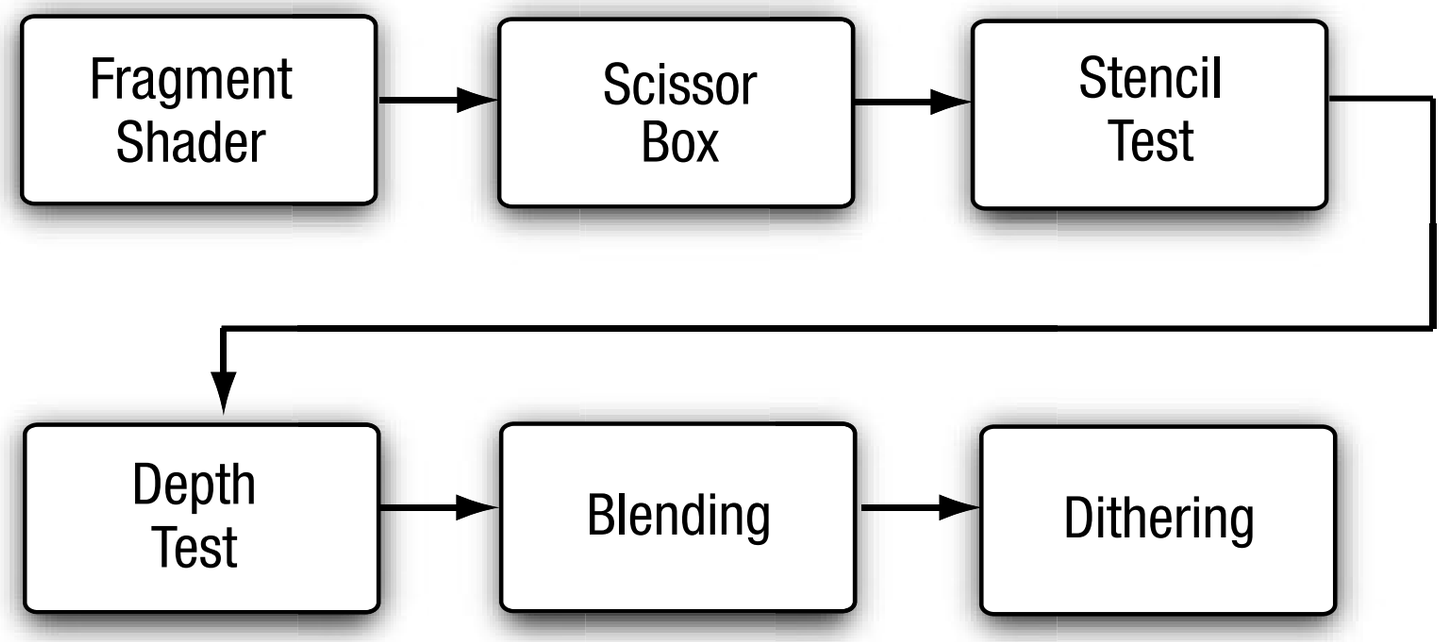
Computer Graphics

spring, 2013

Chapter 11
Fragment Operations

Fragment Operations

- Scissor box testing
- Stencil buffer testing
- Depth buffer testing
- Multisampling
- Blending
- Dithering



Buffers

- Color buffer (front + back)
- Depth buffer (>=16bpp) & Stencil buffer (>=8bpp)
  - Needs to be requested through attribs for EGL configuration

Clearing Buffers

- glClear
  - Buffers specified by a bitmask
  - Might be parallized
- Clear values set by glClearColor, glClearDepthf, glClearStencil

Controlling Buffer Writing

- glColorMask
- glDepthMask
  - Used for rendering translucent objects
- glStencilMask
  - Specifies modifiable bits
- glStencilMaskSeparate
  - Stencil mask based on the “facedness”

Enabling Fragment Tests & Operations

- GL_DEPTH_TEST
- GL_STENCIL_TEST
- GL_BLEND
- GL_DITHER
- GL_SAMPLE_COVERAGE
- GL_SAMPLE_ALPHA_TO_COVERAGE

Scissor Test

- Rectangular region in the framebuffer limiting writable pixels
- Scissor box specified by glScissor
- Enabled with GL_SCISSOR_TEST

Stencil Buffer Testing

- Per-pixel mask
- Bit test
- Stencil function specified by glStencilFunc & glStencilFuncSeparate
- Stencil operations set by glStencilOp & glStencilOpSeparate
- Refer to the sample code

Depth Buffer Testing

- For hidden-surface removal
- Depth buffer needs to be requested during initialization
- Enabled with GL_DEPTH_TEST
- Depth comparison operator set by glDepthFunc

Blending

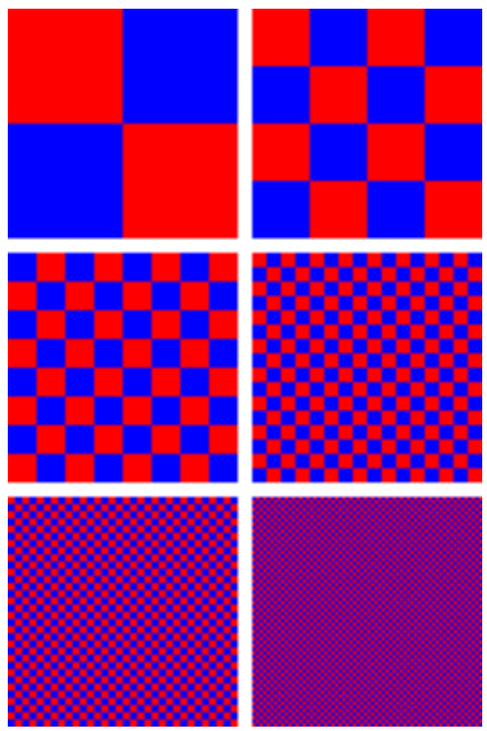
- Blending equation:

$$C_{final} = f_{source}\, C_{source}\ \mathrm{op}\ f_{destingation}\, C_{destination}$$

  - Scaling factors set by glBlendFunc or glBlendFuncSeparate
  - Constant color set by glBlendColor
  - Operator set by glBlendEquation or glBlendEquationSeparate

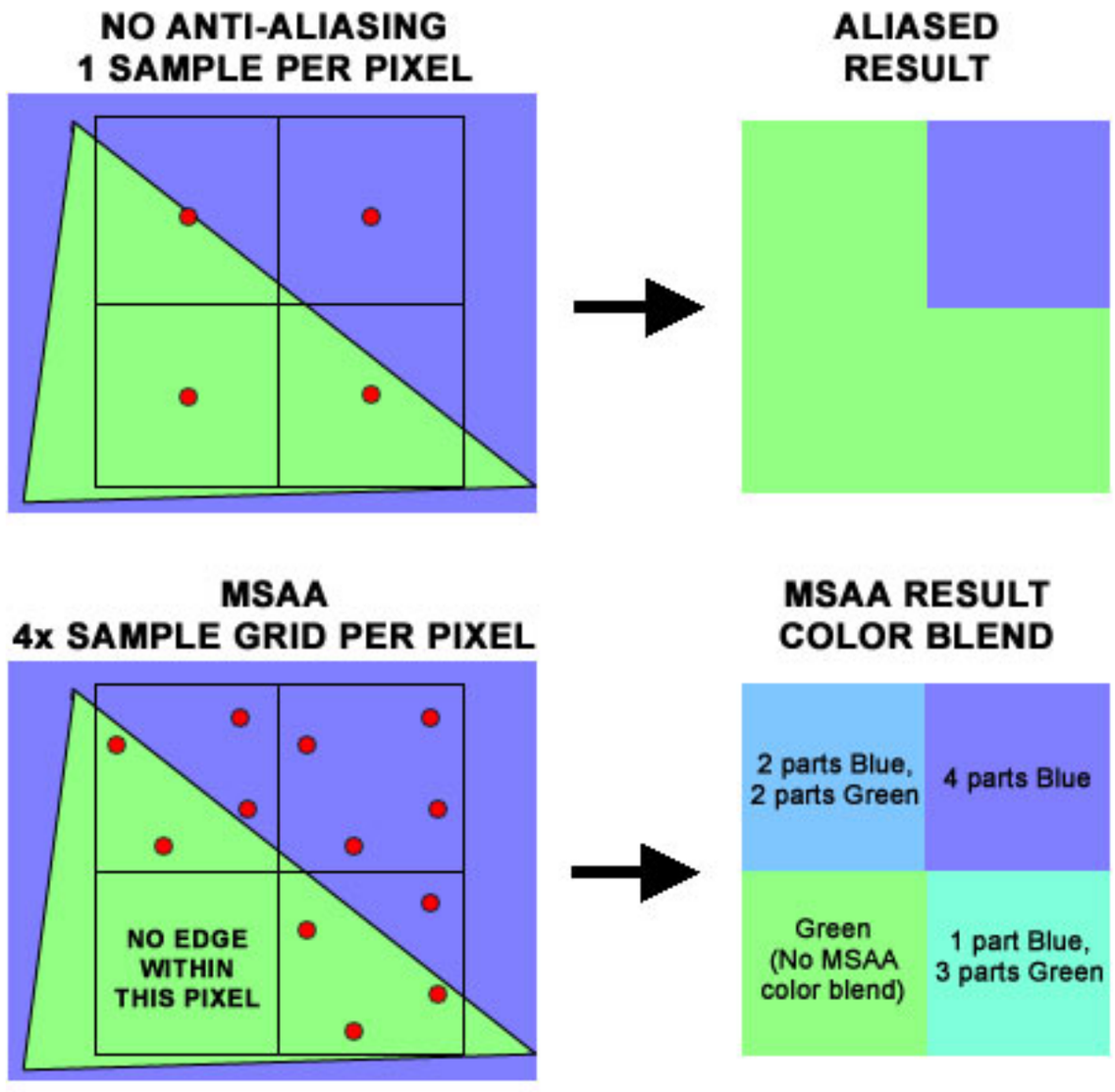
Dithering

- GLES2 doesn’t specify dithering algorithms --> implementation dependent



Multisampled Antialiasing

- MSAA



(image courtesy of Tom's Hardware)

Framebuffer Read & Write

- Color buffer can be read back, but not depth & stencil buffers
- glReadPixels
- No function to directly copy a block of pixels into the framebuffer