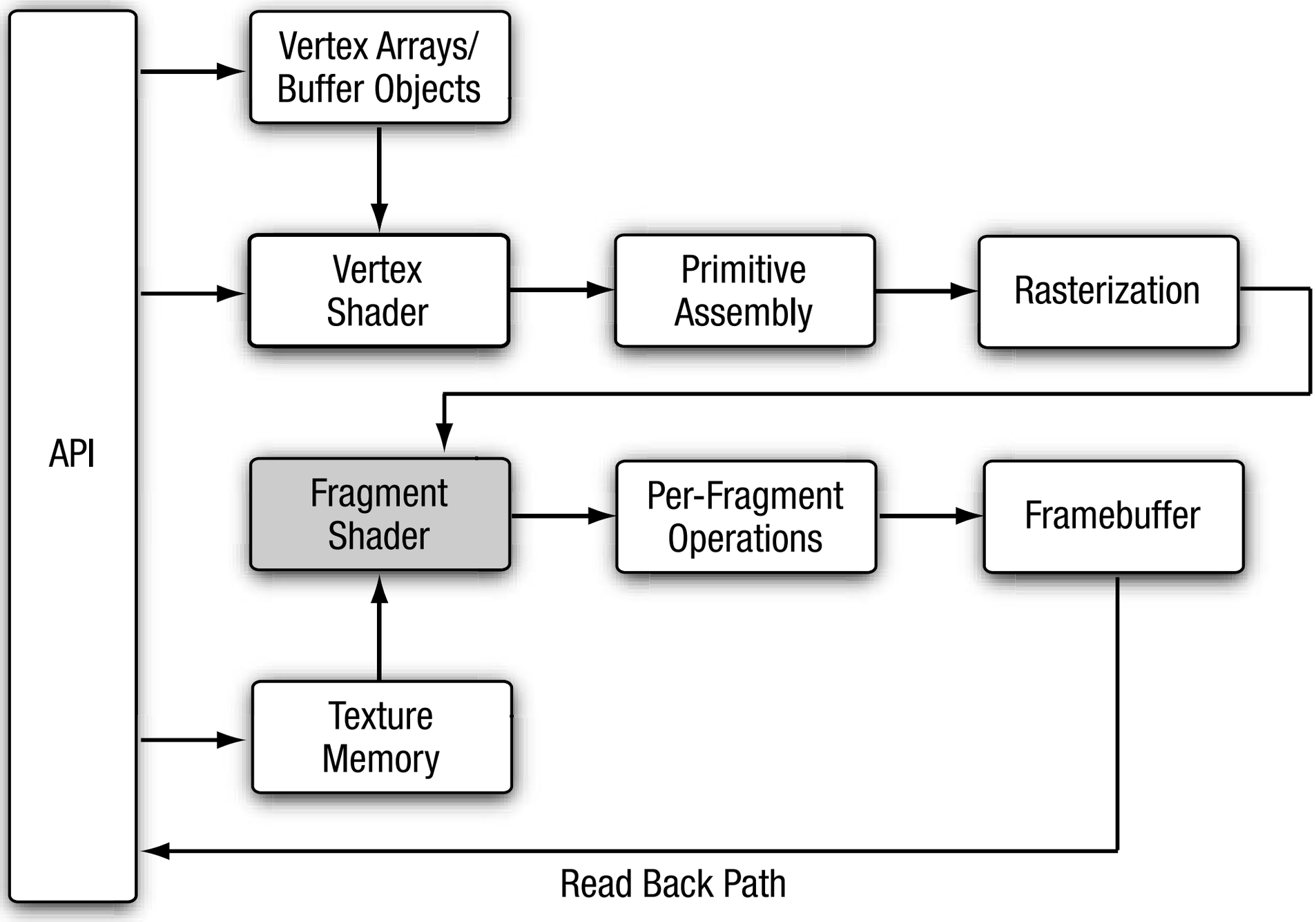
Computer Graphics

spring, 2013

Chapter 10
Fragment Shaders

Topics

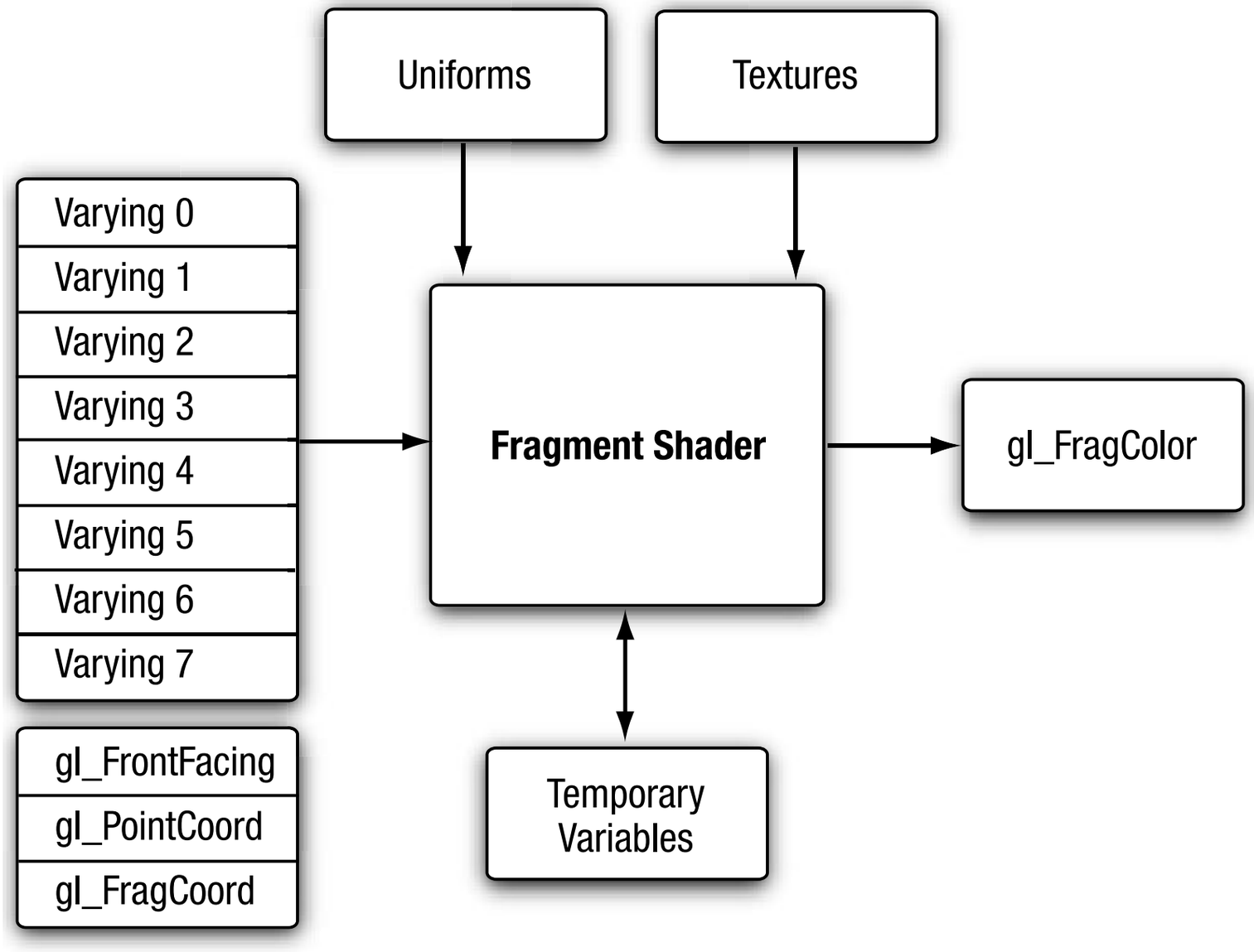
- Fixed function fragment shaders
- Fragment shader overview
- Multitexturing
- Fog
- Alpha test
- User clip planes


API
Vertex Arrays/
Buffer Objects
Vertex
Shader
Primitive
Assembly
Rasterization
Fragment
Shader
Per-Fragment
Operations
Framebuffer
Texture
Memory
Read Back Path

Fixed Function Fragment Shaders

- GLES 1.1
- Three colors to combine -- interpolated vertex color, texture color, constant color
- Limited ways of combining colors
- Can be implemented by shaders in GLES2

Fragment Shader



Built-In Special Variables

- gl_FragColor -- output. Not mandatory
- gl_FragCoord -- read-only. Window coords (w,y,z,1/w). Used to reduce shadow map aliasing
- gl_FrontFacing -- read-only. boolean
- gl_PointCoord -- read-only. Texcoord for point sprite. Used for rendering point sprites.

Built-In Constants

- gl_MaxTextureUnits
  - mediump, >= 8
- gl_MaxFragmentUniformVectors
  - mediump, >= 16 vec4
- gl_MaxDrawBuffers
  - mediump, >= 1
  - Used for MRT (multi-render targets)

Precision Qualifiers

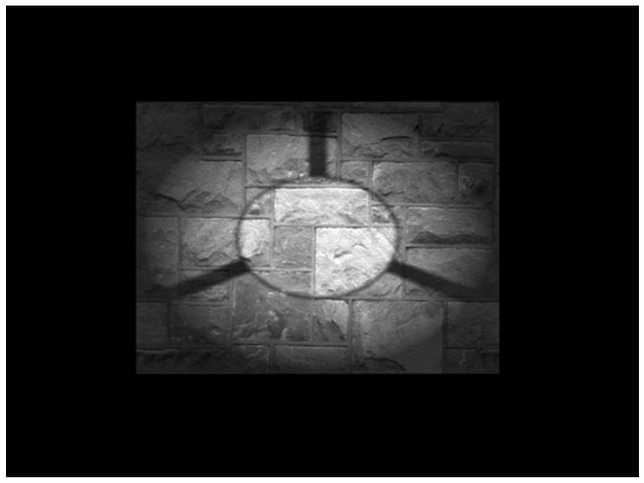
- No default precision for fragment shaders
- At least mediump supported in fragment shaders
- Almost all of the same limitations for vert shaders apply to frag shaders
  - Only difference -- indexing uniforms only by constant integral expressions (computed expressions supported in vert shaders)

Implementing Fixed Functions

- Multitexturing
- Fog
- Alpha test
- User clip planes

Multitexturing

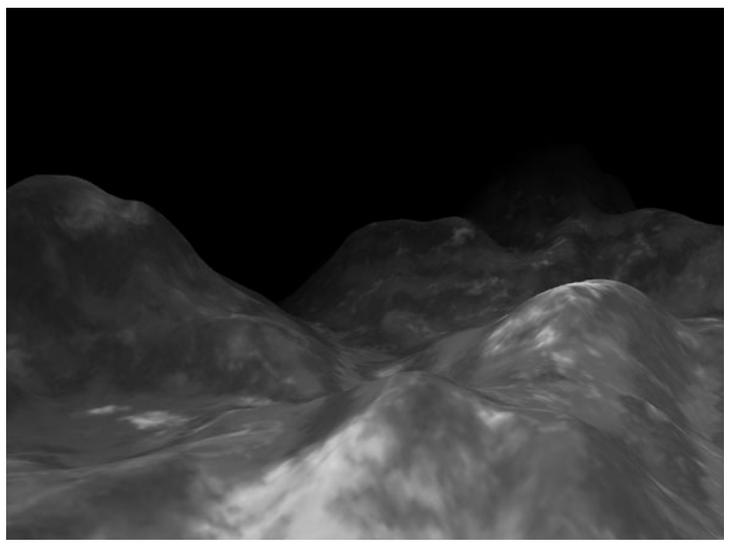
- Examples
  - Precomputed radiosity light map (Quake III)



  - Specular exponent texture (Gaussian specular, smudges)
  - Normal mapping

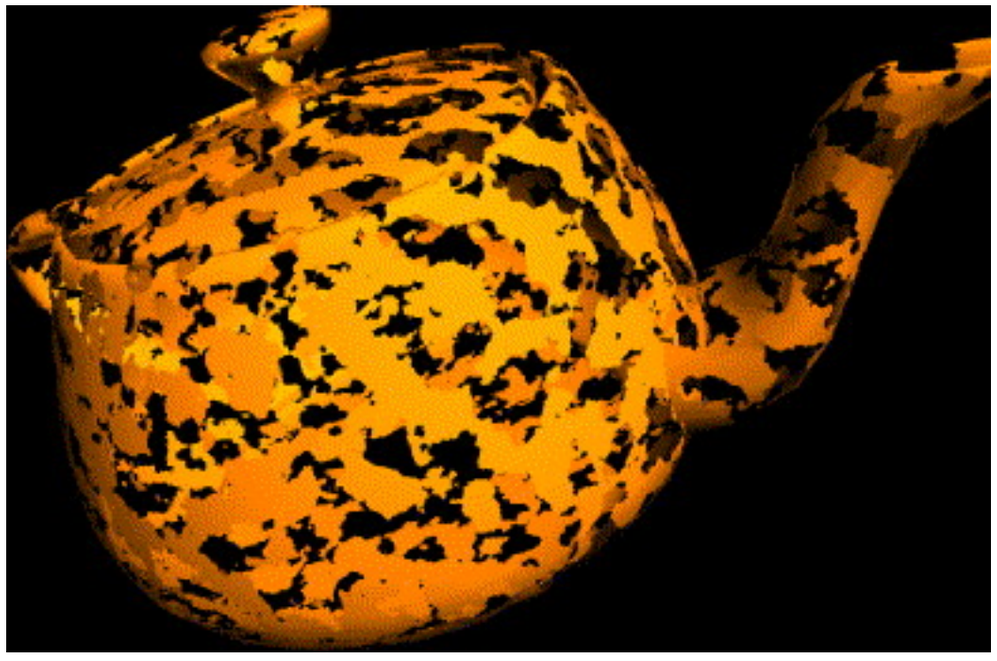
Fog

- To
  - reduce draw distant objects
  - remove “popping” of geometry
- Various effects possible



Alpha Test

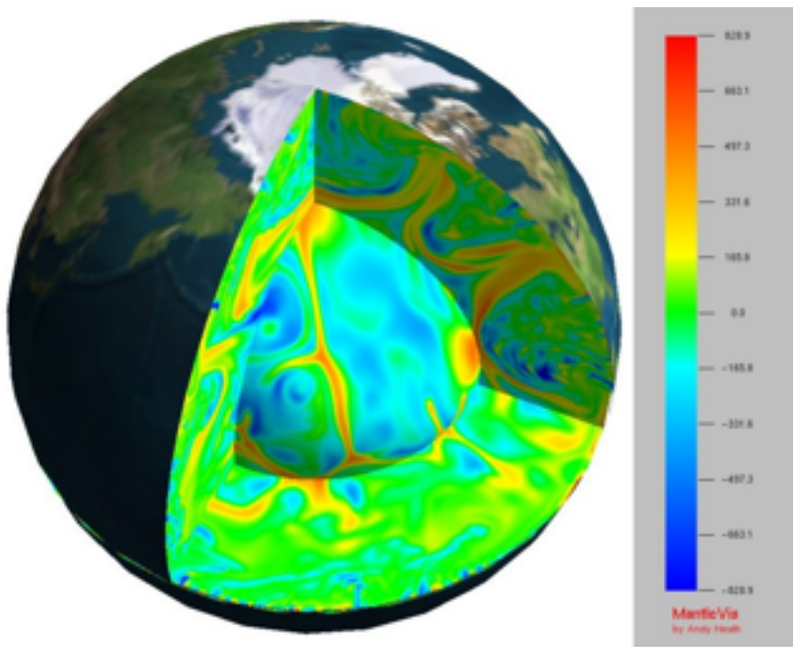
- To render fully transparent color by discarding such fragments



(image courtesy of Make Bailey)

User Clip Planes

- Discards those fragments behind the user clip plane
- The plane equation must be in the same coordinate space



(image courtesy of MantleVis)