CSI 3200 Micro-Computer Graphics Anti-aliasing
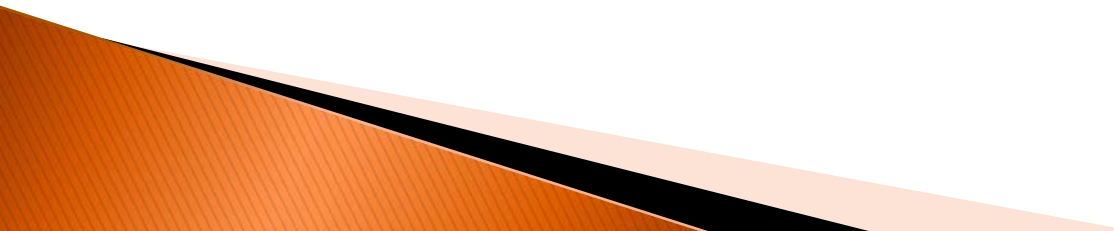
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Outline

- What is Anti-aliasing?
- Techniques
  - Super-sampling
  - Multisampling
- Pros/Cons
- Applying anti-aliasing in your scene
- Example Program
- Anisotropic Filtering (AF)
- Questions?
- Resources
- Review Questions

What is a Anti-aliasing?

- a software technique for diminishing/smoothing jaggies or stairstep-like lines
- Anti-aliasing reduces the prominence of jaggies by surrounding the stairsteps with intermediate shades of gray or color, but it also makes these lines fuzzier
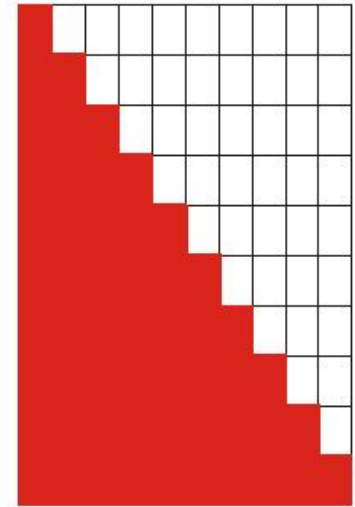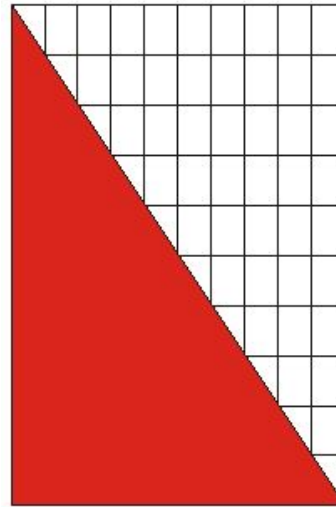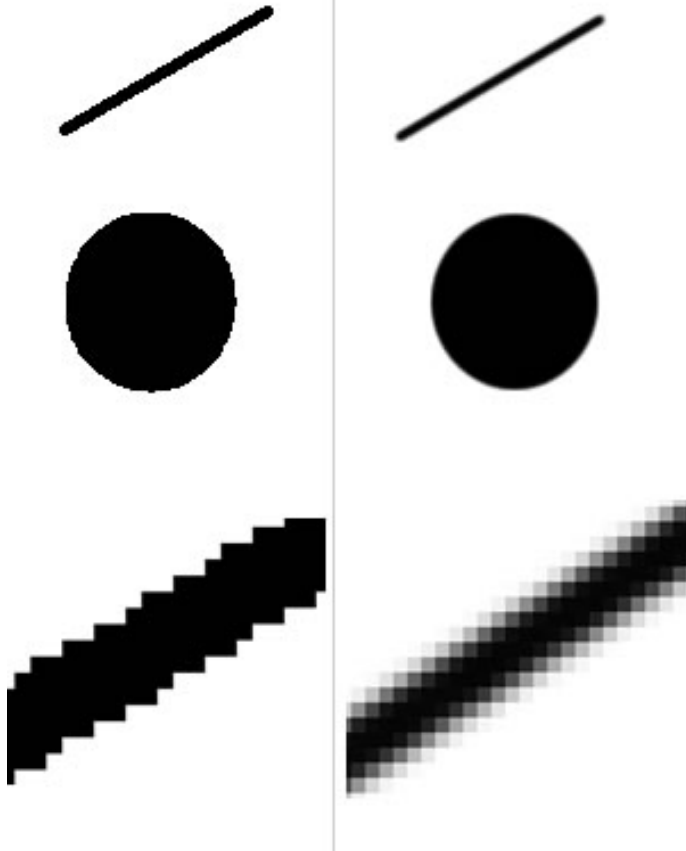
Why does jaggies occur?

- Jaggies occur because the output device (monitor and/or printer) is not high enough in resolution to represent a smooth lines
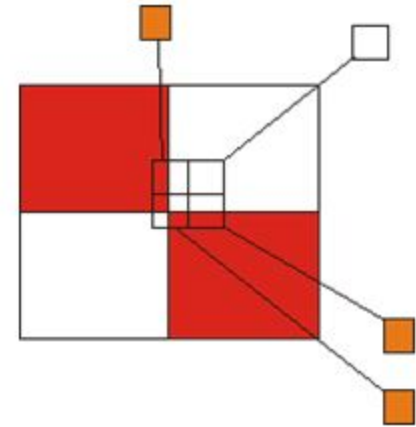
Examples

Aliased   Anti-Aliased

Alias

Anti-aliased

Anti-aliasing Techniques

- ## Super-sampling
  - ◦ taking the corners of each pixel and creating what would be the average color – By doing this you are effectively smudging the image and averaging out the color

Anti-aliasing Techniques

- **Multisampling** – a more efficient but slightly less pretty form of Anti-Aliasing
  - takes multiple samples for each pixel
  - in a fairly standard example the quincunx system takes 4 samples in the corners and 1 sample in the middle
    - each of these samples is given a weight
    - the corners are given a weight of 1/8 each and the centre sample is given a weight of ½
    - the color of the pixel is then determined by similar calculations to Super-sampling (averaging)
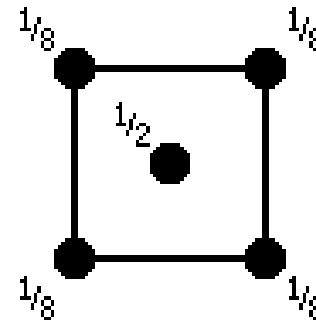
Multisampling

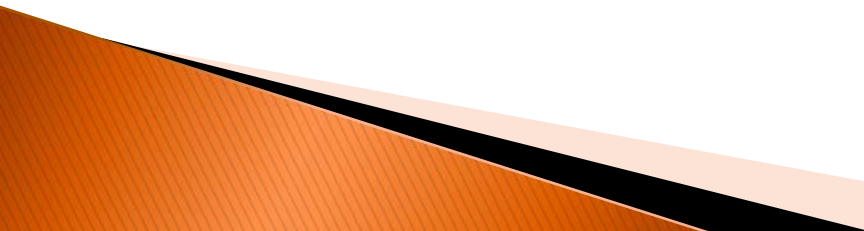2x Quincunx Anti-Aliasing
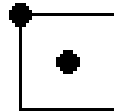
2 texels
sampled
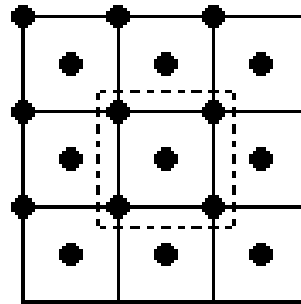
5 texels
blended

blend
weights

Pros/Cons of Anti-aliasing

▶ Pros
- ◦ Smoothes out screen fonts
- ◦ Rounded edges look to have smooth curves
- ◦ Type can be easier to read due to better quality fonts
- ◦ Games look a lot prettier and more realistic

▶ Cons
- ◦ Small text can be too blurred to read
- ◦ already sharp edges can be made fuzzier
- ◦ You can't print out Anti-Aliased text as it blurs
- ◦ Static image sizes are larger
- ◦ Games are affected by lower frame rates

Anti-aliasing and OpenGL

- You can use the **glHint()**

- GL_POINT_SMOOTH_HINT,
  GL_LINE_SMOOTH_HINT,
  GL_POLYGON_SMOOTH_HINT
  - ◦ Specify the desired sampling quality of points, lines, or polygons during antialiasing operations
- GL_FOG_HINT
  - ◦ Specifies whether fog calculations are done per pixel (GL_NICEST) or per vertex (GL_FASTEST)
- GL_PERSPECTIVE_CORRECTION_HINT
  - ◦ Specifies the desired quality of color and texture-coordinate interpolation

Example Program
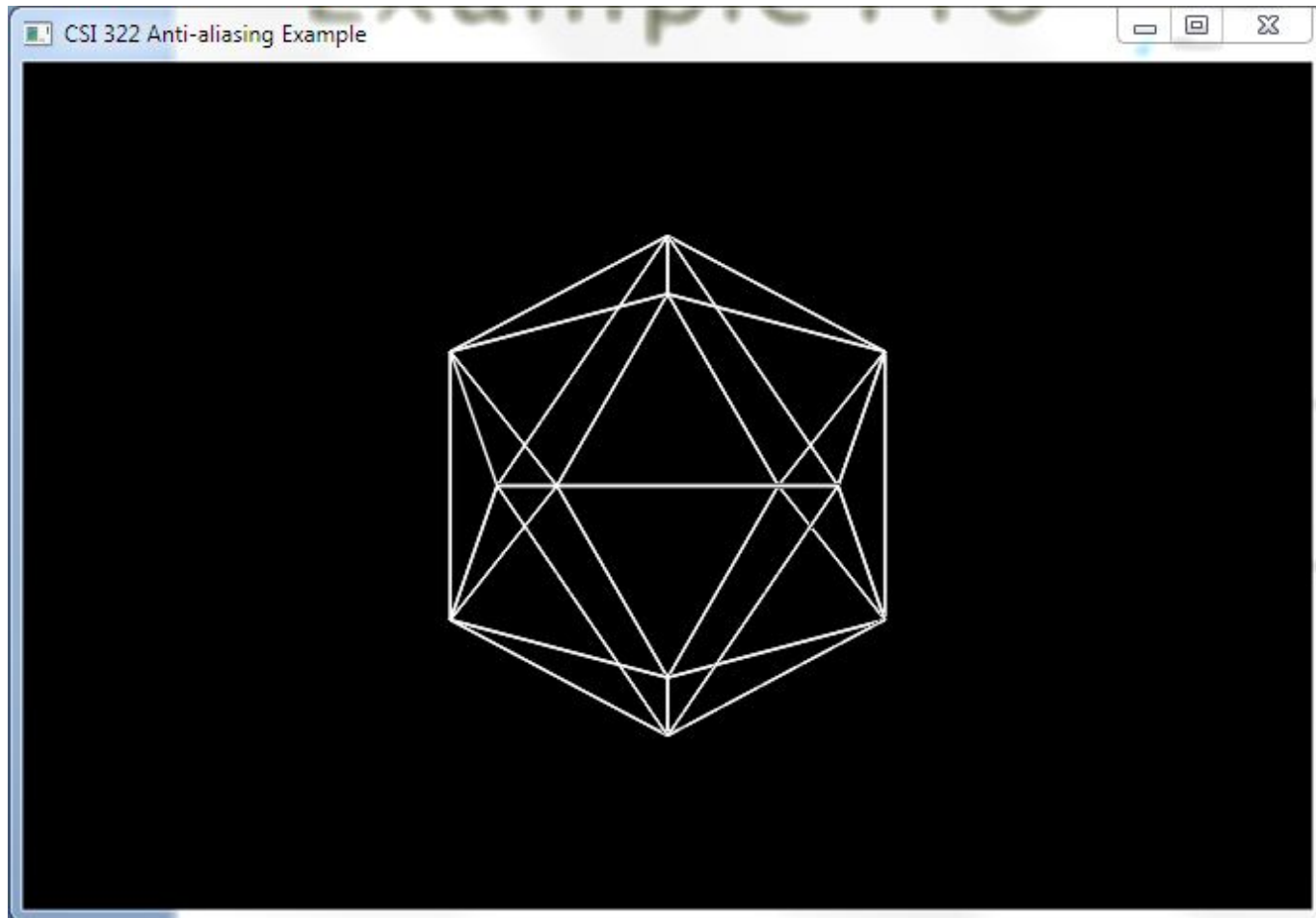
Anisotropic Filtering (AF)

▸ is a graphic algorithm of improving the surface texture of an object

Questions?

Resources

- http://www.informit.com/articles/article.aspx?p=770639&seqNum=2
- http://steinsoft.net/index.php?site=Programming/Code%20Snippets/OpenGL/anisotropicfiltering

Review Question

- What is the difference between super-sampling and multisampling form of anti-aliasing?