



Graphics Summary

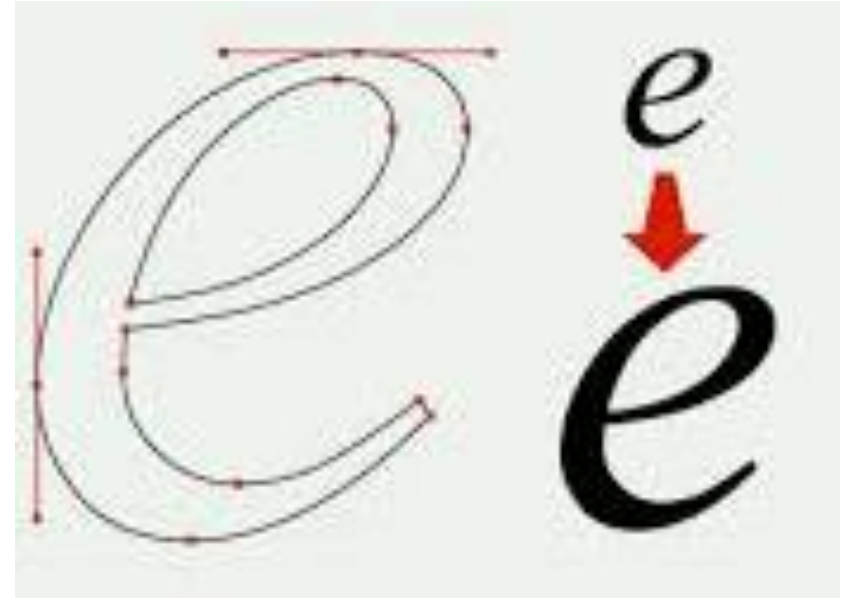
Multimedia Techniques & Applications

Yu-Ting Wu

Two Approaches for Graphical Modeling



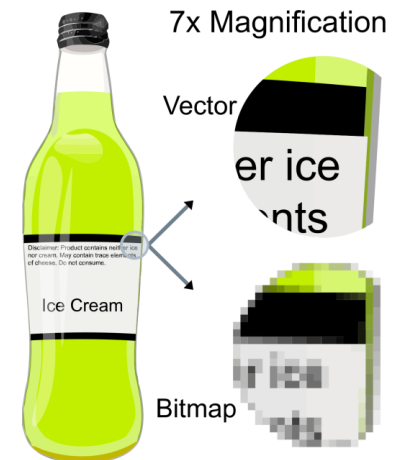
bitmapped graphics



vector graphics

Bitmapped v.s. Vector Graphics

- Bitmapped images provide **better control of pixel values**, thus being more suitable for natural images
- Vector graphics are **resolution independent**, thus being more suitable for texts and icons



Comparison: Image Size

- **Bitmapped images**

128 x 128 = 16384 pixels

each pixel has 3 channels (rgb)

each channel requires 8 bits

49152 bytes

- **Vector image**

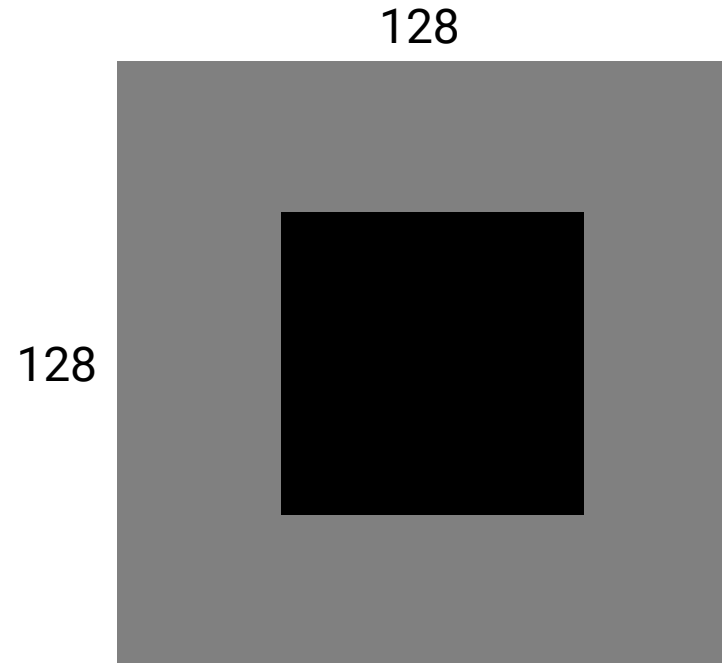
0.5 1.5 0.5 setrgbcolor

0 0 128 128 rectfill

0 0 0 setrgbcolor

32 32 64 64 rectfill (in order)

78 bytes (independent of any resolutions)



Comparison: Bitmapped Image Editor

- Example: **Photopea** (online)

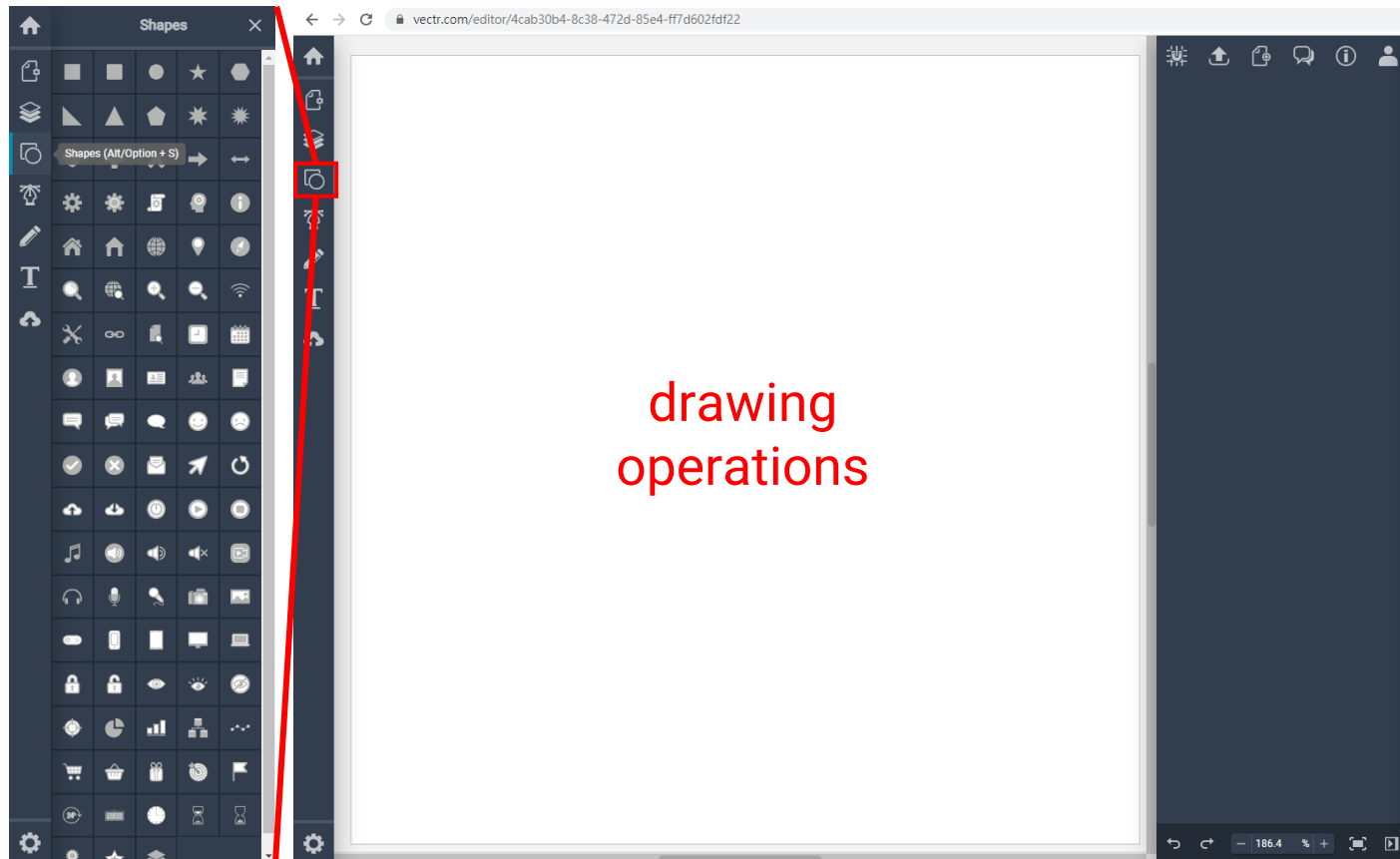
painting operations & pixel adjustment

pixel point processing

pixel group processing

Comparison: Vector Graphics Editor

- Example: **Vectr** (online)



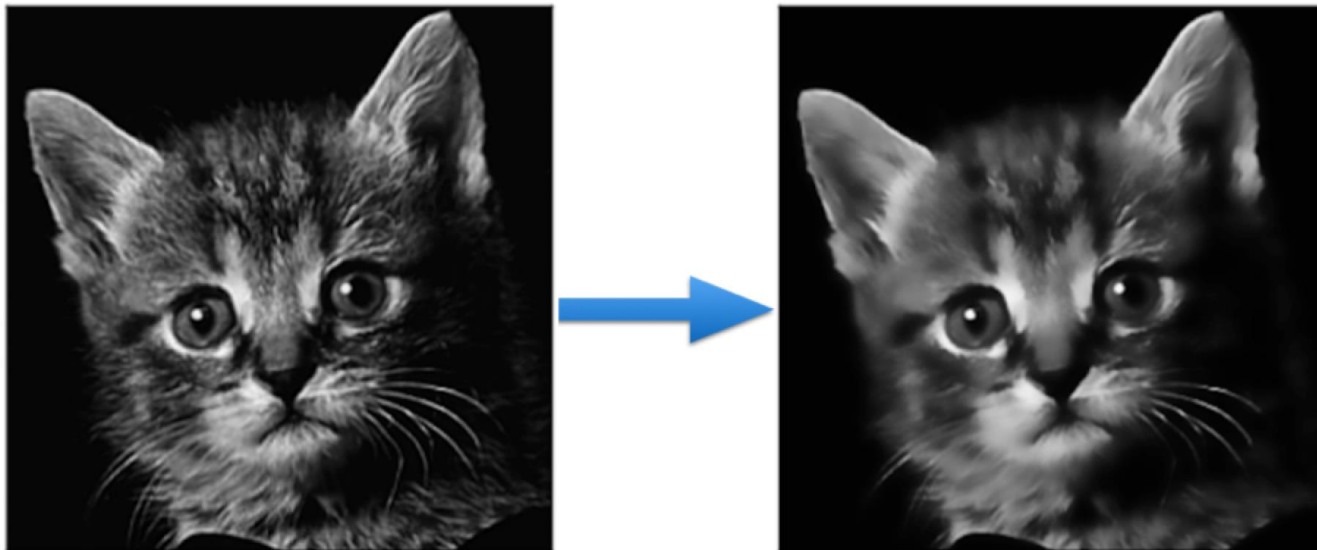
Comparison: Object Selection

- Intuitive for vector representation
- Painstaking for bitmapped image
 - Need to cutout the object boundary (e.g., magic wand)



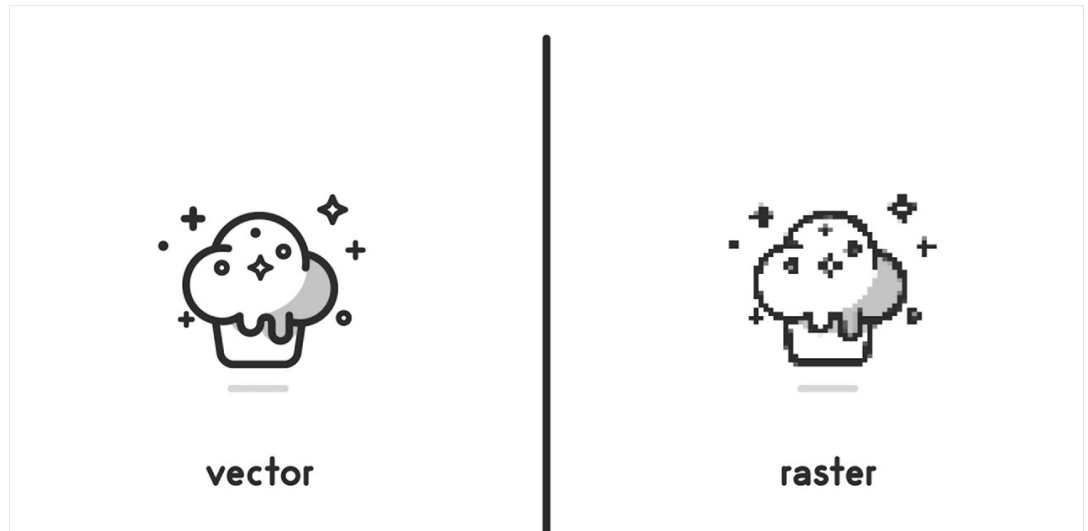
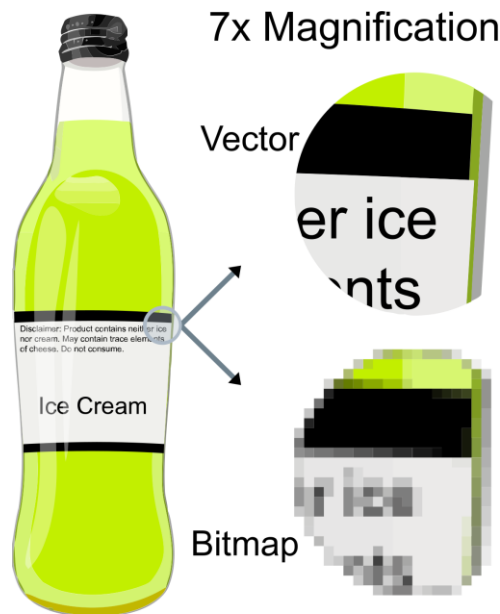
Comparison: Pixel Point/Group Processing

- Example: blurring
 - Simple for bitmapped image
 - Additional work for vector graphics
 - Need to be first transformed into a bitmapped format
 - Difficult to transfer back to vector graphics for further editing



Comparison: Resizing

- Bitmapped images need **down-sampling** or **up-sampling**, usually resulting in perceptual loss of quality
- Vector graphics is independent of the display resolution (online rendering based on math)



Resizing (cont.)

- Live Demo

Conversion: Vector to Bitmapped Images

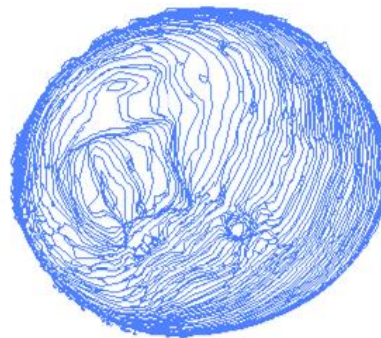
- Easy
- Used the same algorithms that are used to display the image on a monitor
 - **However, will lose all its vector properties after the conversion**

Conversion: Bitmapped to Vector Graphics

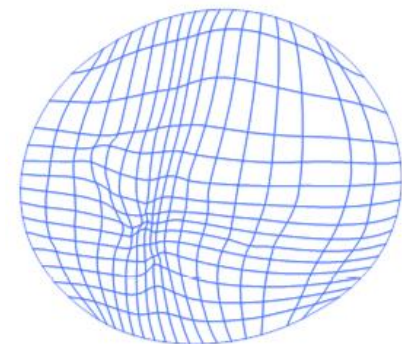
- Very difficult to do well
- Require tools to identify the boundaries of the shapes and shades within the images
- Also require a method to approximate the boundary using the available sorts of curves, lines, and shapes
- Finally, difficult to produce the color textures



input bitmapped image



Adobe Live Trace



Sun et al., SIGGRAPH 07

File Formats of Bitmapped Images

- Related to the way of compressing data
 - **Lossless compression**
 - GIF (Graphics Interchange Format)
 - PNG (Portable Network Graphics)
 - BMP (Windows Bitmap)
 - TIFF (Tagged Image File Format)
 - TGA (Truevision TGA, TARGA)
 - **Lossy compression**
 - JPEG (Joint Photographic Experts Group)
 - TIFF (Tagged Image File Format)

File Formats of Vector Graphics

- Related to different applications (how the graphics objects are rendered)
 - PostScript
 - EPS (encapsulated PostScript)
 - SVG (Scaleable Vector Graphics)
 - SWF (Small Web Format)
 - PDF (Portable Document Format)
 - AI (Adobe Illustrator Artwork)

