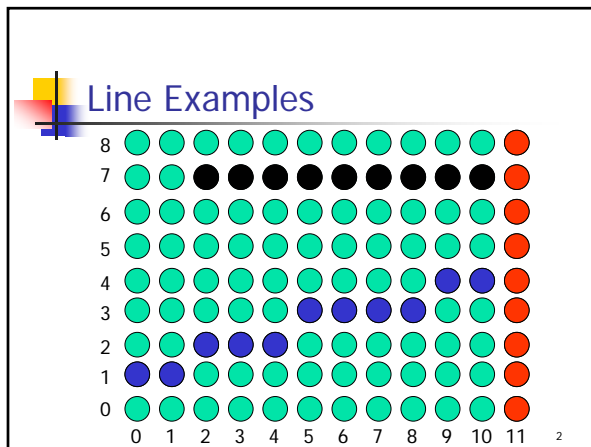
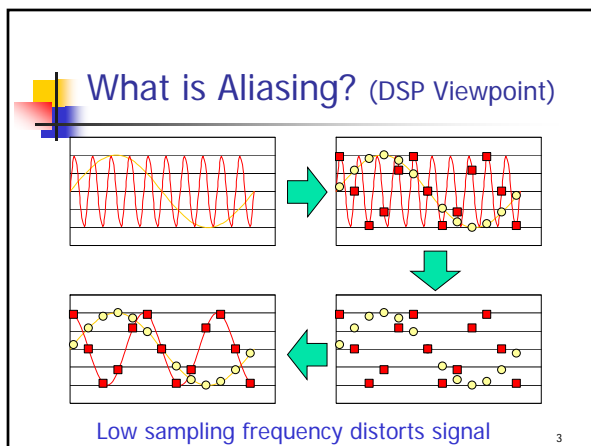


Anti-Aliasing

- What is aliasing?
 - A display artifact (loss of detail and false details)
 - Caused by limited resolution
- Non-horizontal lines distorted
 - Vertical lines ok? (dimmer?)
 - Oblique lines "jagged"
- Can we compensate?

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Nyquist Criterion

Must sample at at least the Nyquist frequency (f_N) in order to correctly capture a signal with a given maximum frequency (f_{max})

$$f_s \geq f_N = 2f_{max}$$

$$\Delta t_s \leq \frac{\Delta t_{min\ cycle}}{2}$$

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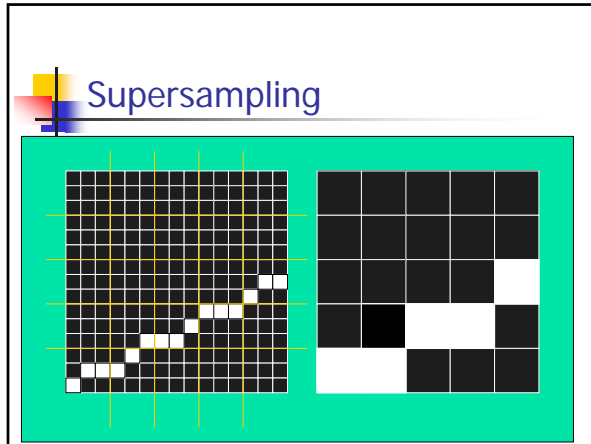
Frequency Domain View

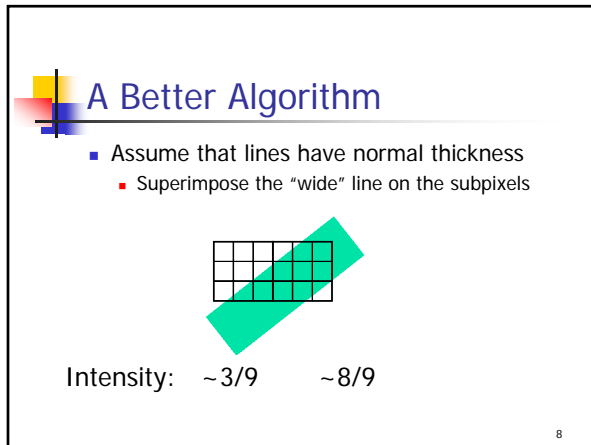
When $f_s < f_N$, spectra overlap, causing aliasing ⁵

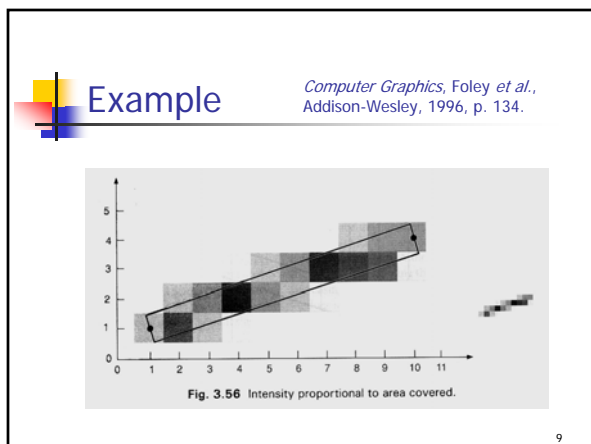
Aliasing in Graphic Displays

- Sampling issue
 - Not really “sampling” a line
 - But generating “misplaced” points
- What can we do?
 - Increase screen resolution?
 - Add extra information another way?
 - Manipulate pixel intensity?

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Color Effects

- Additional effects can be included
 - Color
 - R,G, and B intensities
 - Background and fill
 - Factor in their % of coverage
 - Ex.
 - 9-pixel grid (4 foreground/outline, 3 background, 2 fill)
 - $R = (4*Red_{fore} + 3*Red_{back} + 2*Red_{fill})/9$



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Weighting Masks

Animation: Subpixel movement?

1	1	1
1	1	1
1	1	1

1	2	1
2	4	2
1	2	1

Uniform Center weighted

Can even extend mask across pixels

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Line Algorithm Modifications

- Simple Bresenham
 - Selects one of two pixels as "best"
- Modified algorithm
 - Use Bresenham "p" value
 - Adjust intensity of two candidate pixels
- Adapt to area boundary also

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