

# **Drawing Lines & Anti-Aliasing**

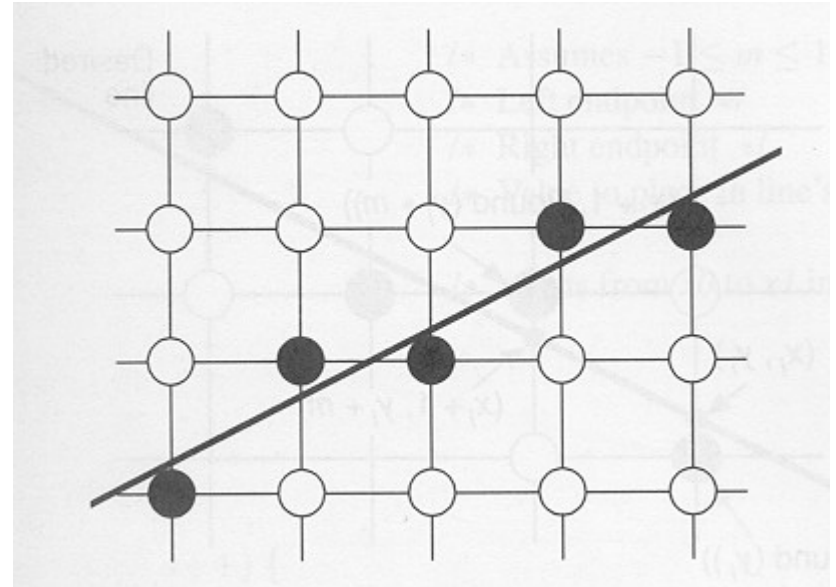
**CSCI 4229/5229**

**Computer Graphics**

**Fall 2006**

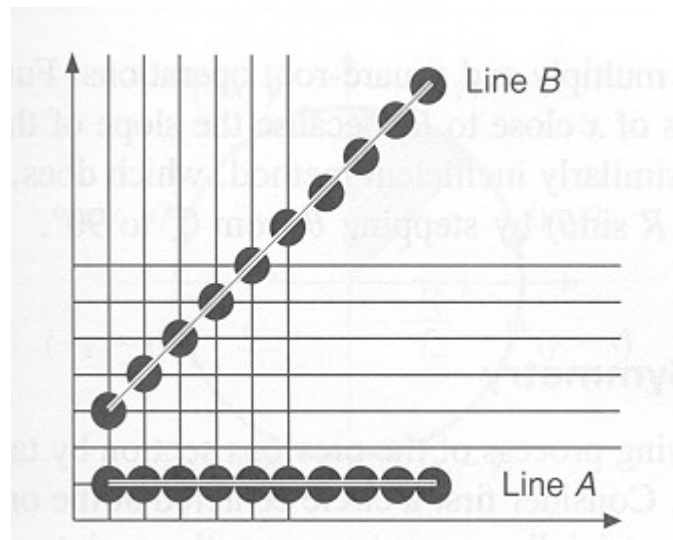
# Scan Converting Lines

- Which pixels to turn on?
  - Floating point
  - Bresenham algorithm



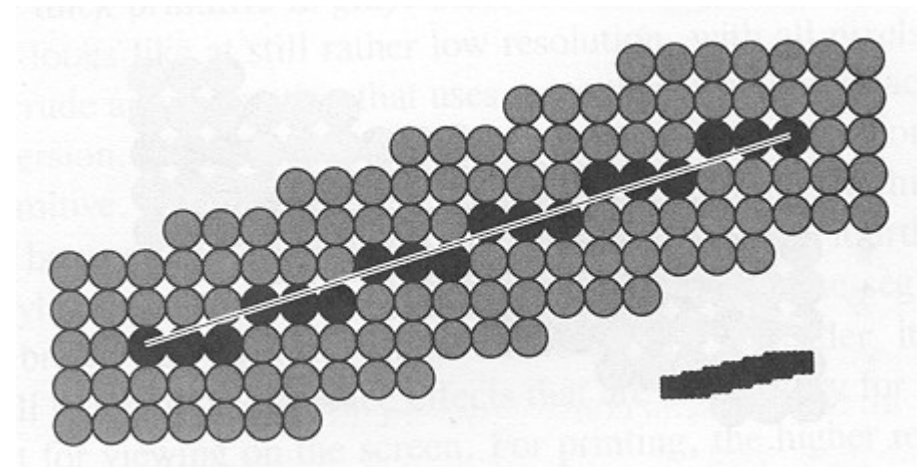
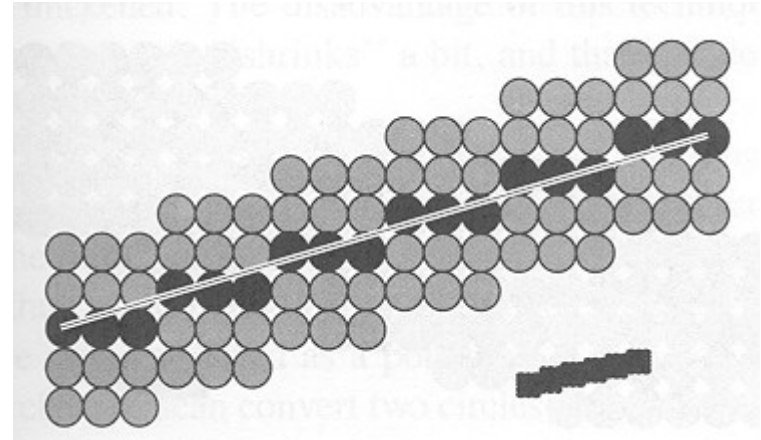
# Line intensity

- Lines parallel to axes appear more dense than lines at 45 degree angles by  $\sqrt{2}$
- If this is an issue you can adjust the pixel intensity inversely proportional to the cosine



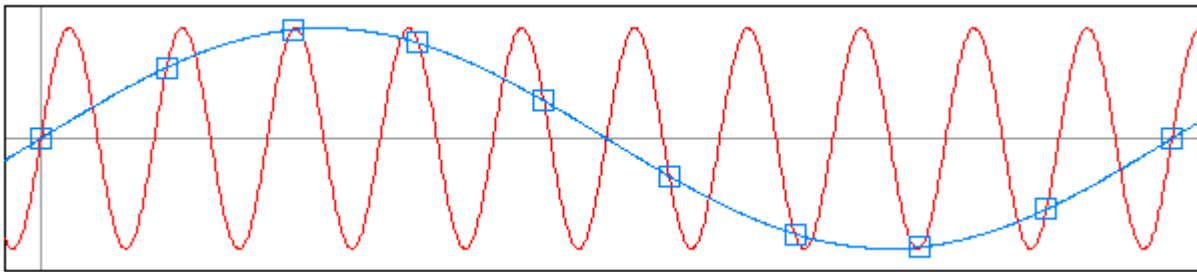
# Thick Lines

- Column replication
- Rectangular pen
- Polygon fill



# Anti-aliasing in signal processing

- Discrete samples of a signal

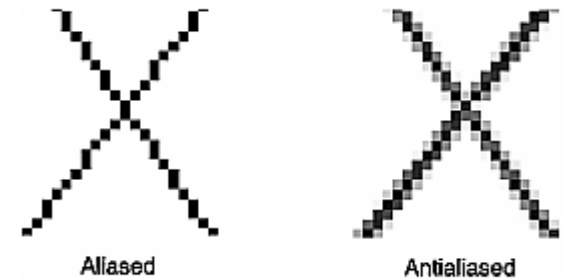


- Low and high frequency samples are the same

# Anti-aliasing in Computer Graphics

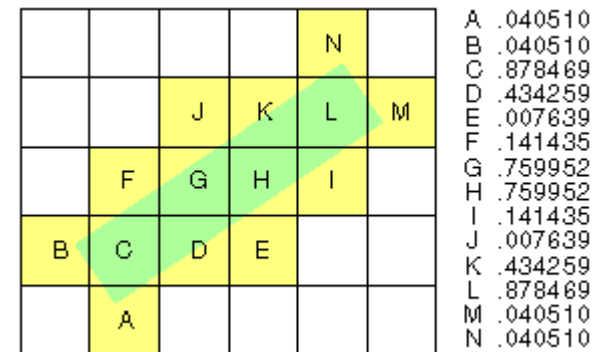
- Aliased lines

- Discrete pixels are turned on
- Nearest pixel selected
- Leads to “jaggies”



- Anti-aliased lines

- Pixels are partially turned on
- Level selected by line overlap
- Leads to smoother lines



# OpenGL Anti-aliased Lines

- `glEnable(GL_LINE_SMOOTH);`
- `glEnable(GL_BLEND);`
- `glBlendFunc (GL_SRC_ALPHA,  
                  GL_ONE_MINUS_SRC_ALPHA);`
- `glLineWidth(1.5);`