

USING GRAPHICS HARDWARE

- ① What does the hardware do?
- ② How does it do that?
- ③ What can't hardware do?
- ④ What do we want to do
- ⑤ How do we map what we want to do to what we can do?

The abstractions

- Primitives
- Vertex operations (TCL) (local) (phong)
- Rasterization / Fragments / Interpolation
- Per-Fragment Computation → world-space (perspective correct)
image-space (pixel)
- Texture Mapping
- Z-buffer (order "doesn't matter")
- Other per-fragment ops
- Frame Buffer
- Blend into frame buffer
- Re-use FB (as texture, or otherwise)
 - FB reads / bus traffic issues

Implementation

- queues and caches
- fragment generation
- importance of barycentrics
- parallelism

Some tweaks:

- ordering of polygons
 - back to front (transparency)
 - front to back (culling)
- early Z / hierarchical Z
- dependent reads

↓
Ins and Outs

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What kinds of things to do?

~~low poly~~

What kinds of things can't you do directly with this?

- complex lighting
- very complex geometry / shape
- atmospheric effects
- stylized looks
- high dynamic range
- complex / specific surface lighting responses
 - view direction dependent
- global lighting effects
- non-local geometric effects heat shimmer

} motion blur / depth of field

KINDS OF TRICKS

- Texture maps to do other things
 - toon shading
- Fancy kinds of mapping
 - Bump mapping, relief mapping,
- Deferred Shading / Frame buffer tricks
- Pre-Computed Lighting
- Fancy Computation of texture coordinates
 - Decal Projection / Slide Projection
 - Environment Mapping

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Visual Effects

water

glass

hazy from heat

semi-invisibility (?) ^{Steinich}

fire / explosions

flashlights

Recursive View/ Reflectors

NPR (cell, glow, art effects)

Hair (also dynamics)

Performance

Multi- Threading

What methods do get used

Content

Procedural Textures

Destructable / Dynamic

Recursive Views

Interactive Properties

Secondary Motion

Massive Environment

Dynamic Loading

A.I.

Path Finding

Reactivity

Believable Behavior

Animation

Fluid / responsive characters

Trees Blowing / Hair

Ragdoll Physics

Authoring / Behavior

Climbable points

SOUND (spatialized)