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Automatic Mapping



NWN2 MODS
NWN2MODS.COM

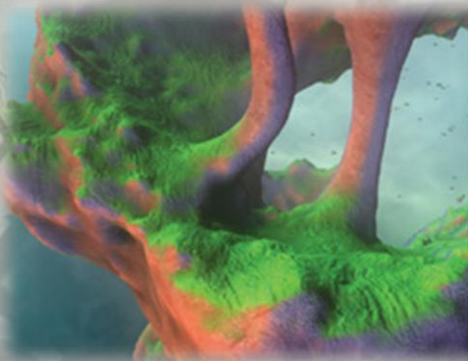
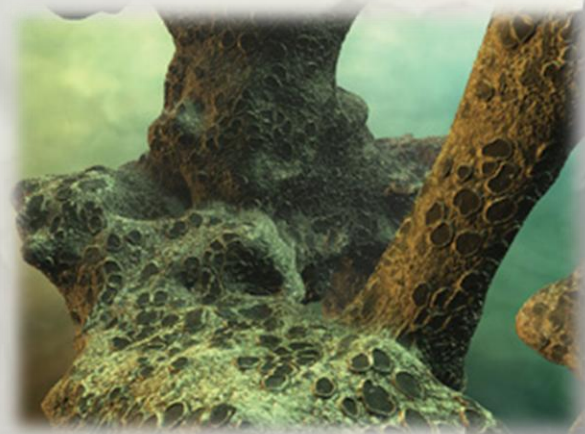


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Triplanar Texturing

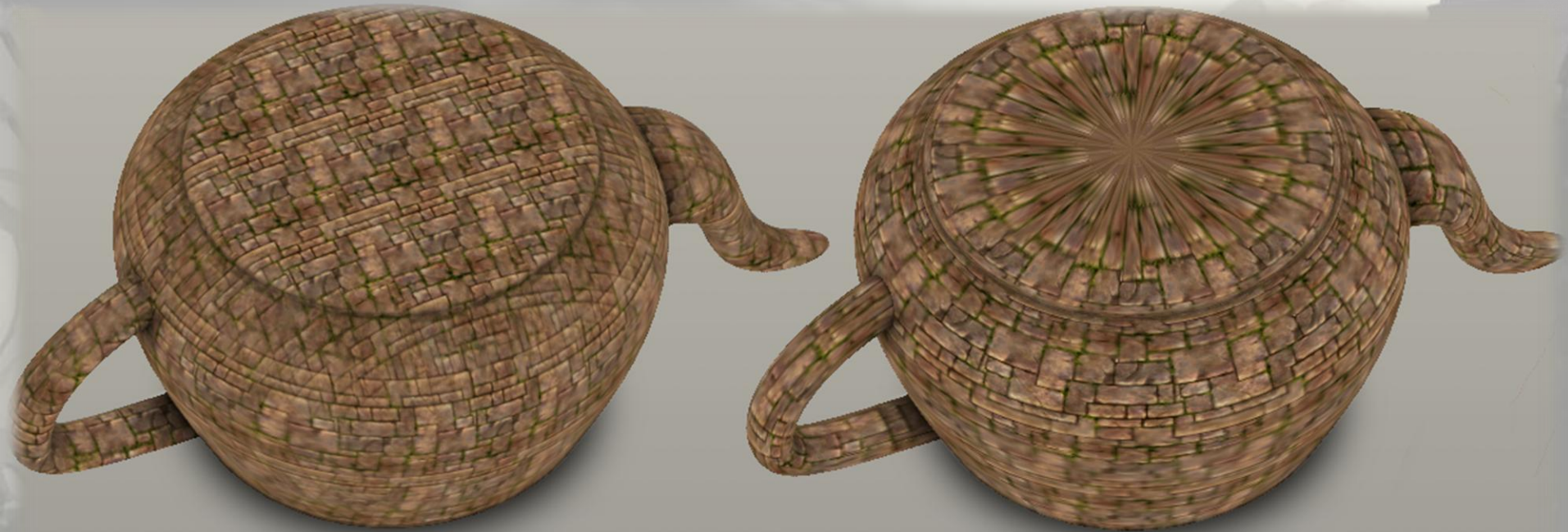
- Nvidia
- Tiled UV based on vertex position for each axis
- Albedo and normal



Triplanar Texturing

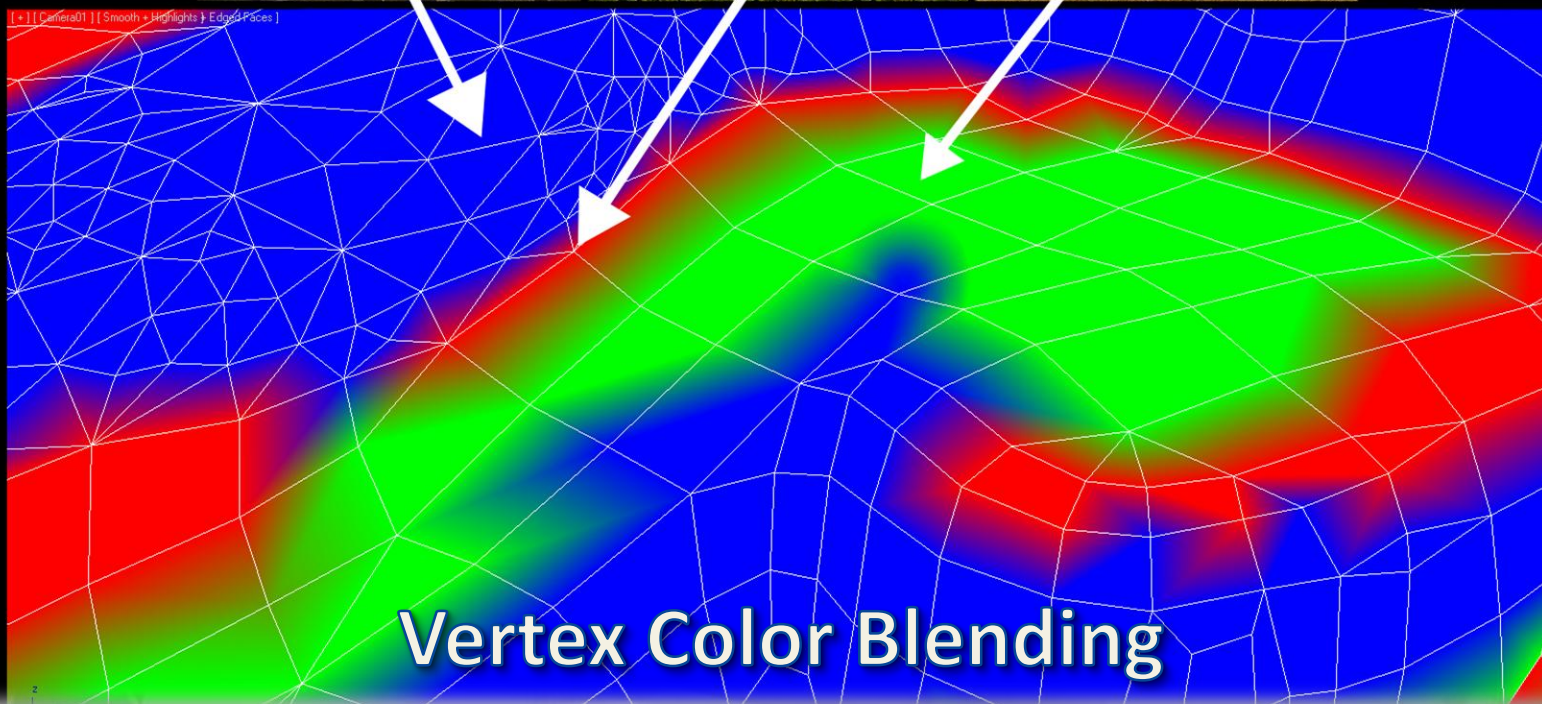


Triplanar Projection



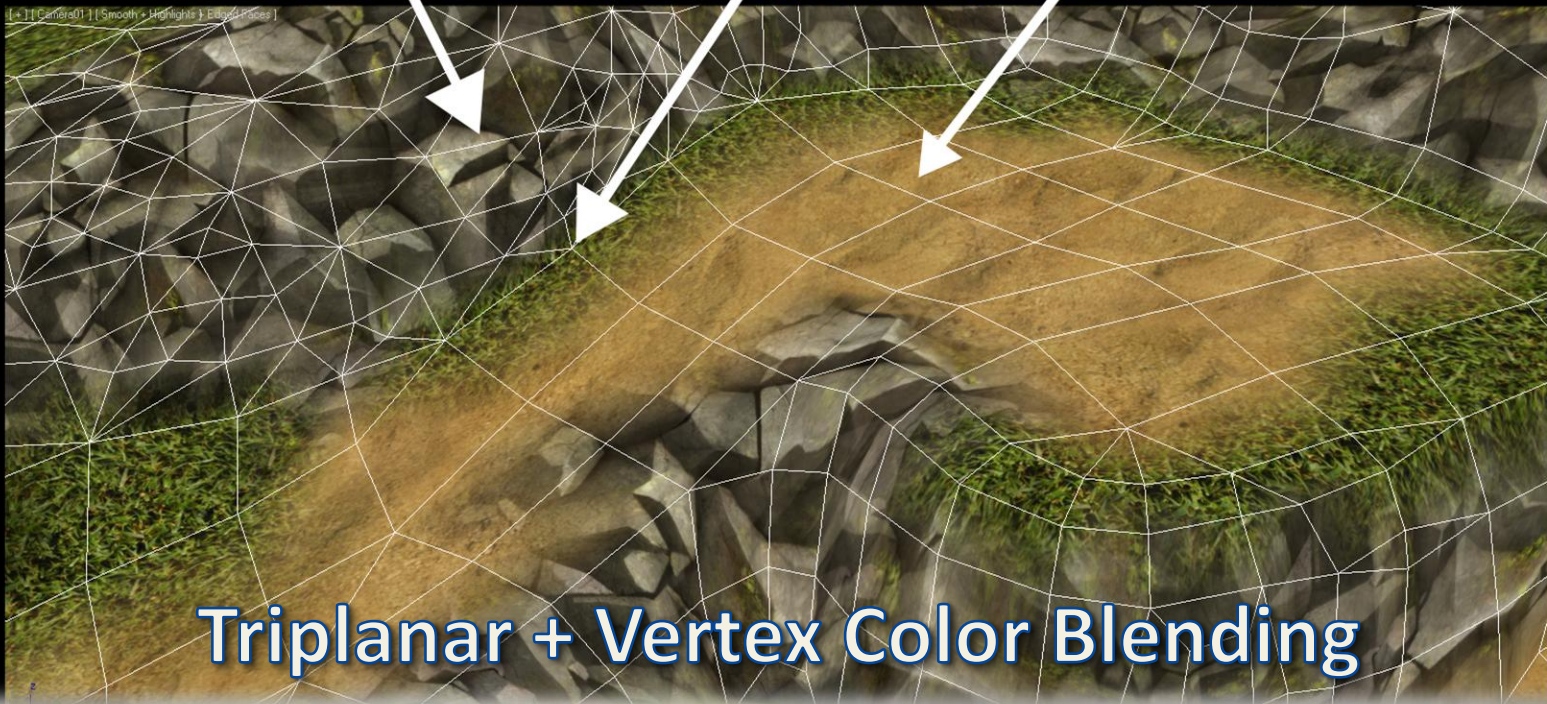
Simple UV Unwrap





Vertex Color Blending





Triplanar + Vertex Color Blending





Flash

- Shader with a lot of instructions
- Lots of sampling
- GT8600: 3 ms
- Radeon HD 2400: 1.2 ms

2D UI



INVENTAIRE

ARMES

TENUE

TENUE NIVEAU 2

AIR 70sec

ARMURE 5%

POINTS

1

CREDITS

7 900

TS CLE

KIT DE SOIN MAX

Soin médical restaurant toute la santé.

Parcourir [Entrée] Choisir

GRO30-B INTENSE
GUARDIAN

Damage 177
Accuracy 94.9
Fire Rate 7.7

Hold your ground... Forever.
+50% Critical Hit Damage
+16 Ammo Regeneration
+50% Reload Speed

TEDIORÉ

12

0198567

Pipe 1 clear: ☐
Pipe 2 clear: ☐

TEDIORÉ

556
91.3
1.9

[E] PICK UP

1257
685

N NE

LV 40 PLAGUEBEARER

2 / 114



Interface

- Pro
 - It's native!
 - Toolset
 - Multithreaded rasterizer?
- Cons
 - Not GPU-accelerated.





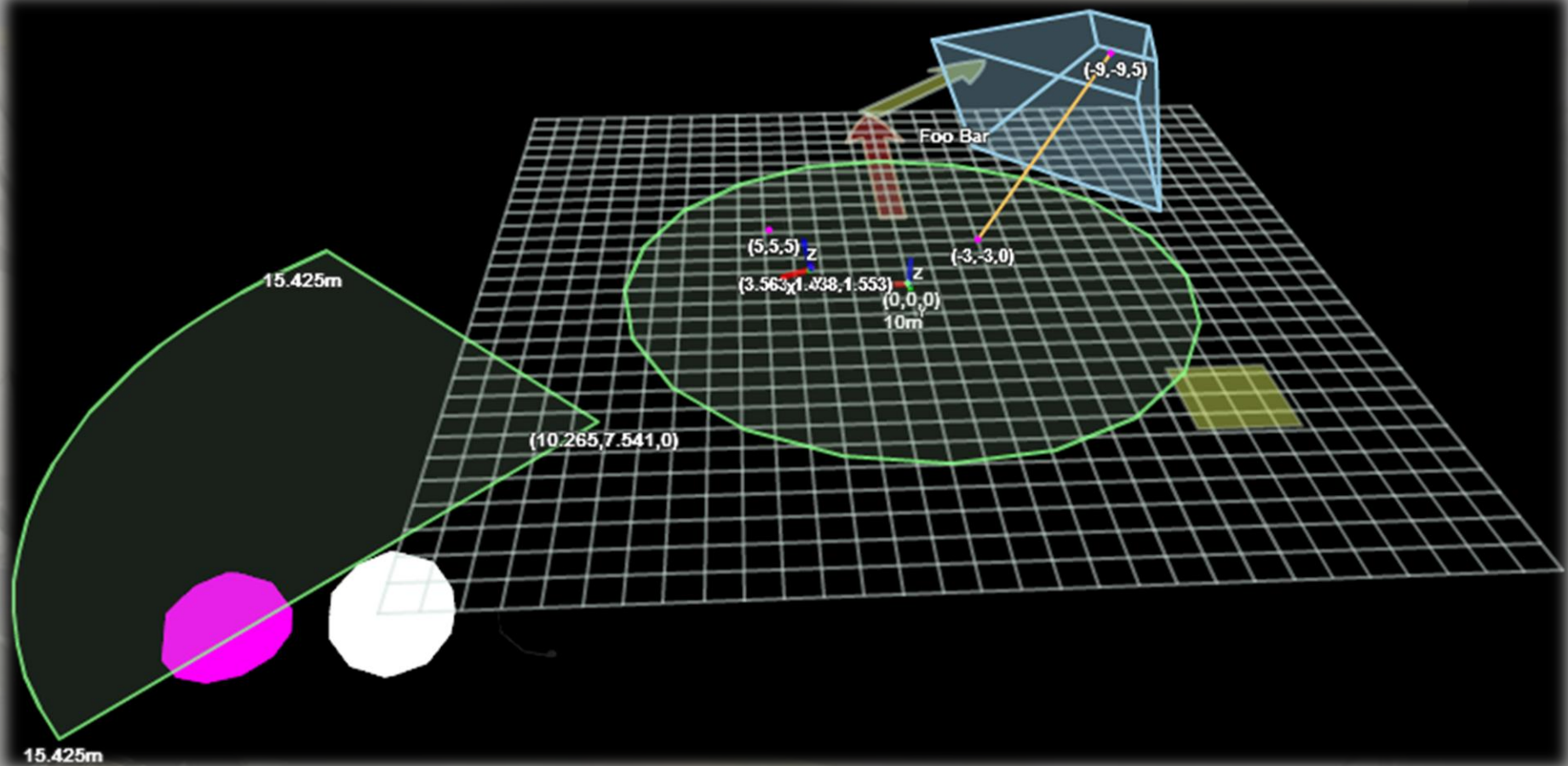
++2D UI

- Complementing Flash 11 3D
- Technique
 - Projecting 2D elements in the scene
 - Keeping mouse events
 - Keeping vector animations and blends
 - Native text rendering
 - Game design & art helper tools
 - Easy to integrate, debug Minimal Components
- Result in Flash
 - Final





Helpers





Flash CPU

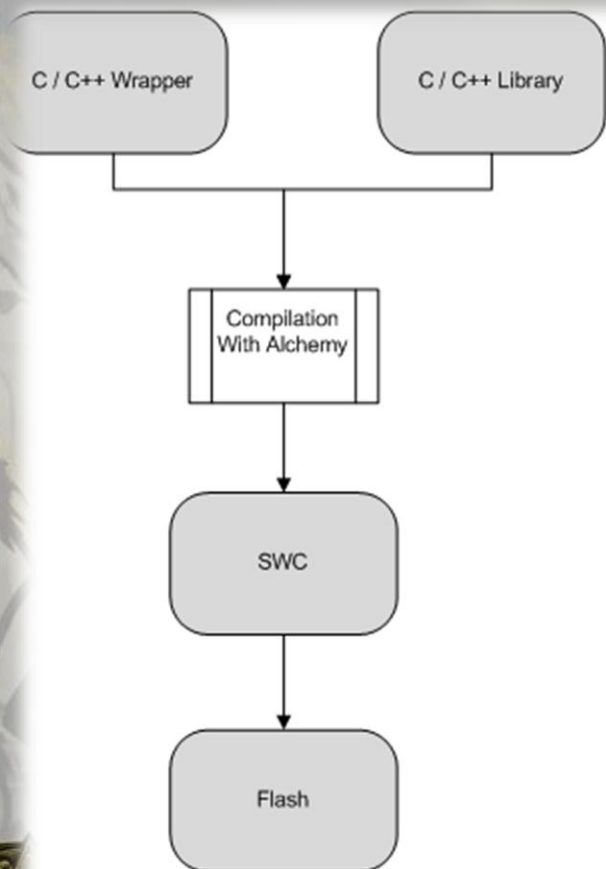
- Problems:
 - Single-threaded
 - Slow Data access
- How
 - Fast memory opcodes
 - Azoth
 - Easy to debug (Breakpoints)
- Where
 - Scene partitioning
 - Particle transformation



Alchemy

- Alchemy allows C and C++ code to run in the ActionScript Virtual Machine (AVM2).
- The C/C++ code is converted to AS3 using a special compiler, and then built into a SWC.
- This enables the porting of several existing solid and proven libraries.
- The compiler also performs a lot of optimization to make the code run faster by using fast memory access.

Alchemy Flow



```
package
{
    import comodule.PyroWrapper.CLibInit;
    import com.frimastudio.icefield.entity.Entity3D;
    import com.frimastudio.icefield.SceneRenderer;

    public class LibExample extends Entity3D
    {
        private var mloaderPyro:CLibInit;
        private var mPyroShell:Object;

        public function LibExample()
        {
            mloaderPyro = new CLibInit();
            mPyroShell = mloaderPyro.init();
            mPyroShell.CreateParticleLibrary();
        }

        override public function Render(aRenderer:SceneRenderer, aRenderPass:uint) : void
        {
            mPyroShell.Render(aRenderer);
        }

        override public function Update(aTimer:Number) : void
        {
            mPyroShell.Update(aTimer);
        }
    }
}
```


Adobe Flash Player 10

Fichier Afficher Contrôle Aide



Adobe® Flash® Player 11 (11,0,0,144d) (Incubator build)



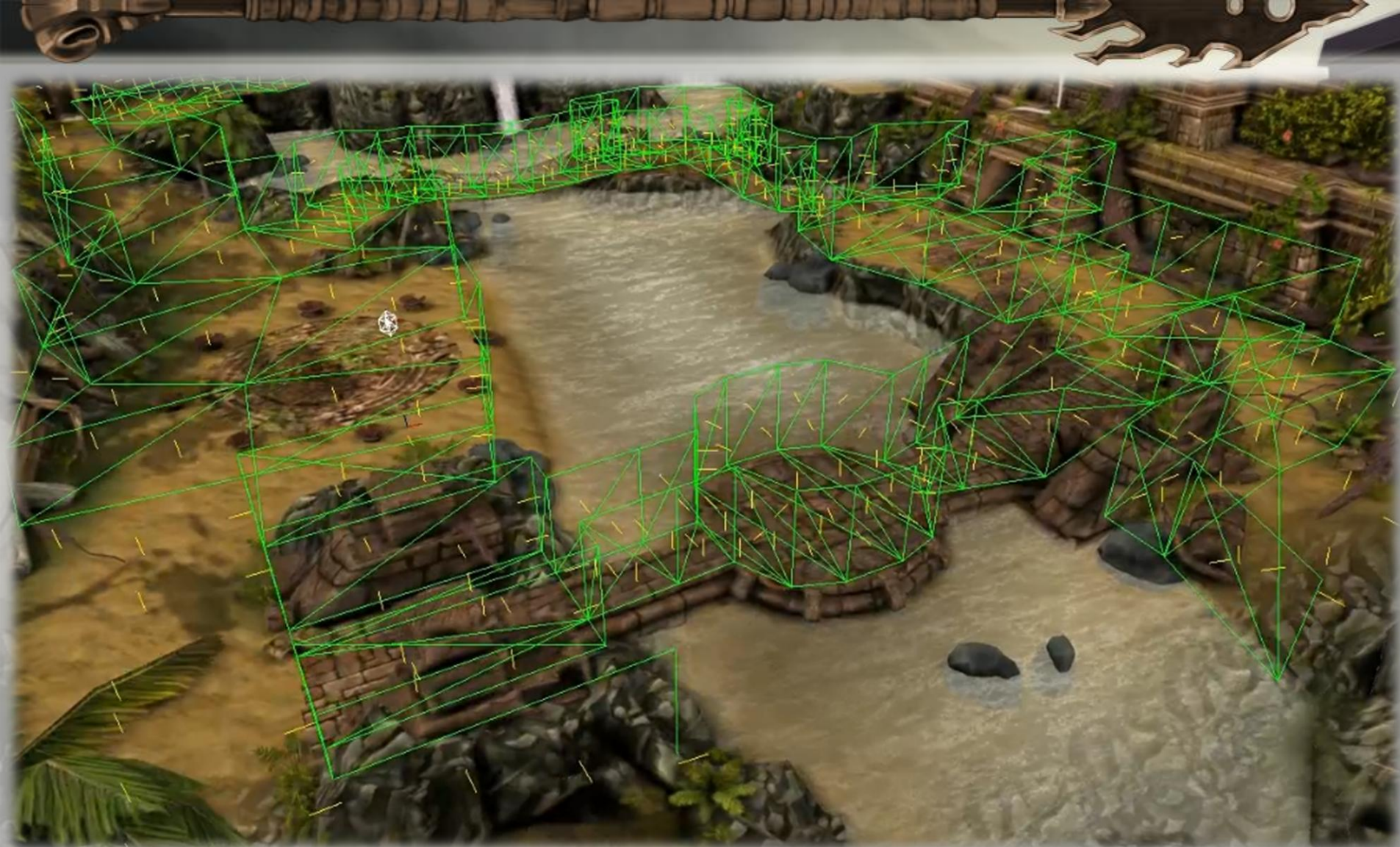
What is Bullet Physics

- Physics engine
- Simple
 - Dynamic and static volume and mesh
 - Apply force and impulse
 - Generate collision callback
 - Character controller
- But also
 - Dynamic constraint
 - Clothing
 - More...

Bullet Physics

- Open Source
- Who uses Bullet?

Games	Movies	Software
<i>Grand Theft Auto IV</i>	Megamind	Blender
<i>Red Dead Redemption</i>	Bolt	Softimage
Free Realms	2012	Irrlicht



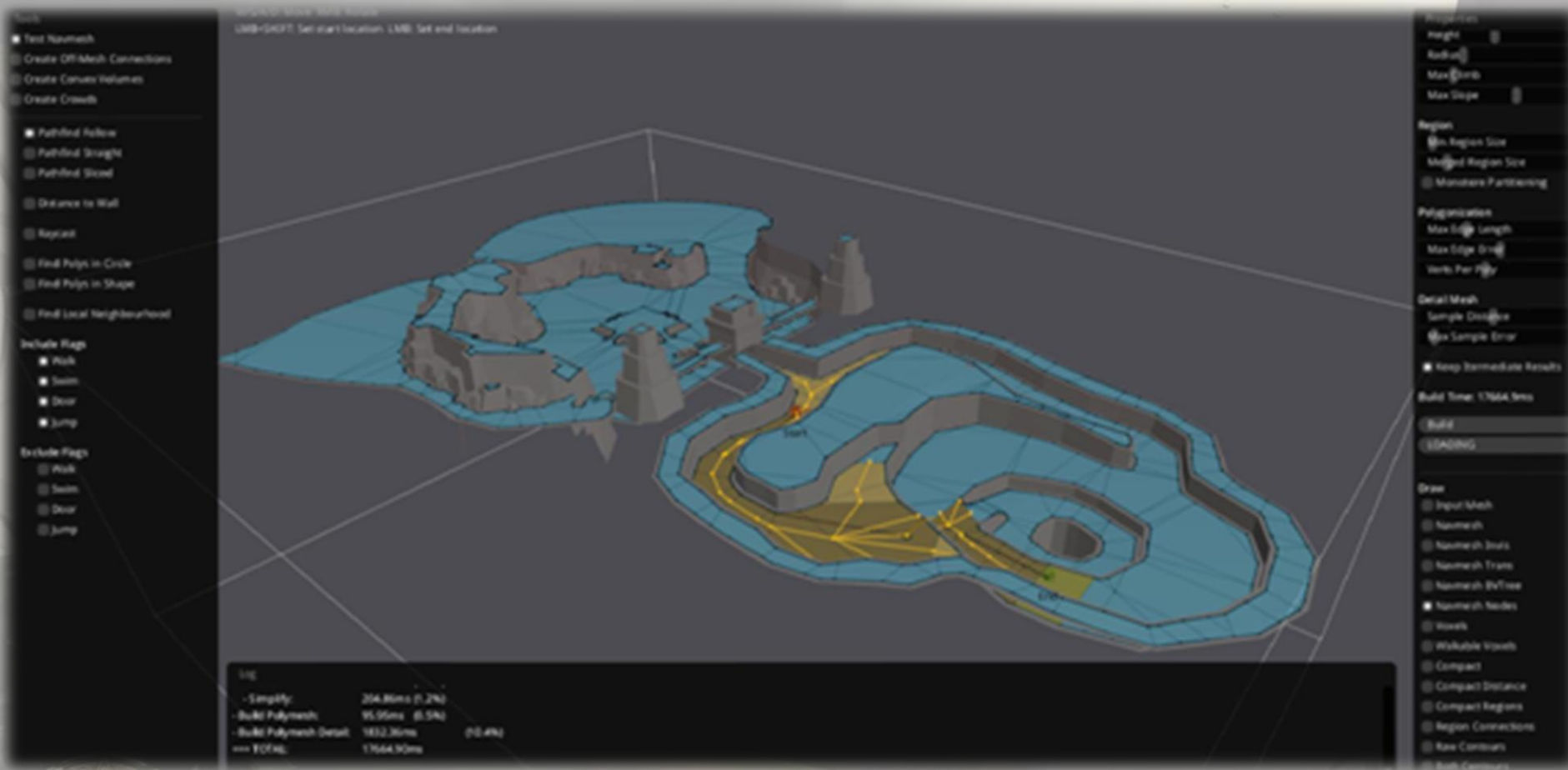
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Recast Navigation





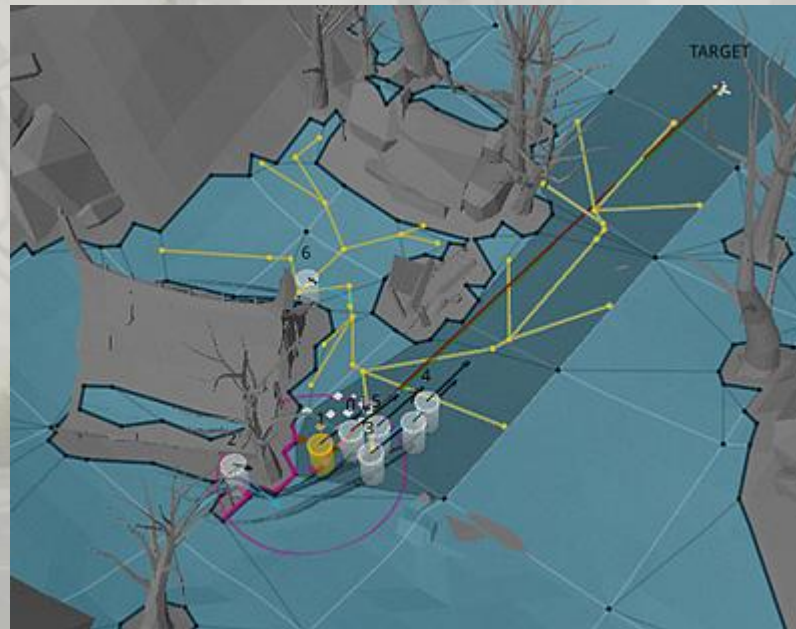
Recast Navigation





Detour / Detour Crowd

- Detour is a pathfinding system
- It use Recast's navigation mesh
- It Manages collision, avoidance, separation, etc.



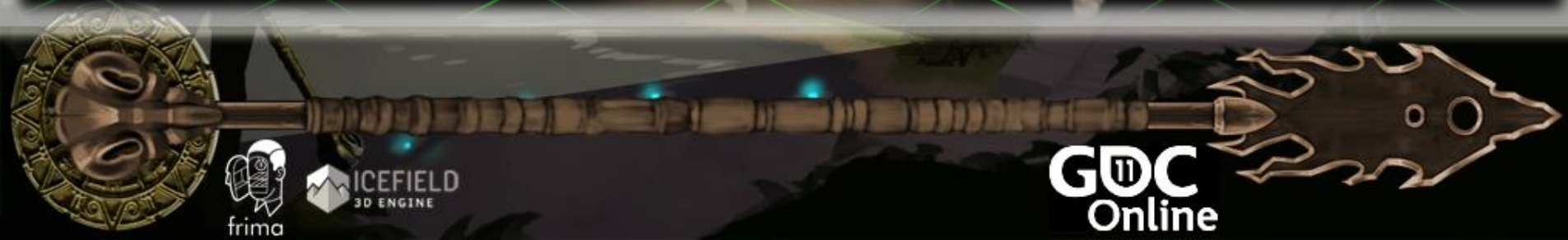
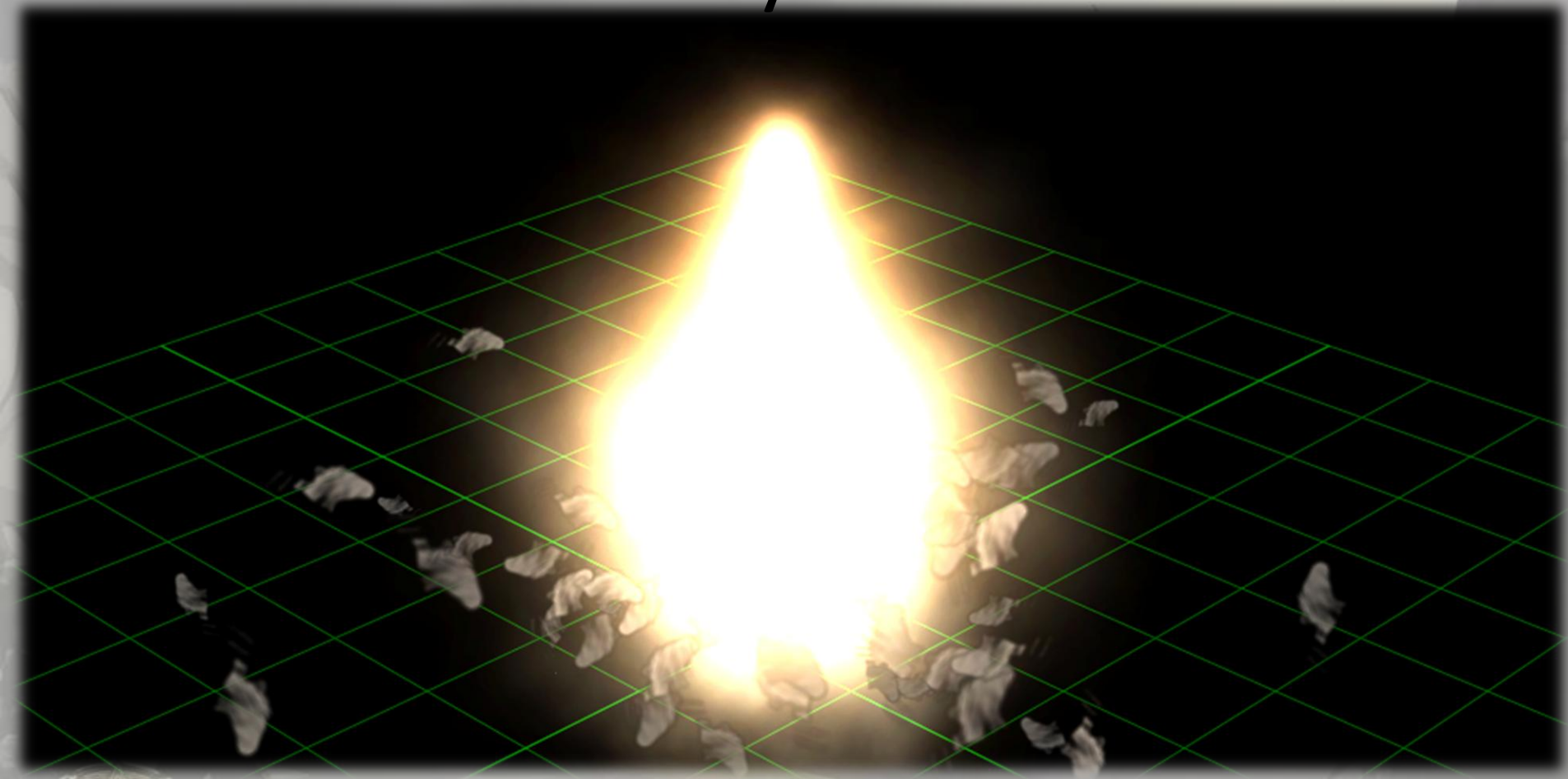


Neema

Chat Goes Here



Pyro



What is Pyro

- It's user friendly
- It manage properties such as:
 - Life, number, size, velocity, weight, spin, motion rand
 - Wind, Angular velocity, attraction, zoom, visibility, tint
 - Sub-Emitters and a lot more!
- Support variation over time of properties
- « Per title » License







From Flash to Flash 3D

- There is no such thing as Display List Management
- There is no time line
 - No clip animation
 - No script on frames
 - No label and dispatch
 - No gotoAndPlay()
- No library
 - No exported symbol
 - No centralized asset list
- Testing collision is a bit more difficult than the `DisplayObject.HitTest()`



From Flash to Flash3D

- Several 3D frameworks already exist for Flash 11:
 - Alternativa / Minko / Flare3D / Away3D /
 - Adobe Proscenium
 - Frima Icefield.
- There are also several existing Flash helpers
 - flash.geom.Utils3D
 - flash.geom.Vector3D
 - flash.geom.Matrix3D
- Concepts you will need to learn:
 - 3D space coordinates
 - Object transformation using Matrix3D and Vector3D
 - Shaders open new door to wonderful effects



From 3D to Flash 3D

- FP11 targets desktops, tablets and mobiles!
 - API limited to OpenGL ES 2.0 definition
 - Limit of 200 shader instructions
 - Limited shader instructions (no branching, no MAD, etc.)
- Overhead on Change Target (20%)
 - Auto MipMapping
 - Loss of depth
- Anti-aliasing only on BackBuffer
- Only support 8-bit textures (HDR)
- No MRT

From Anyone to Flash3D

- Single-threaded
- No mouse lock (FPS)
- Limited keyboard in fullscreen
- Streamable content (Web-based)
 - Files download weight
 - Load only when needed
 - Limited browser cache
 - Async resource loading
- Can use the regular Flash 2D interfaces

NZEMA





FAQ

- Why not using Unity ?
- What about HTML5 ?
- Alchemy is still beta, would you consider using it in production?
- Are you single ?

Contact

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