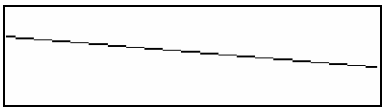
Supplement to Chapter 2 of *The Science of Digital Media* – Digital Image Representation

Programming Assignment – Digital Imaging > Line Drawing[1]

Introduction:

If you draw a line using rectangular pixels that are aligned with the sides of a display monitor, it's impossible to avoid jagged edges on the line unless the lines are perfectly horizontal or vertical. This effect is called *aliasing*.

You can see aliasing in the diagonal line below, which has been enlarged to exaggerate the effect.



Instructions:

The Assignment

Using the programming language of your choice, implement a line-drawing algorithm. Write the algorithm so that is draws lines that are one pixel wide with black pixels on a white background. Then run it to draw a number of lines and look at the effects of aliasing.

Now modify your program to include anti-aliasing as an option. Anti-aliasing should color a pixel in a shade of gray in proportion to how close the pixel is to the line – meaning that the closer it is to the line, the closer the pixel value is to 0, which is black.

Your final program should allow the user to

- specify that anti-aliasing is or is not to be used
- input the endpoints of the line to be drawn
- draw lines repeatedly

Depending on the programming language you use, you can either write the line out to a bitmap to be looked at later, or show the line interactively as the program is run.

Ideas for Further Experimentation and Analysis

- Implement the algorithm to draw lines of a given width in pixels.

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