CSE- 4105

Md. Manowarul Islam
Lecturer
Department of CSE
Jagannath University

Display Hardware

- Video Display Devices
  - Cathode Ray Tube (CRT)
  - Liquid Crystal Display (LCD)
  - Light-emitting diodes (LED)

- Hard-Copy Devices
  - Ink-jet printer
  - Laser printer
  - Film recorder
  - Electrostatic printer
  - Pen plotter

Review

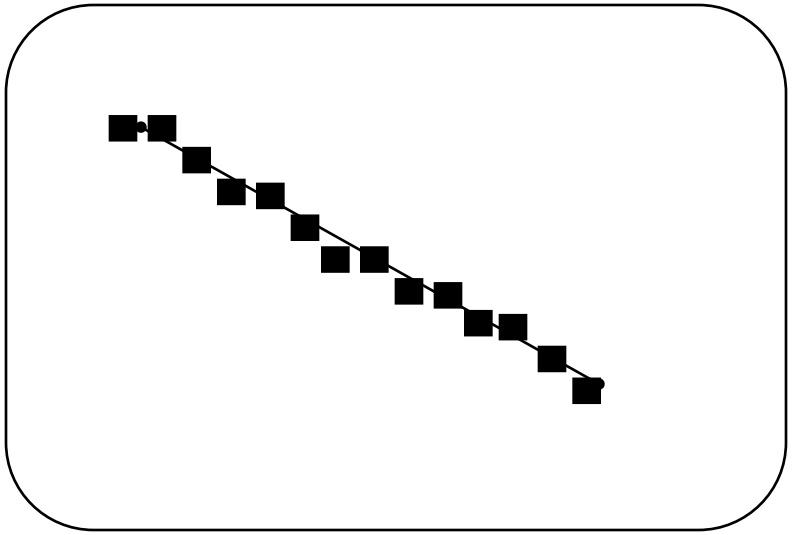
- Vector vs. Raster
  - Another place we see this… web-based graphics
    - Macromedia flash is vector based
    - JPG images are raster based
  - CRTs
    - Vector based
    - Raster based

Raster Graphics

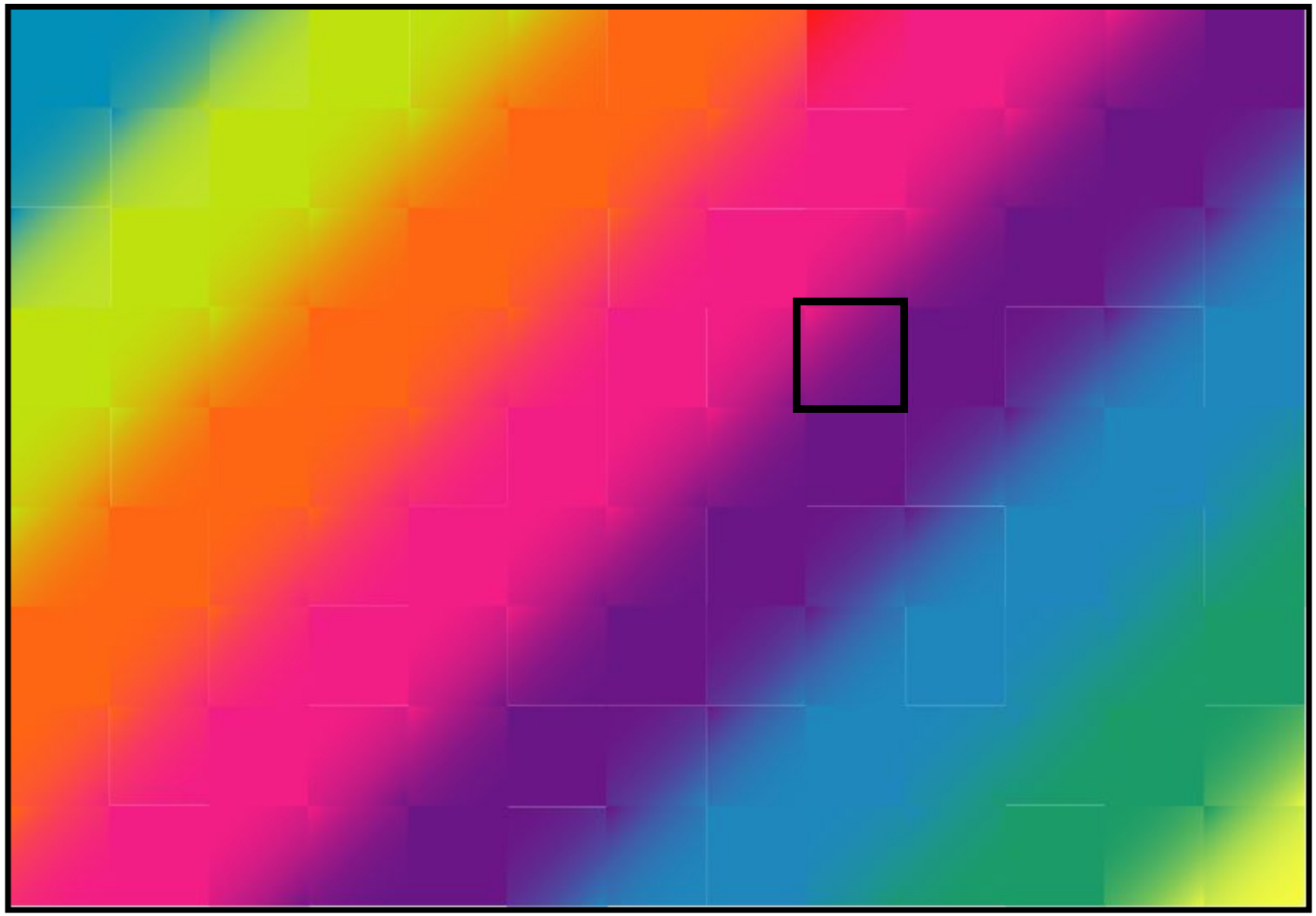
- A raster image is defined by pixels.
- A pixel is the smallest display element that makes up the images seen on a computer monitor or television.
- In raster images, the more pixels an image contains, the higher its resolution.
  - For example, in a raster image a square is drawn as a grid of pixels (dots) and each of those pixels will have a specific color value.
- Programs such as Photoshop, PaintShop, and PhotoPaint all work with pixels (raster images).

Raster Graphics

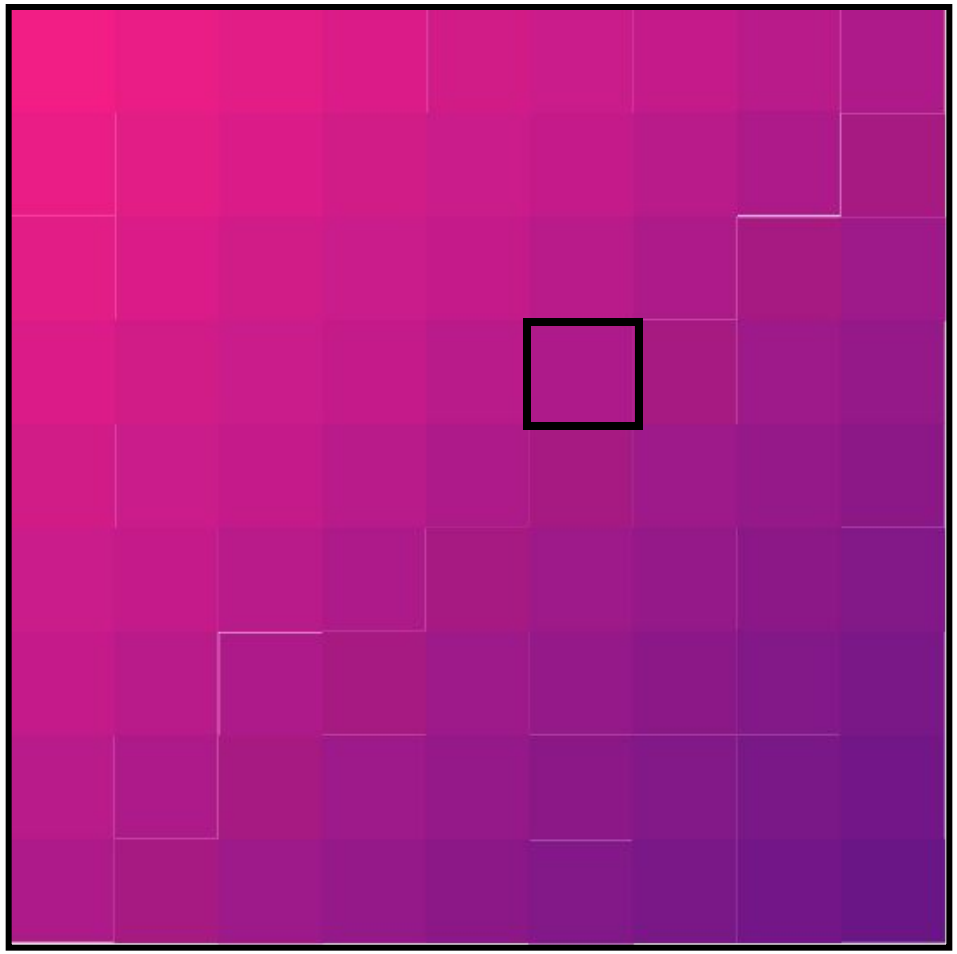
- How to generate a line using rasters
  - A line is represented by assigning some pixels a value of 1
  - The entire line is specified by the pixel values



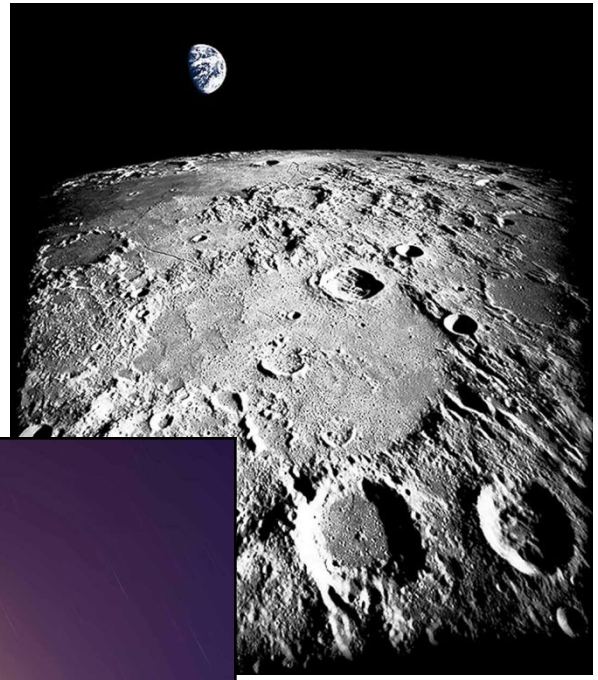
“Maps” of Dots

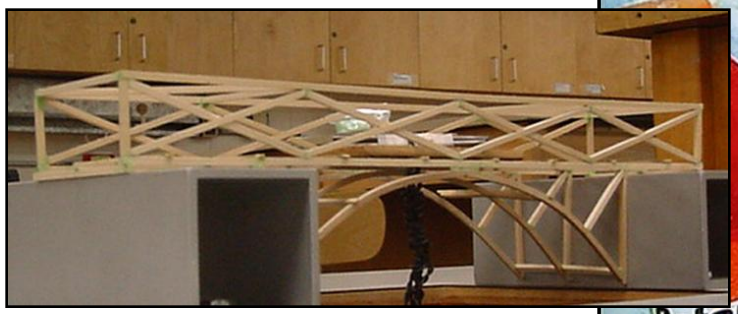


“Maps” of Dots



Bitmap Examples





Problems

- A raster image is resolution-dependant because it contains a fixed number of pixels that are used to create the image.
  - 160 x 120, 800 x 600, 1400 x 1050
- Since there is a fixed and limited number of pixels, a raster image will lose quality if enlarged beyond that number of pixels as the computer will have to 'make up' the missing information.

Making Bigger

100%

(900 x 983 dpi)

200%

500%

Warning! Warning!

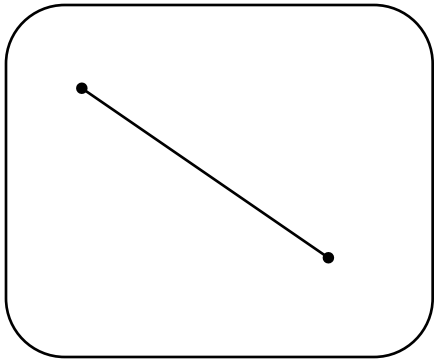
- DPI is critical!
- Printers: 300 dpi, 600 dpi
- Monitors: 72 dpi (Internet pictures)
- If you download a picture from the Internet to print out, make sure it's BIG!

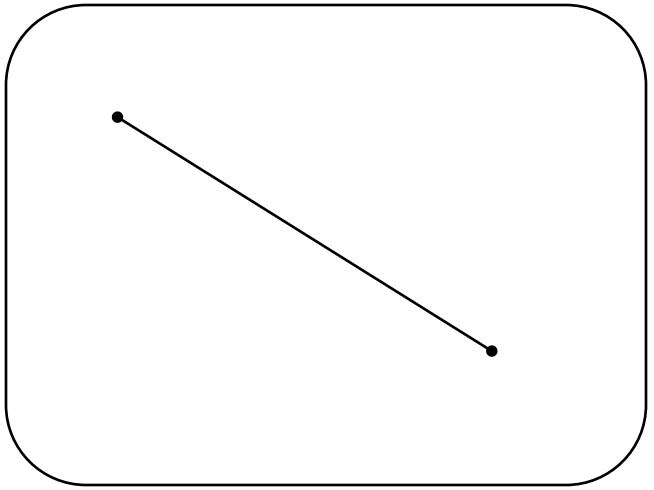
Vector Graphics

- Vector graphics are created from mathematical formulas used to define lines, shapes and curves.
- Vectors can have various attributes such as line thickness, length and color.
  - For example, in a vector image, a square is drawn as four lines connected at the corners.
- Vector graphics are resolution-independent because the vector objects are drawn mathematically in the computer.

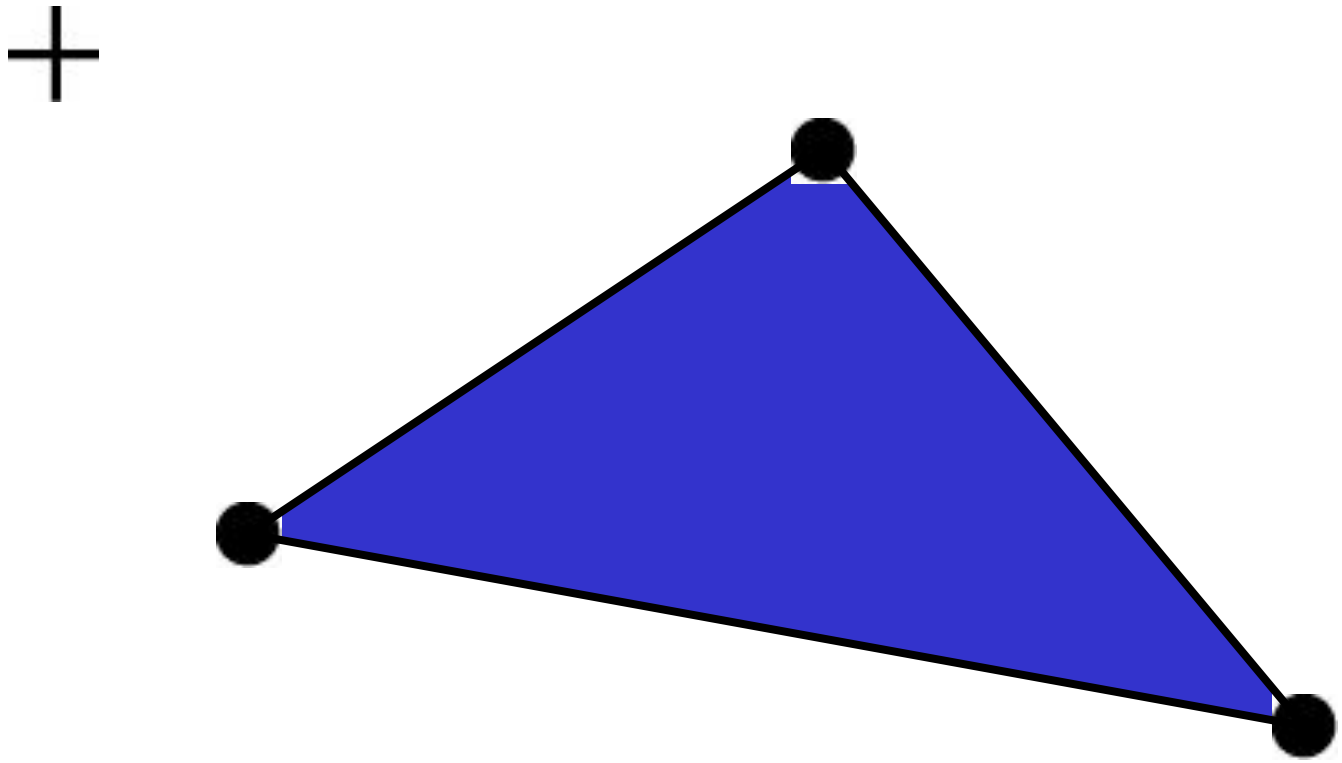
Vector Graphics

- How to generate an image using vectors
  - A line is represented by endpoints (10,10) to (90,90)
  - The points along the line are computed using a line equation
    - $y = mx + b$
  - If you want the image larger, no problem…





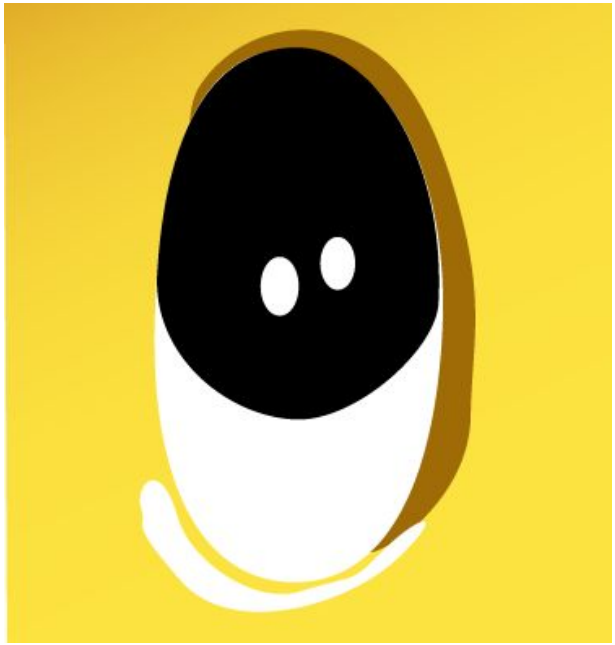
Points, Lines and Fill



Vector Image

100%

200%



500%

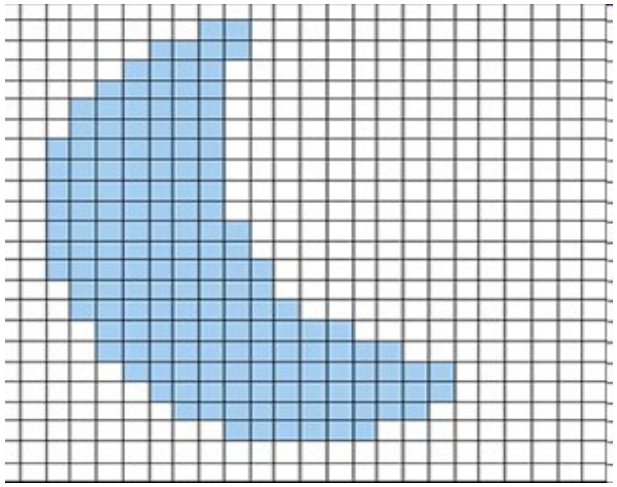
Advantages of Vectors

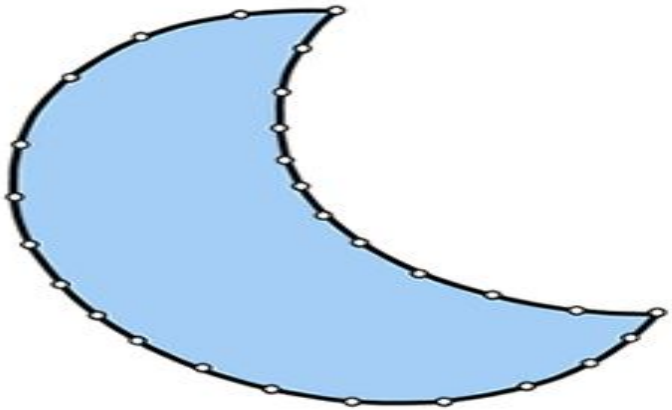
- Resolution Independent
  - Regardless of how much the image is enlarged or reduced, the image definition and quality remain the same.
- Small File Sizes
  - Easily transferred over the Internet.

Disadvantages of Vectors

- Lower color quality than raster images.
  - They do not support as many colors.
- Not good for photographic images.

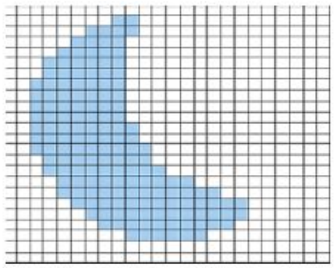
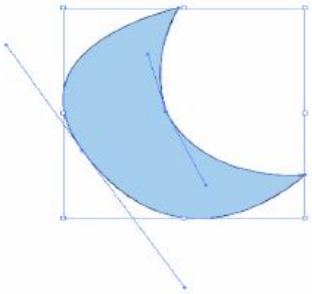
Raster vs Vector Images





Raster vs Vector

Raster and Vector Graphics

Raster	Vector
	
Made up of a ***grid*** of pixels	Geometric shapes and lines that are defined ***mathematically***
Resolution dependent	Resolution ***independent***
When scaled, visual quality and sharpness is degraded	When scaled, visual quality and sharpness is ***unaffected***
File size is relatively ***large***	File size is relatively ***small***
File Formats: ***GIF, TIF, BMP, PSD***	File Formats: ***EPS, WMF, AI***
Pixel-oriented	***Object*** -oriented

Thank You