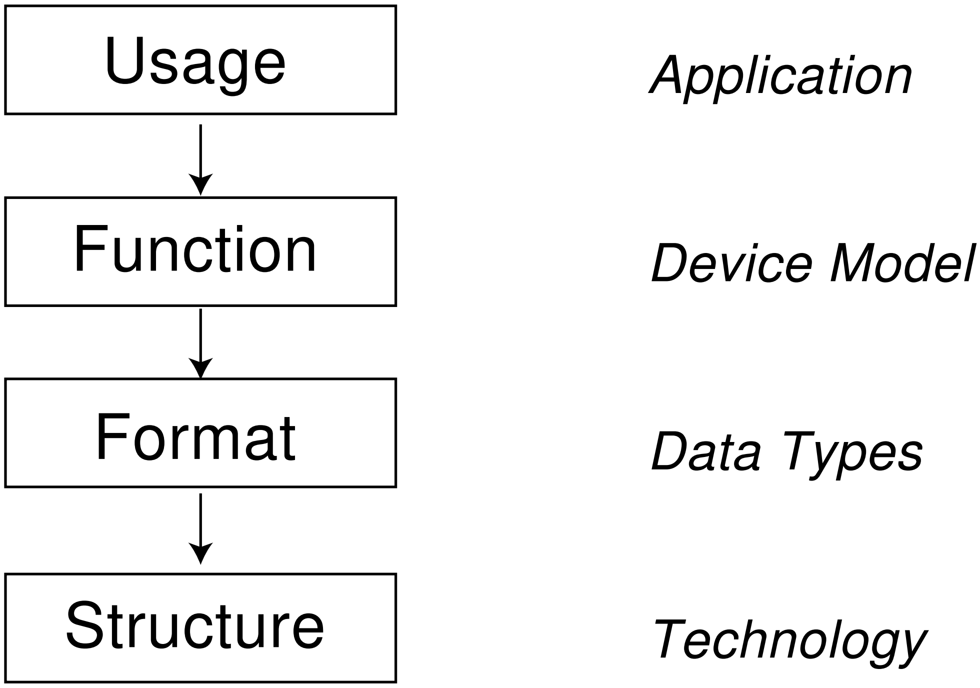
Graphics Devices

- Format of Graphics Data
- Classification Criteria
- Types of Graphics Devices
- Interactive Workstations
- Imaging Systems
- Graphics Standards

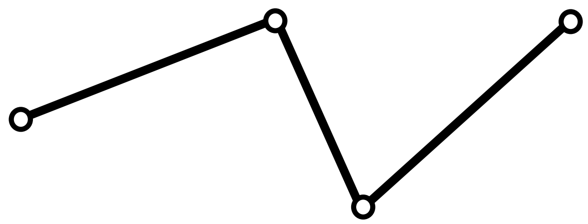
Conceptual Model



Format of Graphics Data

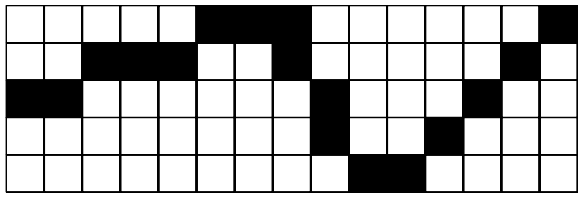
- Vector
  - Coordinates
  - Points, Curves, Surfaces

    (Geometry)



- Raster
  - Matrix
  - Pixel / Intensities

    (Image)



Computation with Graphics Data

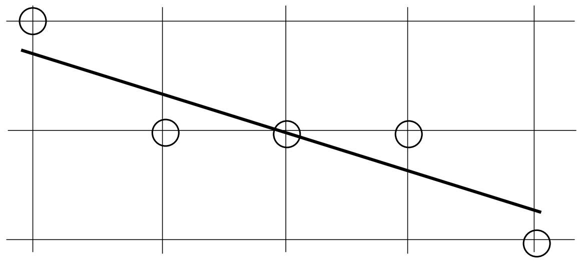
- Vector
  - (N-Vectors)
  - Floating Point Operations
- Raster
  - (Large Matrices)
  - Integer Operations

Coversion between Formats

- Scan Conversion

  (Vector to Raster - Graphics)

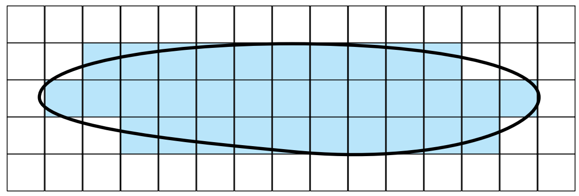
  - Border
  - Interior Fill



- Segmentation

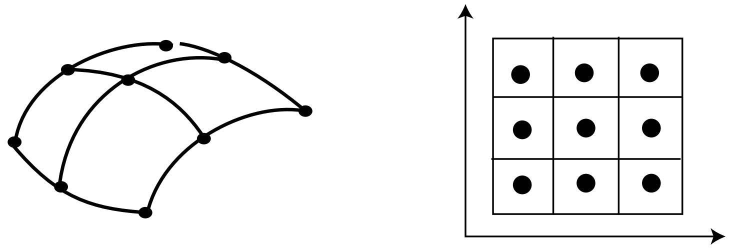
  (Raster to Vector - Vision)

  - Edge Detection
  - Classification



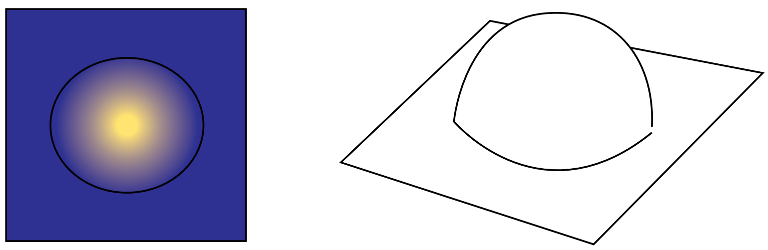
Mixing Up Formats

- Model as an Image



  - Intrinsic Connectivity
  - Image Proc. Techniques

- Image as a Model



  - Continuous Model
  - Diff. Geometry Techniques

Classification Criteria

- Functional Characteristics
  - Input
  - Processing
  - Output
- Graphics Data Format
  - Vector
  - Raster
- Mode of Use
  - Non-Interactive
  - Interactive

Types of Graphics Devices

- Graphics Devices
  - Input
    - Vector
    - Matrix
  - Process
    - Vector
    - Matrix
    - Hybrid
  - Output
    - Vector
    - Matrix

Input Devices

- Vector
  - Relative Coordinates
    - Mouse / Trackball
    - Joystick
    - Dials
    - Spaceball
  - Absolute Coordinates
    - Tablet
    - Light Pen / Touch Screen
    - 6D Digitizer / Data Glove
- Matrix
  - Frame Grabber
  - Scanners
  - Range Devices

Processing

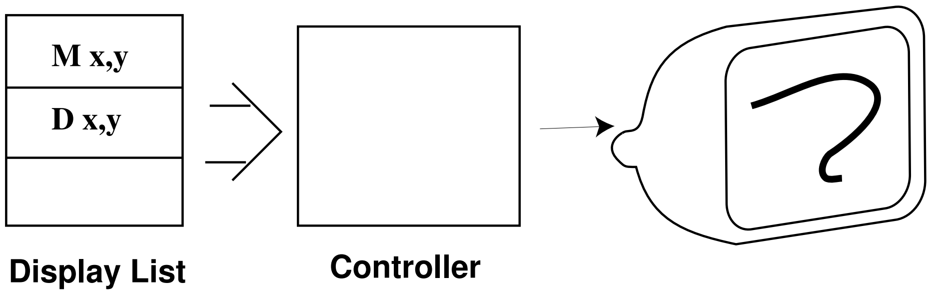
- Vector
  - SISD
    - FPU
  - MISD
    - SGI - Geometry Pipeline
- Matrix
  - SIMD
    - Pixar
  - MIMD
    - Pixel Machine
- Hybrid

Output

- Vector
  - Plotter
  - Vector Displays
  - 3D Laser
- Matrix
  - Graphic Printers
  - Film Recorders
  - Raster Displays
  - 3D Syntering

Vector Displays

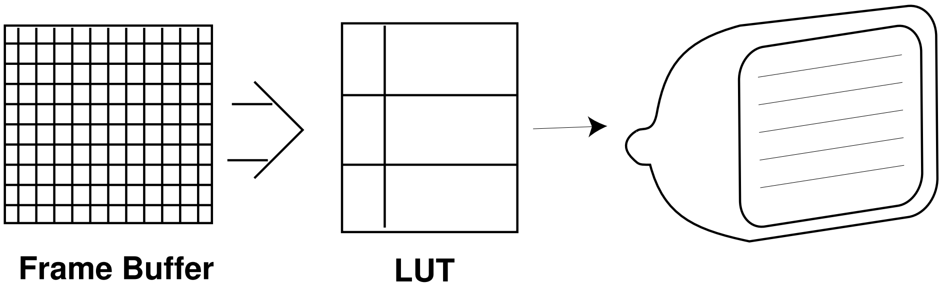
- Architecture
  - Display List
  - Controller



- Technology
  - Direct View Storage Tube
  - Calligraphic Display

Raster Displays

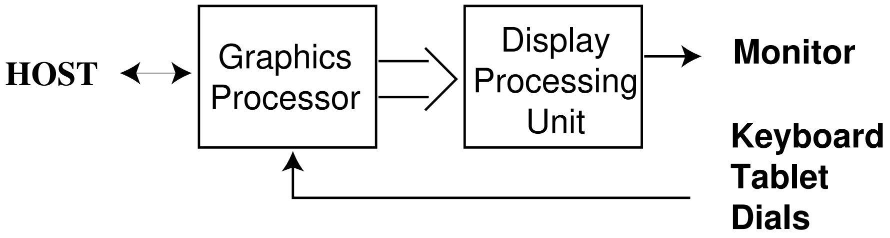
- Architecture
  - Frame Buffer
  - LUT



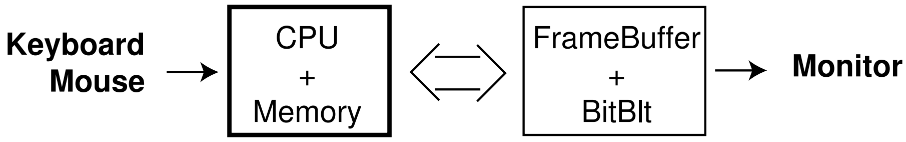
- Technology
  - CRT's
  - Liquid Cristal
  - Plasma Pannel

Interactive Workstations

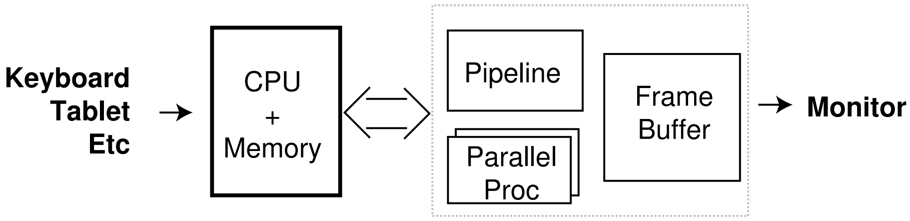
- Calligraphic (PS-300)



- Bitmap Workstation (Sun)



- High Performance Workstation (IRIS)



Device Independence

- Logic Devices
  - Locator
  - Valuator
  - Buttons
  - Canvas
- Interaction Tecniques
  - Widgets
- Standards
  - X Windows
  - Open GL

2D Graphics Subsystem

- Input
  - Event Driven
  - Polled
- Raster Display
  - Read/Write
  - PixBlit
  - Scan Conversion
- Text Display
  - Display
  - Editing
- Feedback
  - Cursors

3D Graphics Subsystem

- Viewing Tranformations
- 3D Scan Conversion
- Visibility (Z-Buffer)
- Shading
- Pick