FIGURE 1.1 A user creating an image on a paint system. (ZBrush interface. Courtesy of Ofer Alon.www.pixologic.com.)

a)

b)

FIGURE 1.2 Enhancing an image. (a) Original. (b) Enhanced.

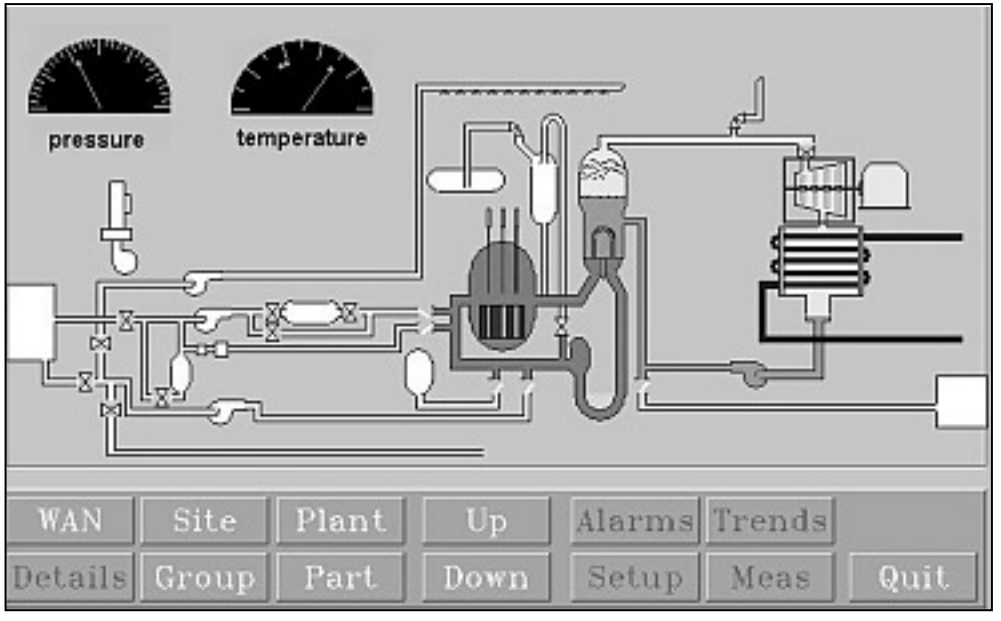


FIGURE 1.3 Monitoring a manufacturing process. (Courtesy of Dataviews Corporation.)

FIGURE 1.4 A woman wears a head-mounted display and data gloves to interact with a virtual world. (Courtesy of NASA.)

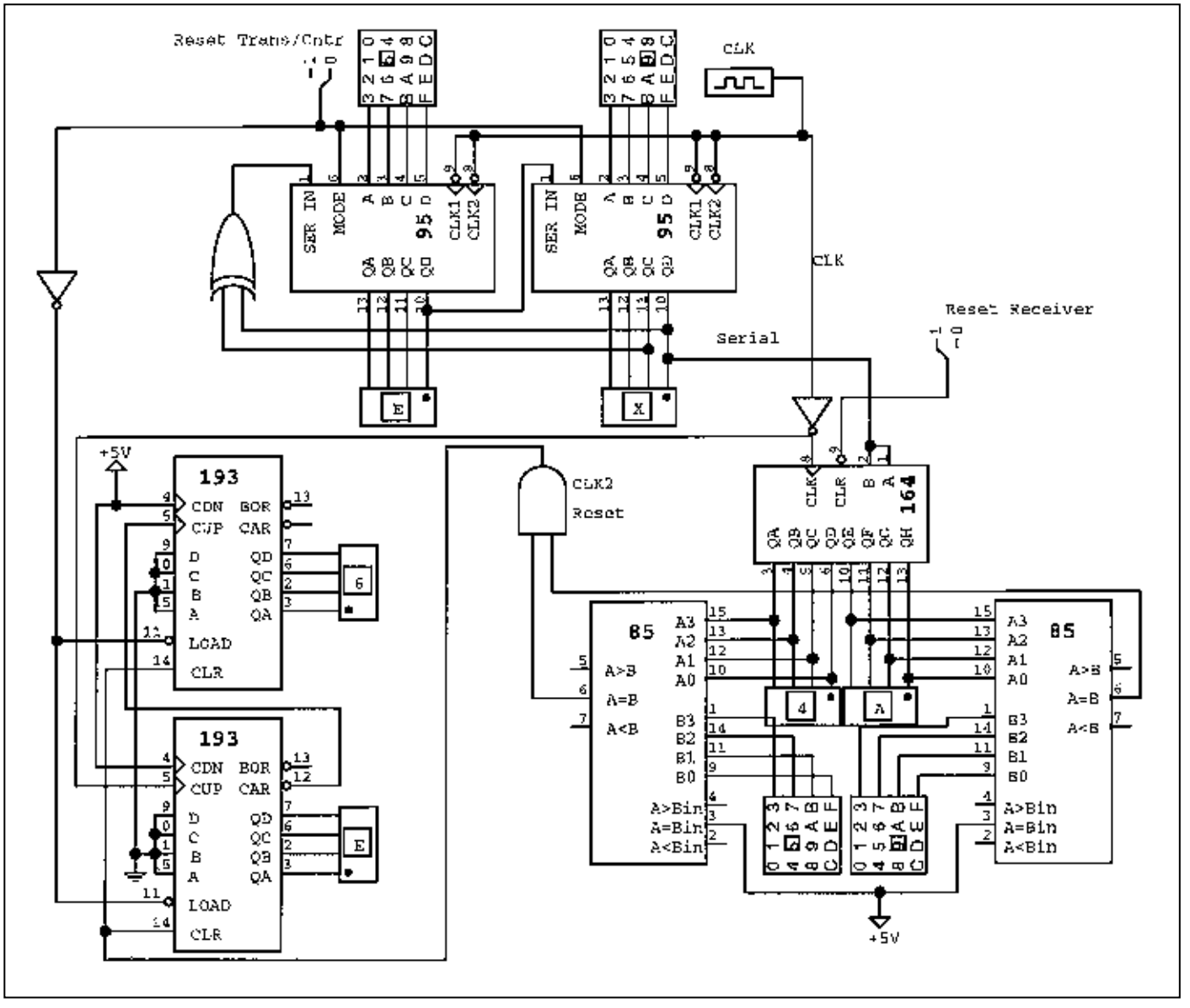
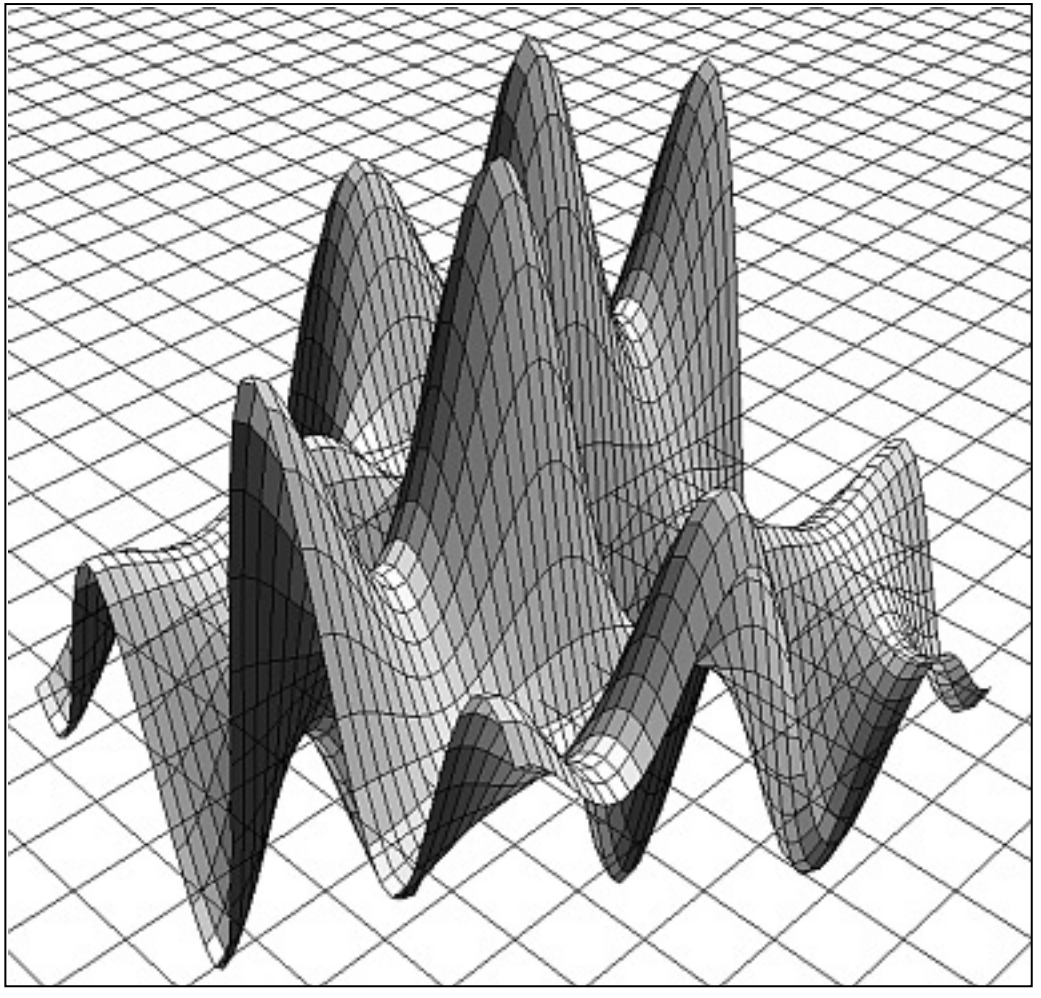
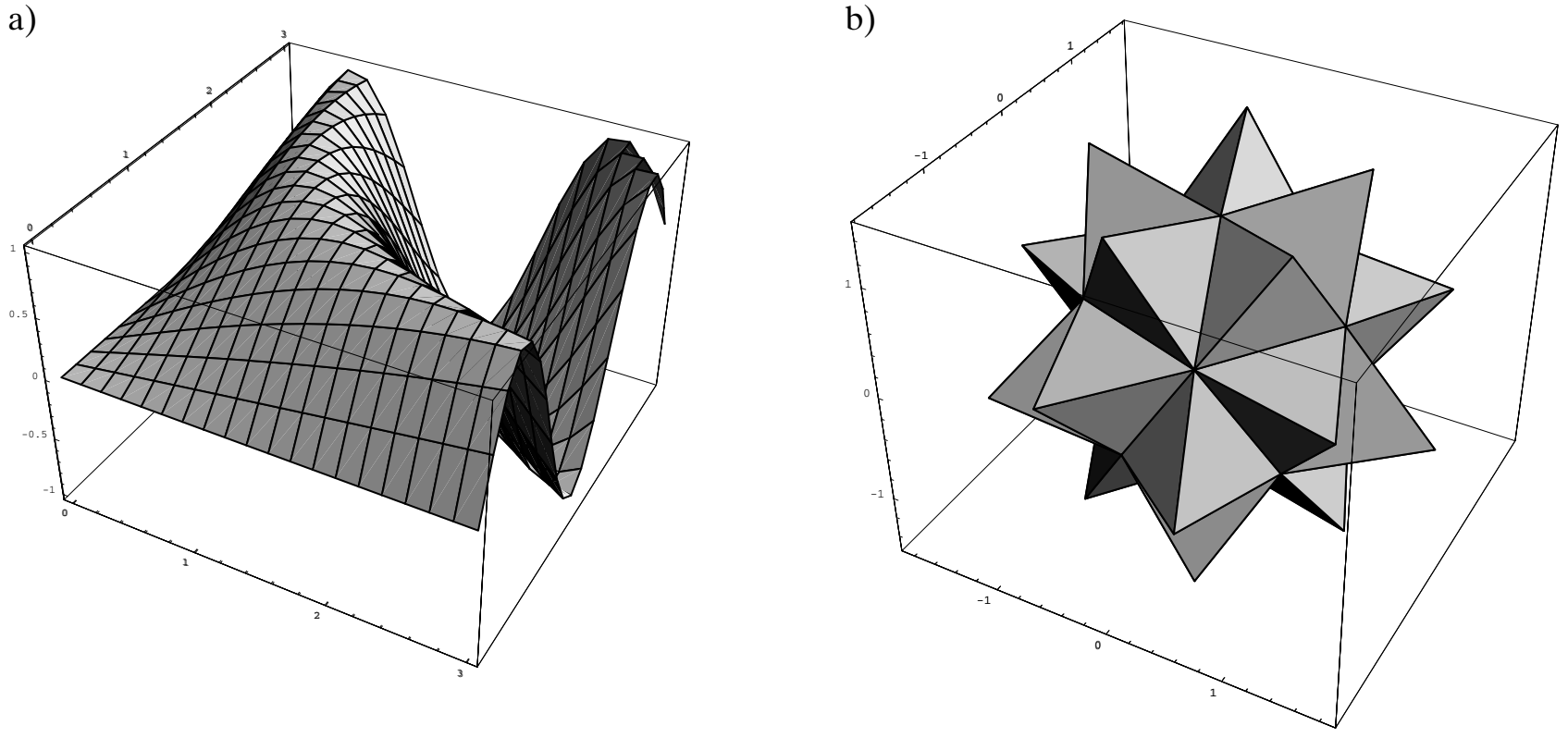


FIGURE 1.5 Digital logic design application. (Courtesy of Chris Vadnais and Capilano Computing Systems, Ltd.)

FIGURE 1.6 Display of complex scientific data.






```
ParametricPlot3D[{t,u,Sin[t u]},{t,0,3},{u,0,3}]
```

FIGURE 1.7 *Mathematica* displays of (a) a complex mathematical surface and (b) a mathematically defined solid object.

FIGURE 1.8 (a) A polyline drawing of a dinosaur. (Courtesy of Susan Verbeck.) (b) A plot of a mathematical function. (c) A wire-frame rendering of a three-dimensional object.

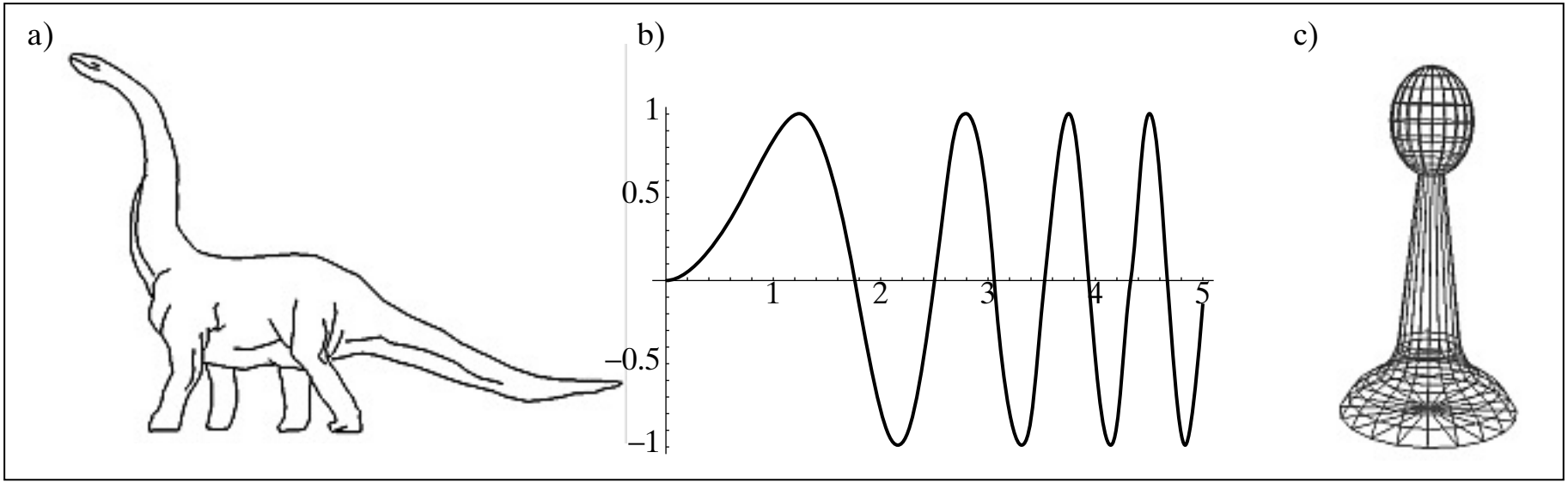
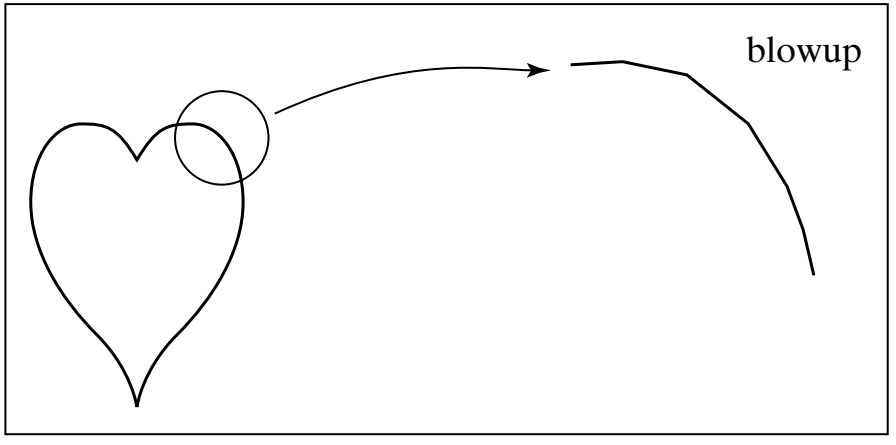


FIGURE 1.9 A curved line made up of straight-line segments.



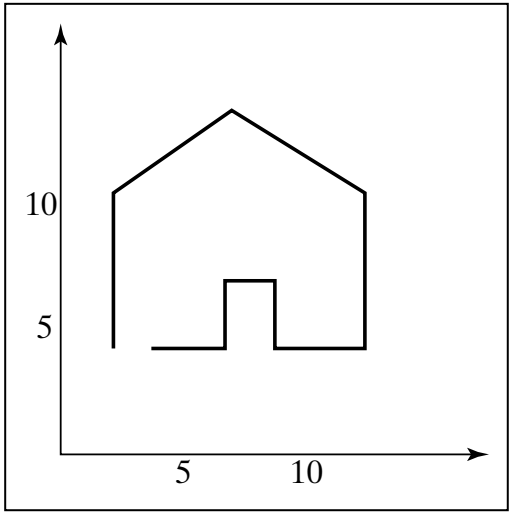


FIGURE 1.10 A sample polyline.

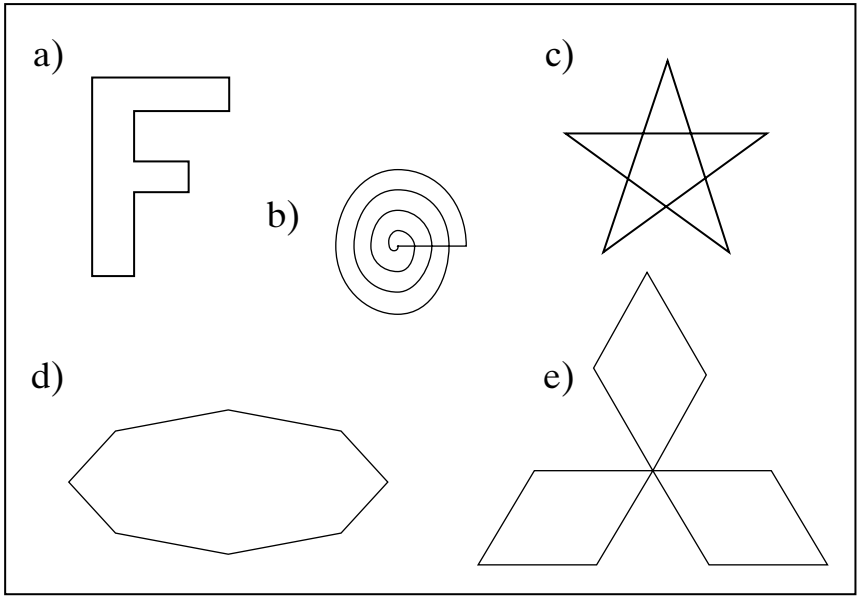


FIGURE 1.11 Examples of polygons.

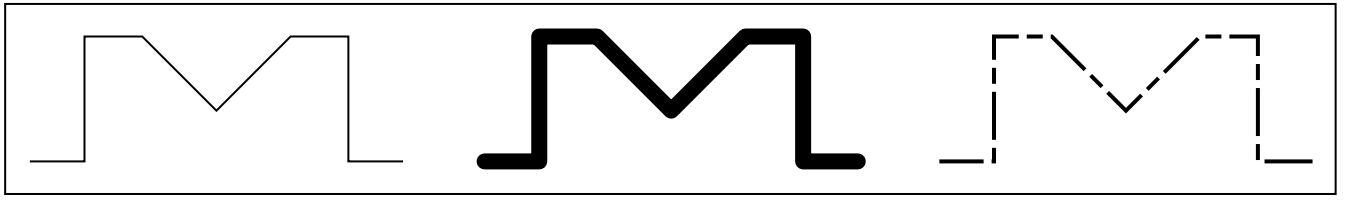
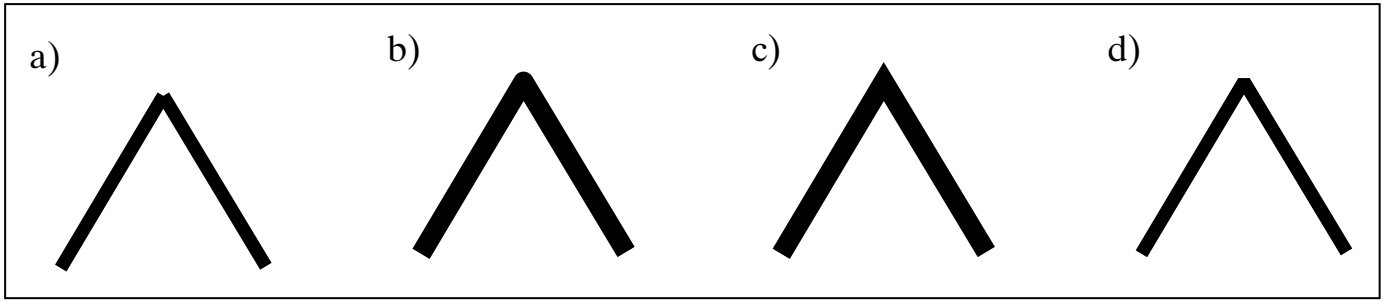


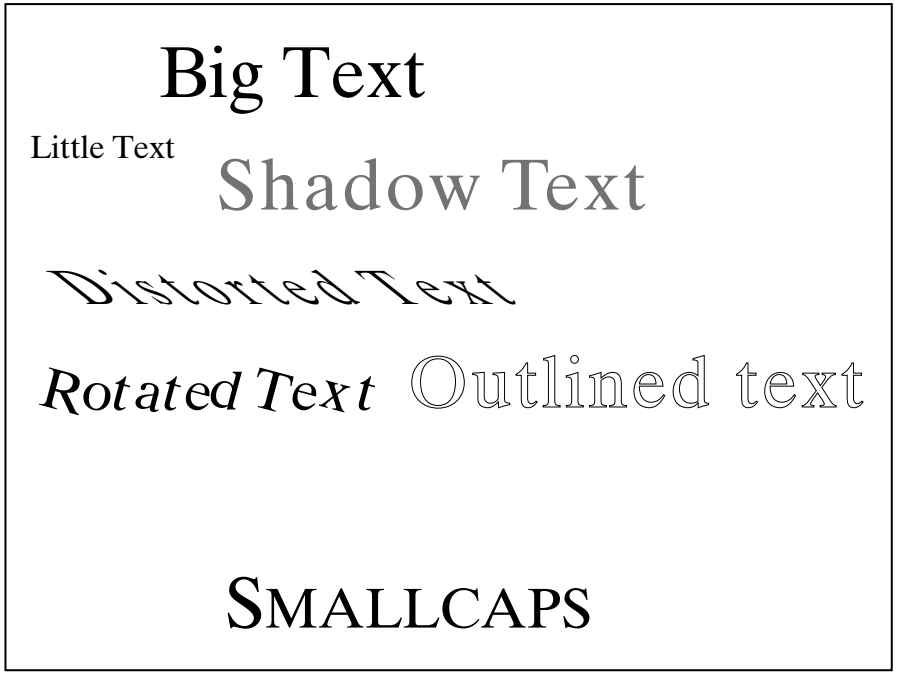
FIGURE 1.12 Polylines with different attributes.



The attributes of a polyline are sometimes set by calling routines such as `setDash(dash7)` or `setLineThickness(thickness)`.

FIGURE 1.13 Some ways of joining two thick lines in a polyline.

FIGURE 1.14 Some text drawn graphically.



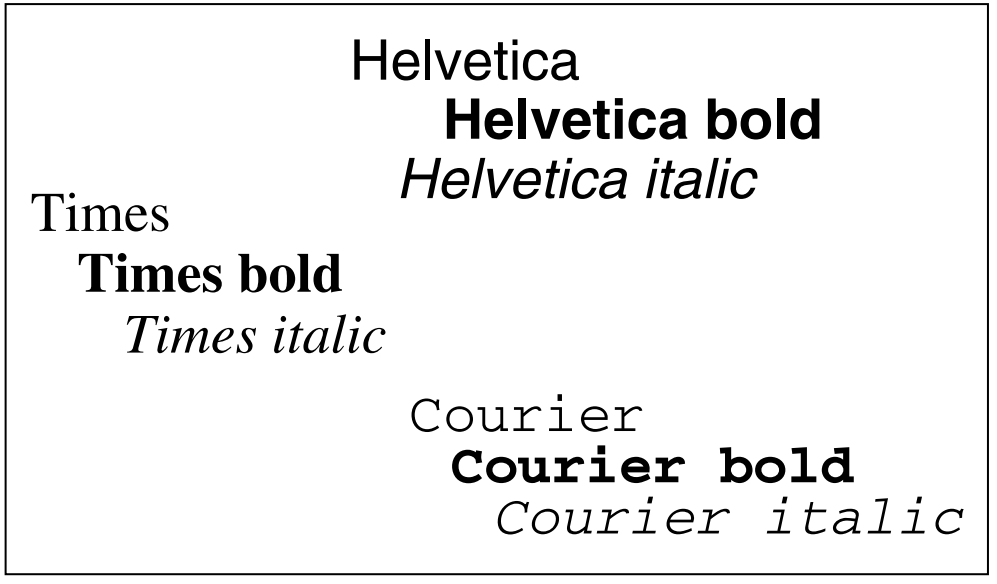


FIGURE 1.15 Some examples of fonts.

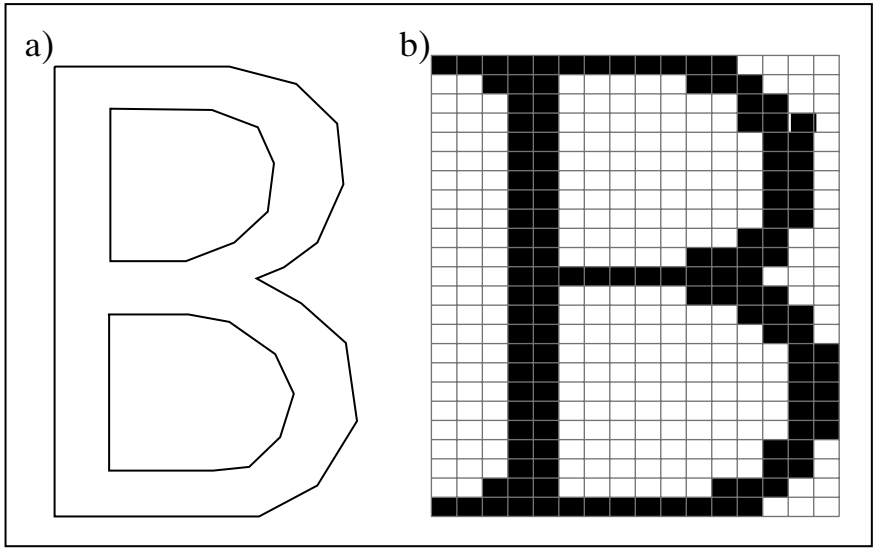


FIGURE 1.16 A character shape defined by (a) a polyline and (b) a pattern of dots.

FIGURE 1.17 Examples of filled polygons.

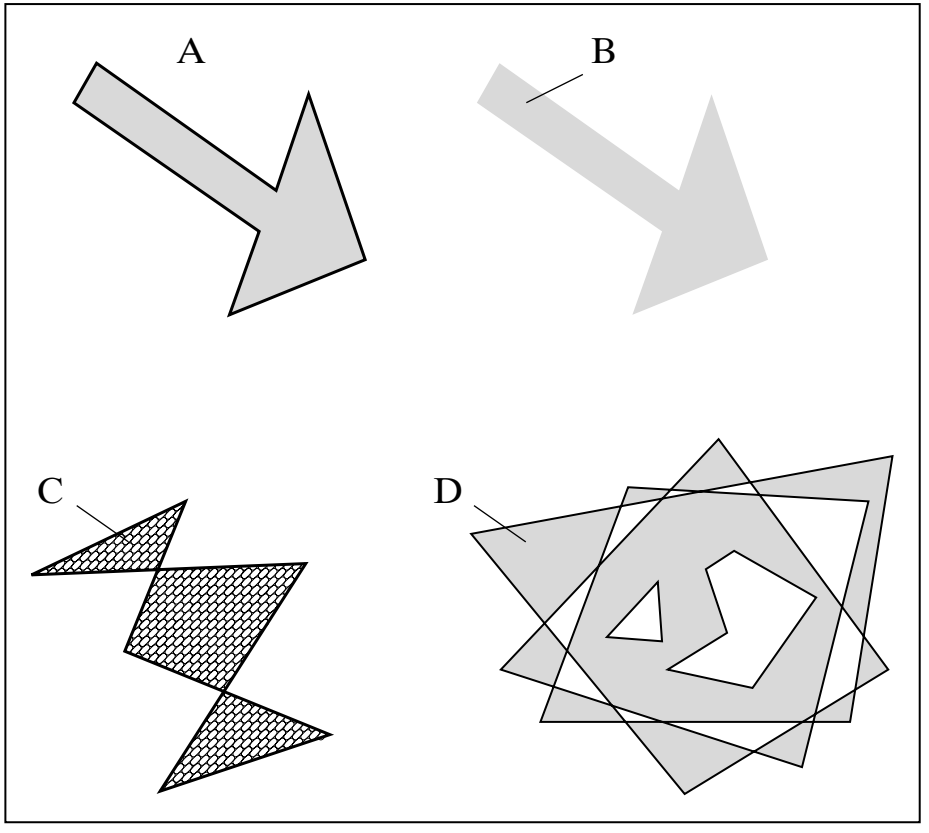
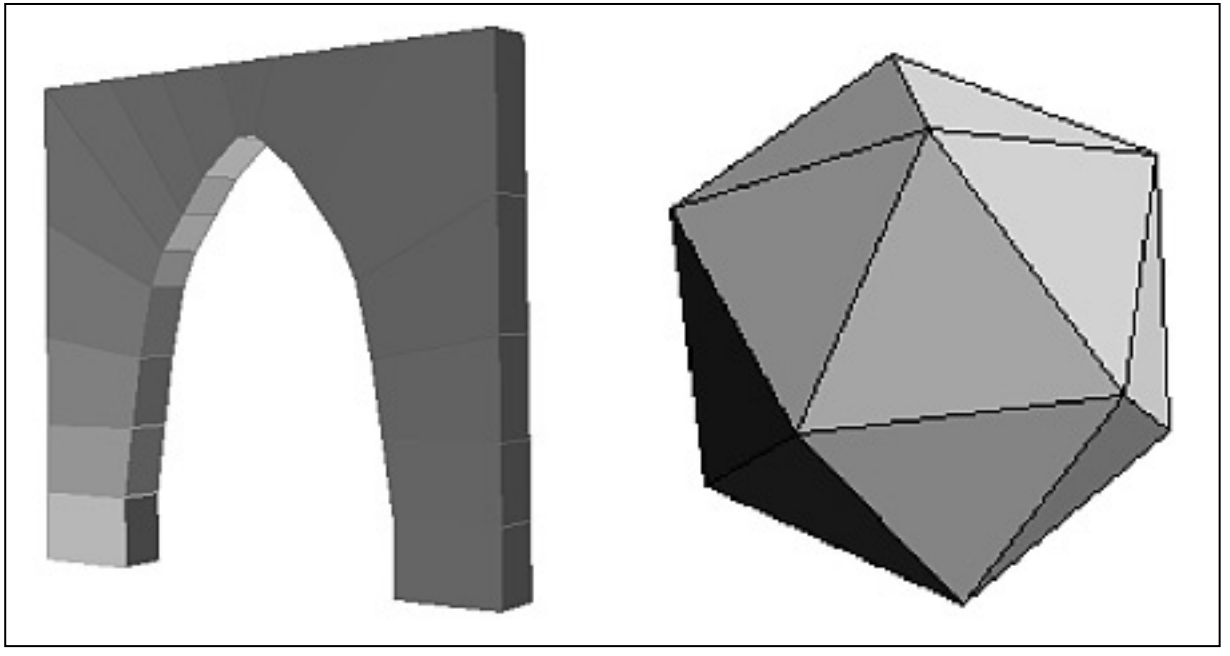


FIGURE 1.18 Filling polygonal faces of three-dimensional objects to suggest proper shading.



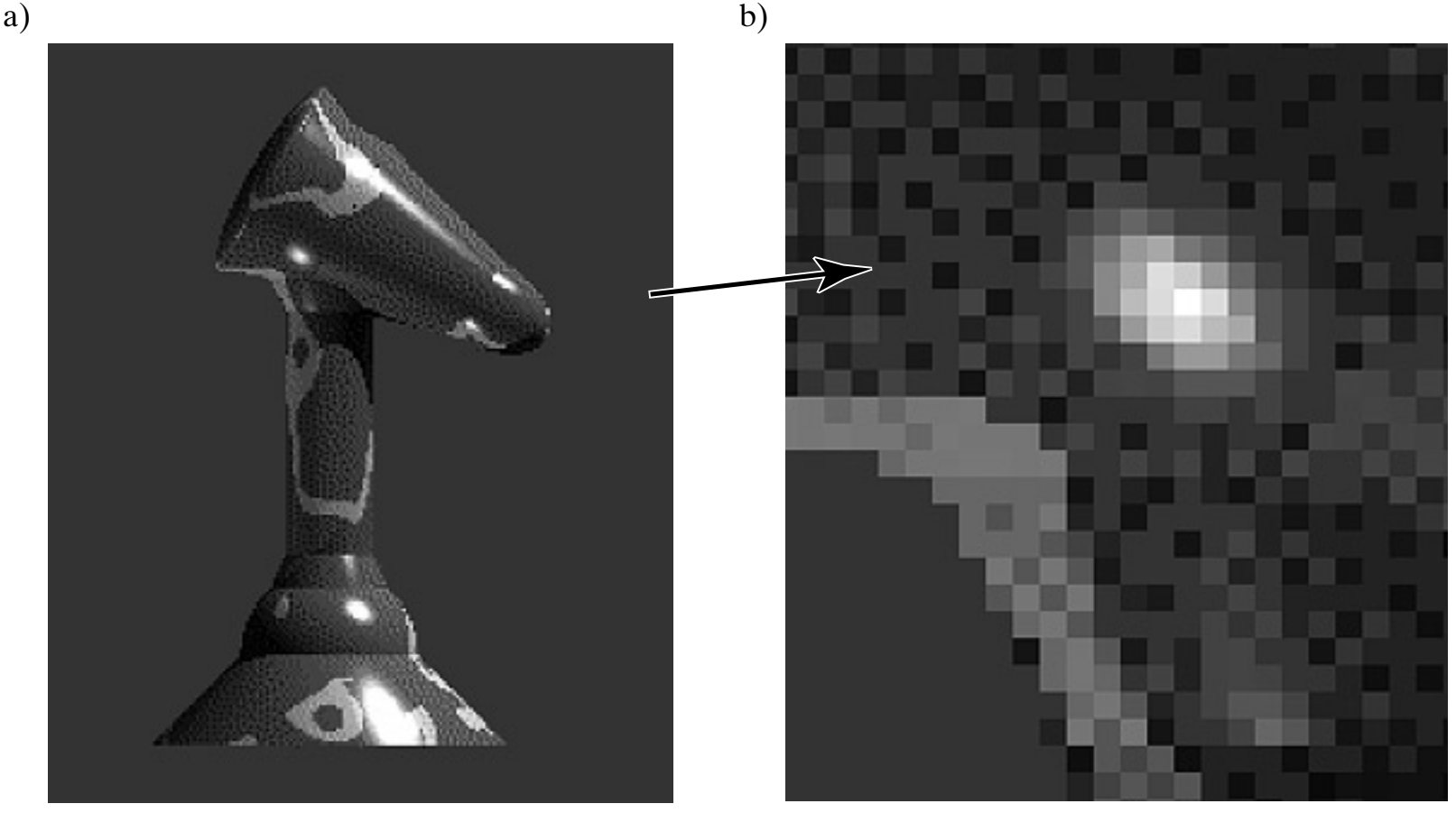


FIGURE 1.19 (a) A raster image of a chess piece. (b) A blowup of the image. (Ray tracing courtesy of Andrew Slater.)

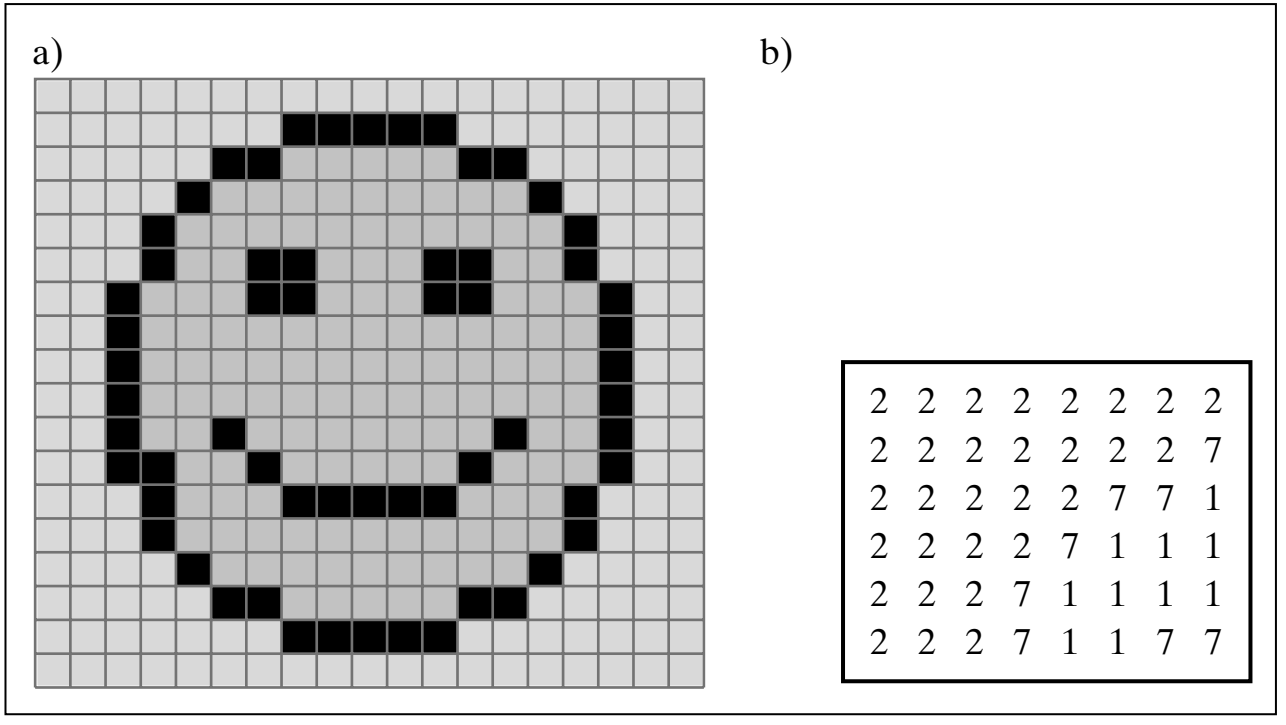


FIGURE 1.20 A simple figure represented as a bit map.

FIGURE 1.21 (a) A collection of lines and text. (b) Blowup of part (a), having "jaggies."

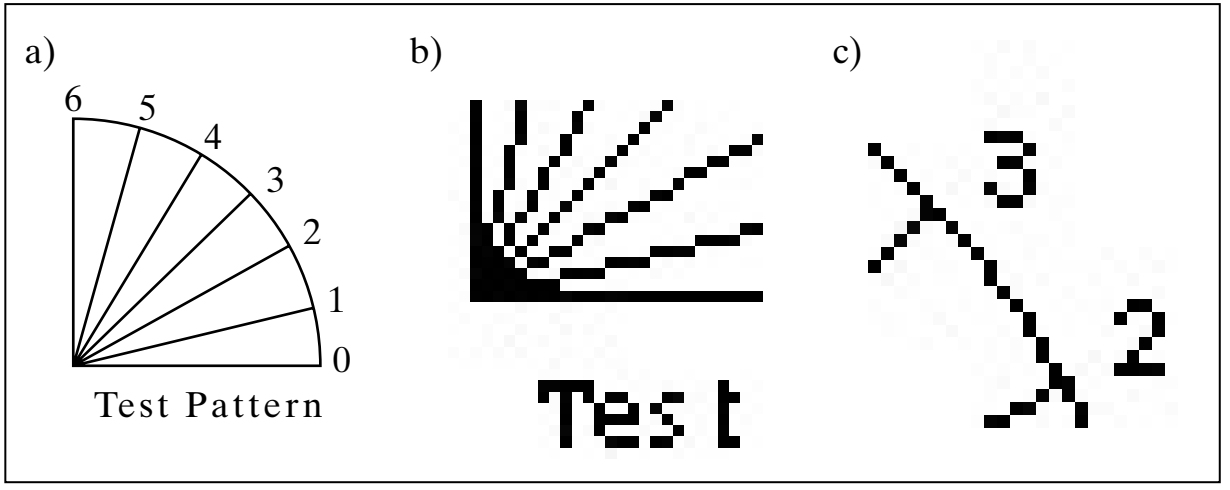


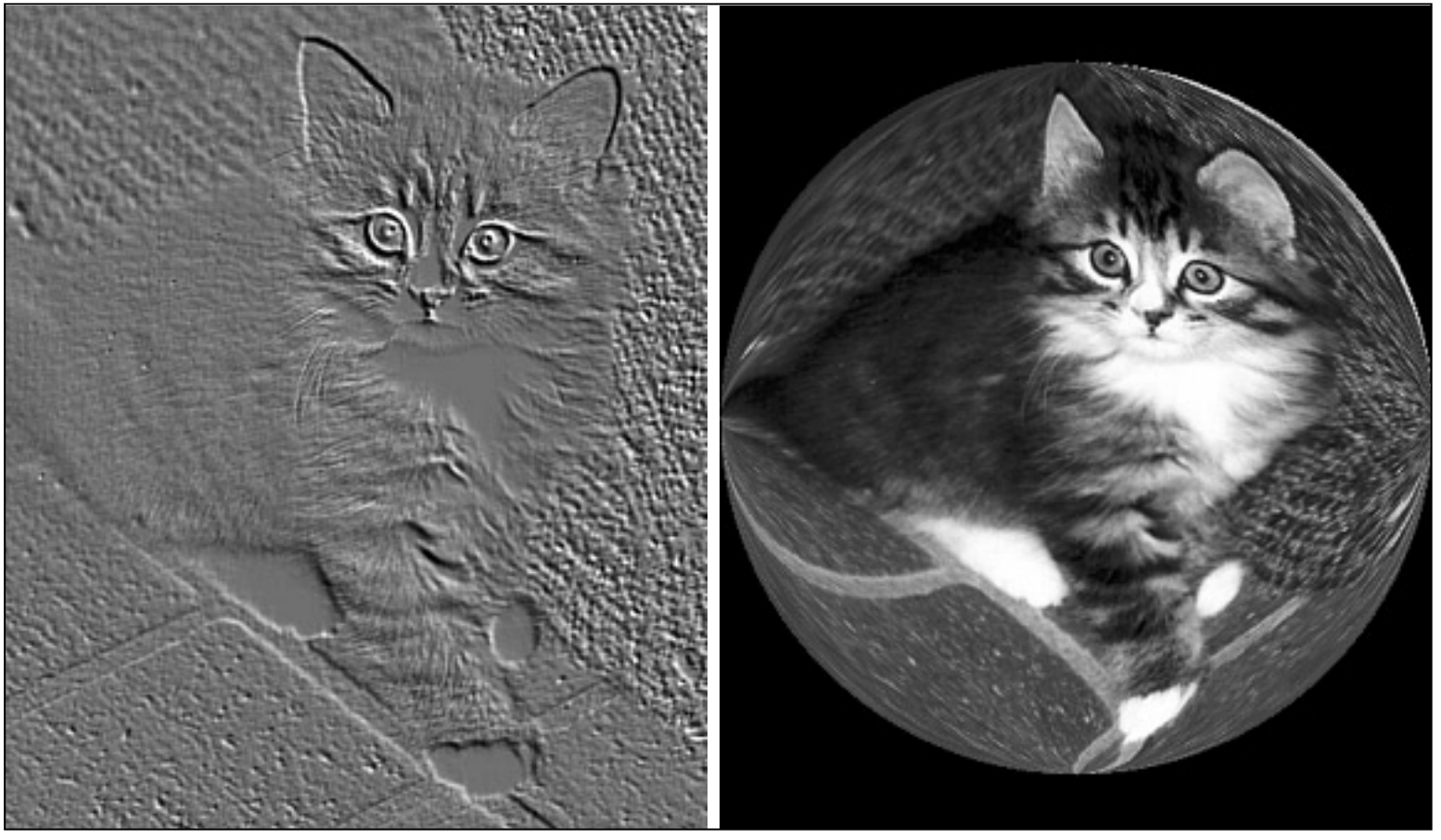
FIGURE 1.22 A scanned image.

FIGURE 1.23 Three successive blowups of the kitten image of Figure 1.22. (a) Three-times enlargement. (b) Six-times enlargement. (c) Twelve-times enlargement.

a) b) c)

a) b)

FIGURE 1.24 Examples of image enhancement.



a) b)

FIGURE 1.25 Examples of altering an image for visual effect.

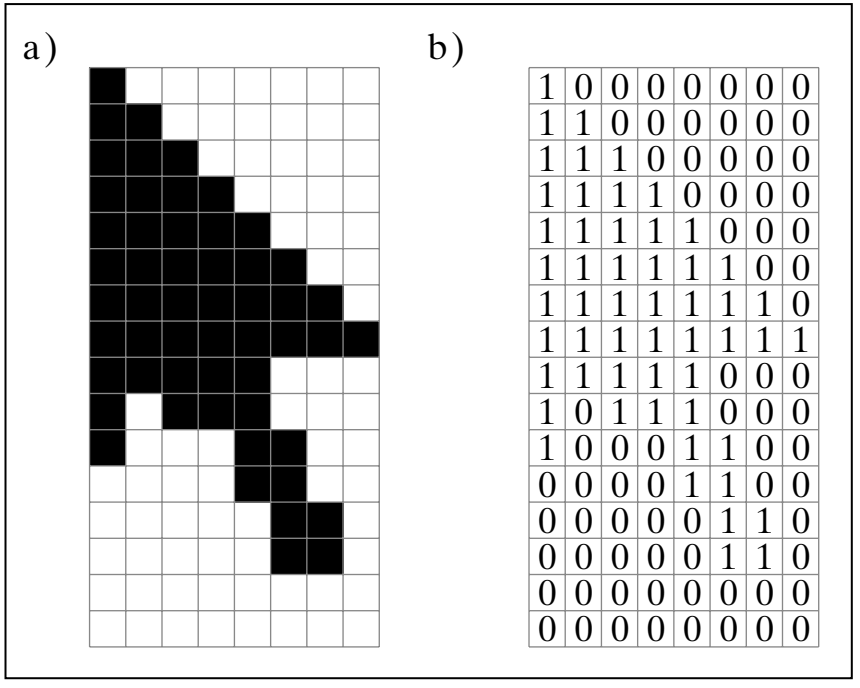


FIGURE 1.26 (a) A bilevel image of a cursor. (b) A bit map of the image.

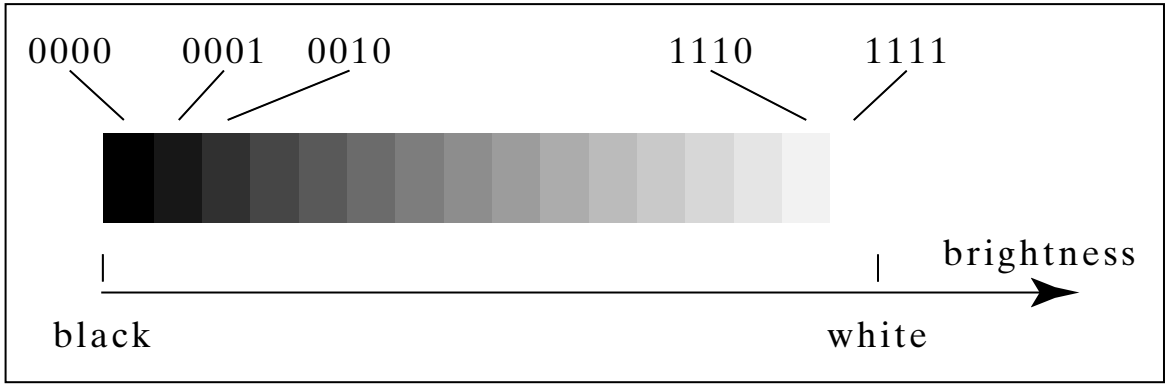
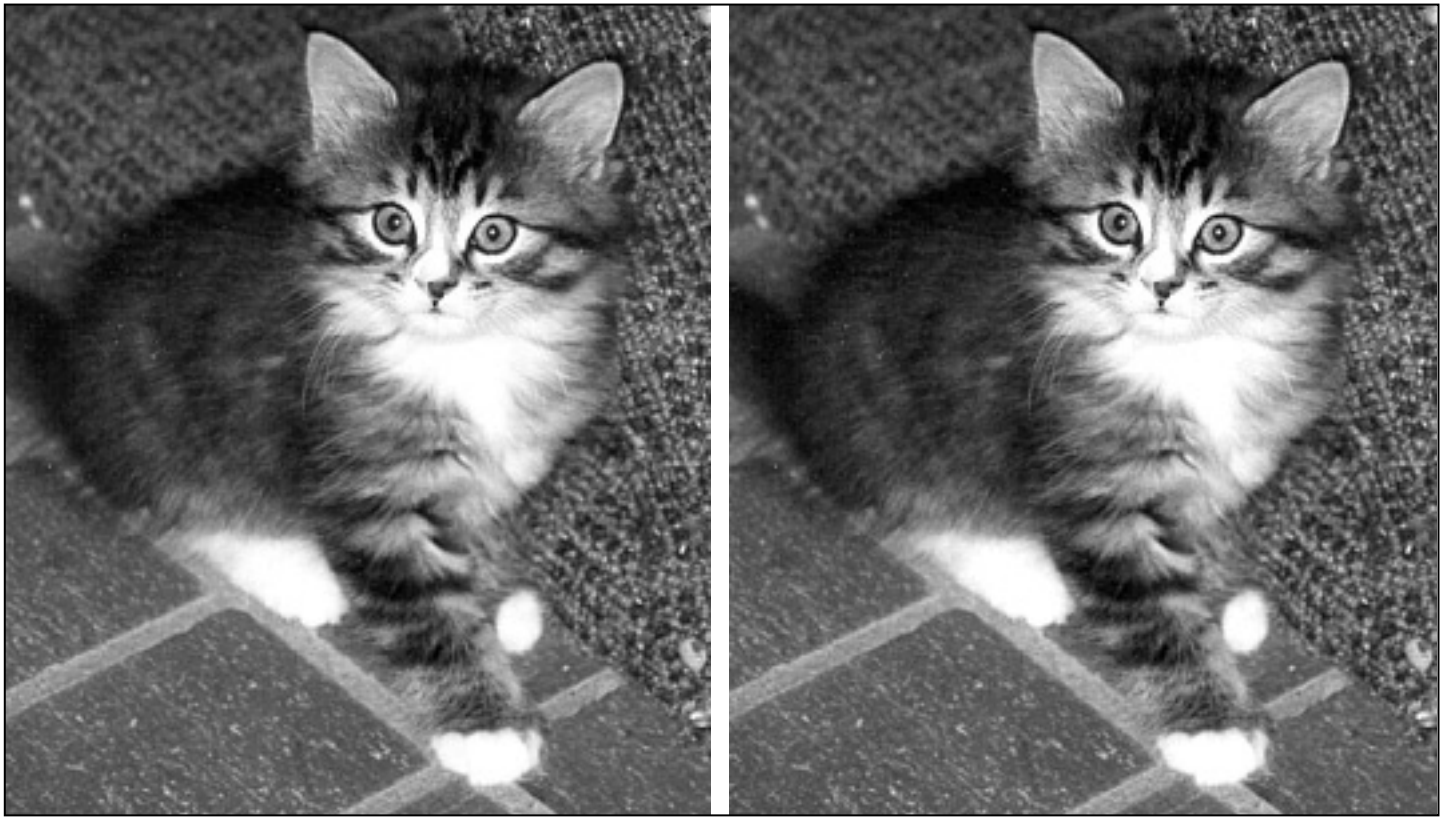
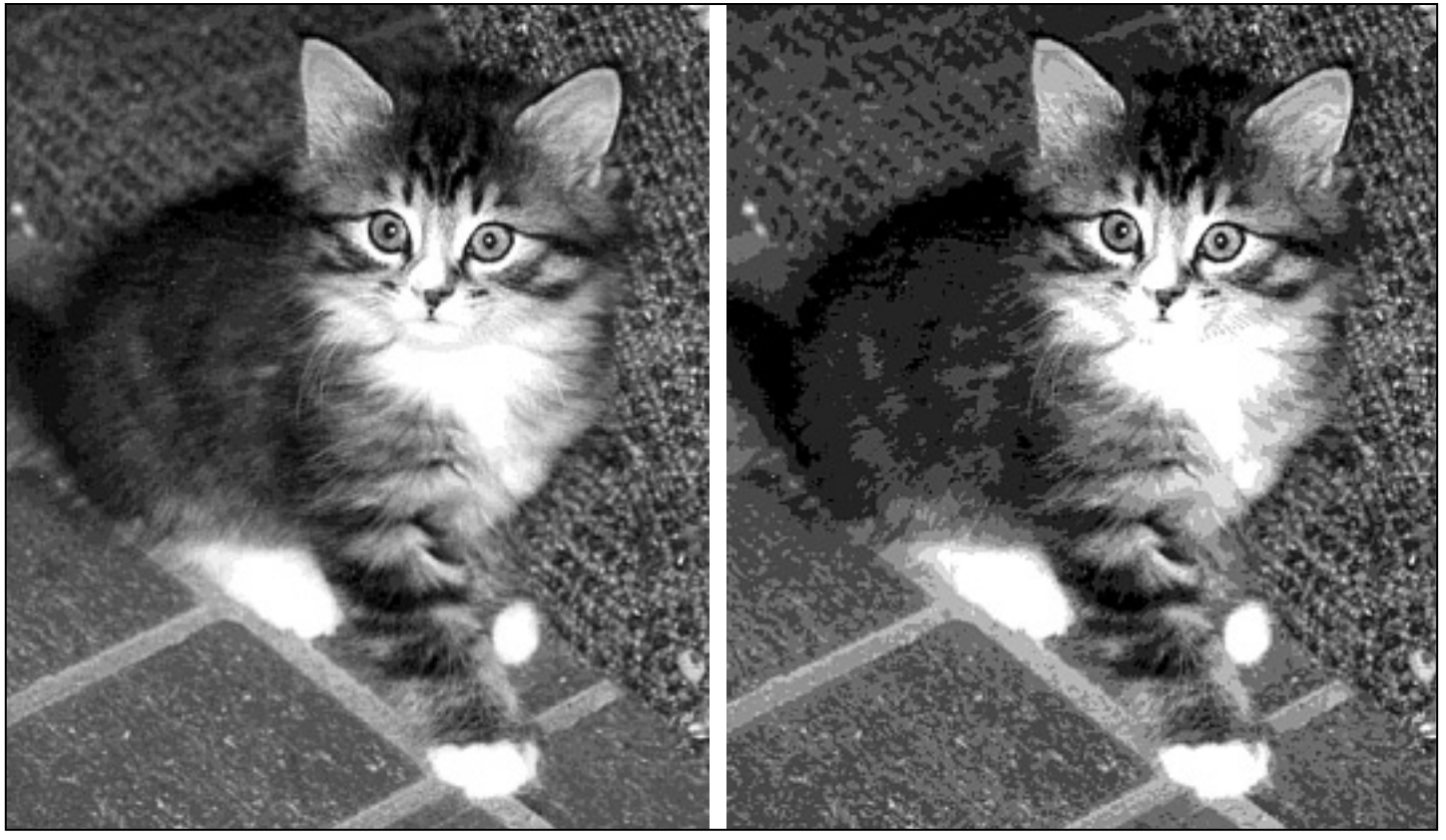


FIGURE 1.27 Sixteen levels of gray.



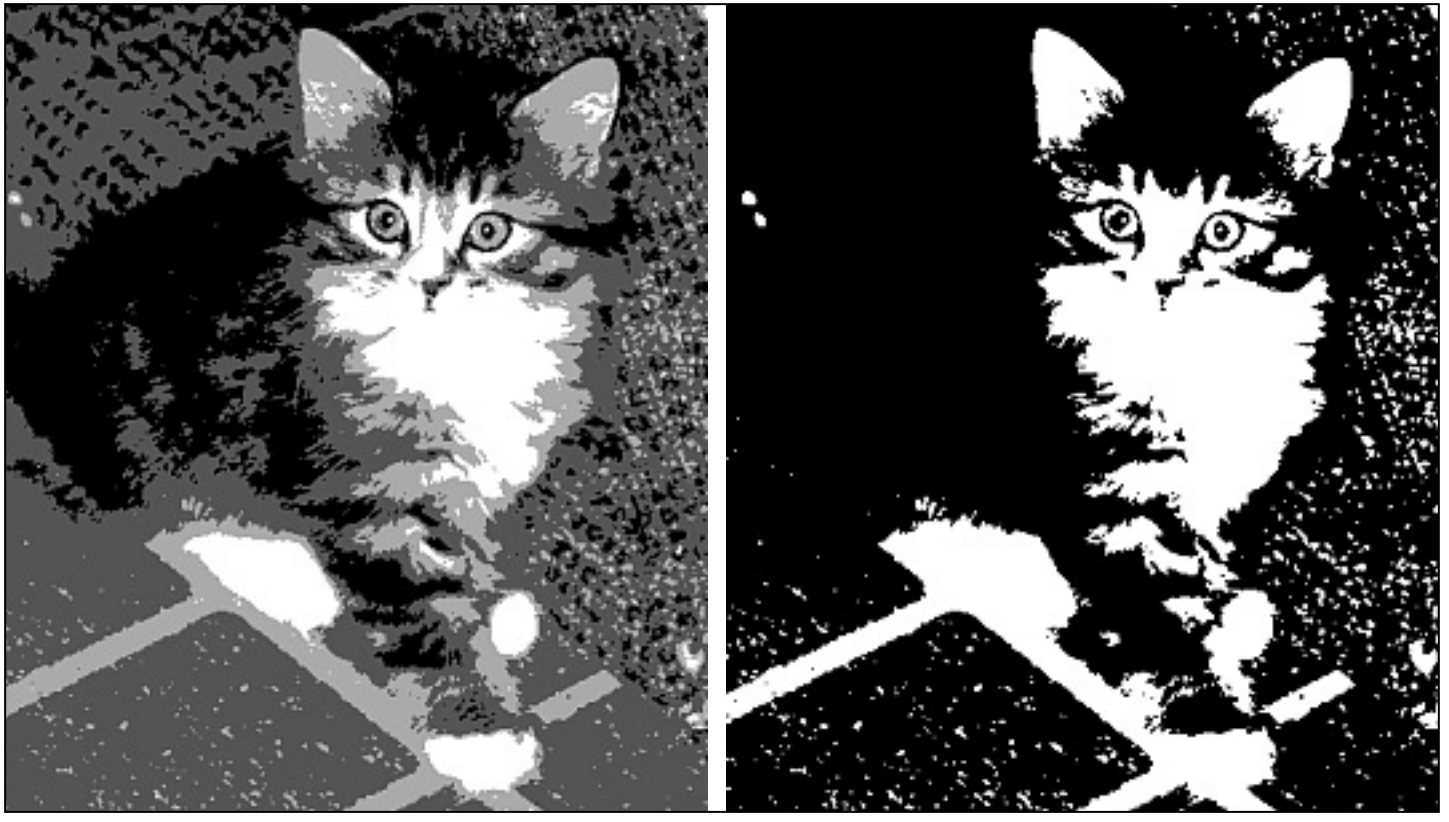
a) b)

FIGURE 1.28 The image of Figure 1.22 reduced to (left) six bits per pixel and (right) five bits per pixel.



a) b)

FIGURE 1.29 The image of Figure 1.22 reduced to (left) four bits per pixel and (right) three bits per pixel.



a) b)

FIGURE 1.30 The image of Figure 1.22 reduced to (left) two bits per pixel and (right) one bit per pixel.

color value	displayed
0,0,0	black
0,0,1	blue
0,1,0	green
0,1,1	cyan
1,0,0	red
1,0,1	magenta
1,1,0	yellow
1,1,1	white

FIGURE 1.31 A common correspondence between color value and perceived color.

FIGURE 1.32 Example of a drum plotter. (Courtesy of Hewlett Packard Company. Reprinted with permission.)

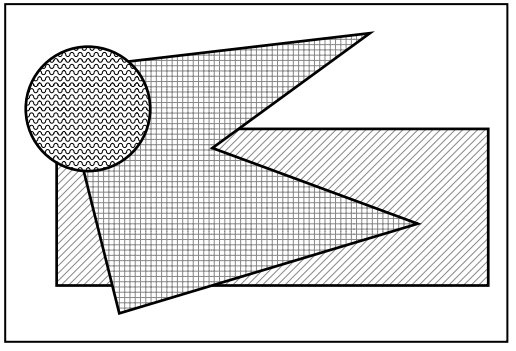
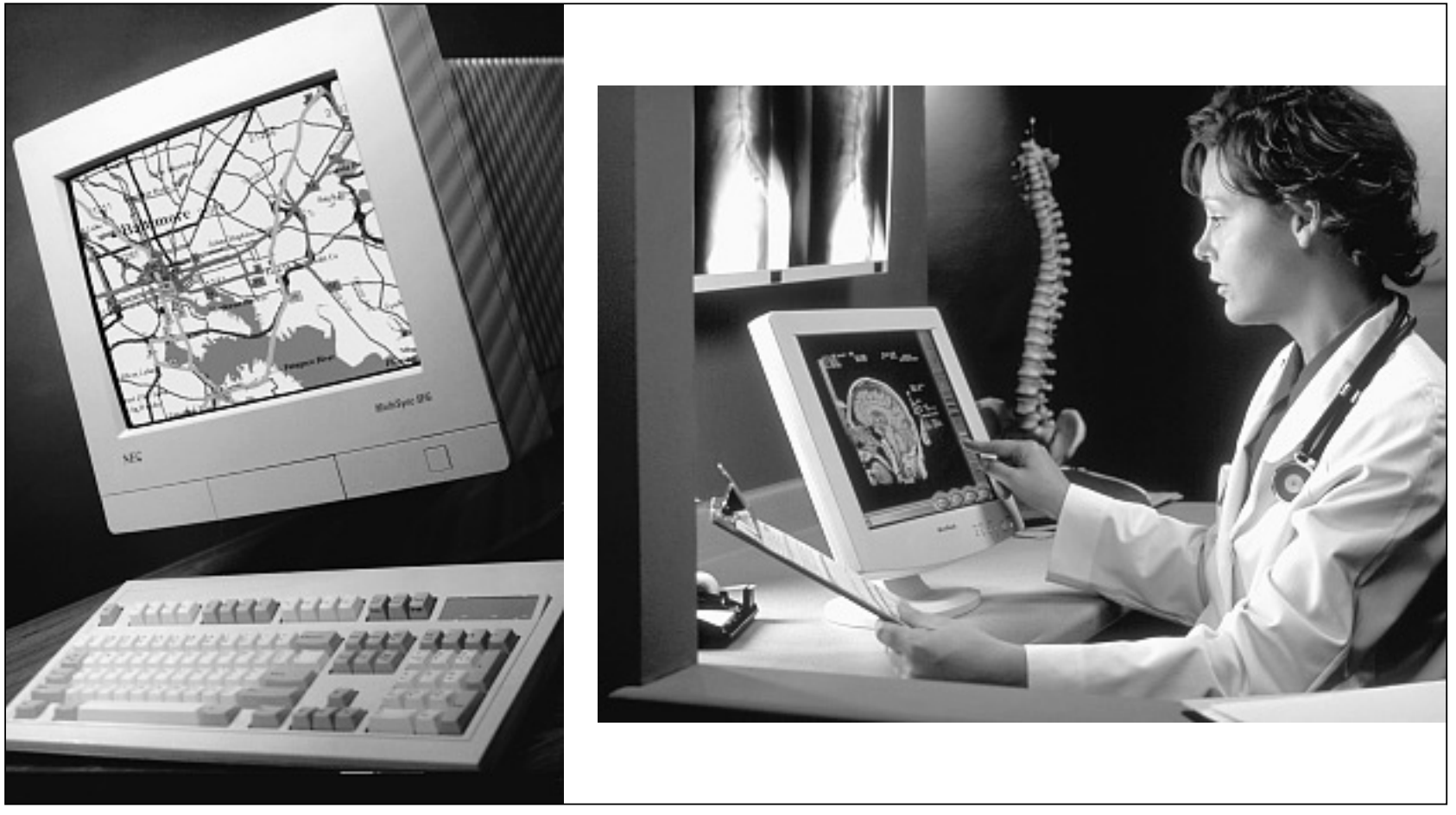


FIGURE 1.33 Cross-hatching to simulate filling a region.

FIGURE 1.34 (a) Video monitors on PC. (b) Flat-panel display.



a) b)

FIGURE 1.35 The built-in coordinate system for the surface of a raster display.

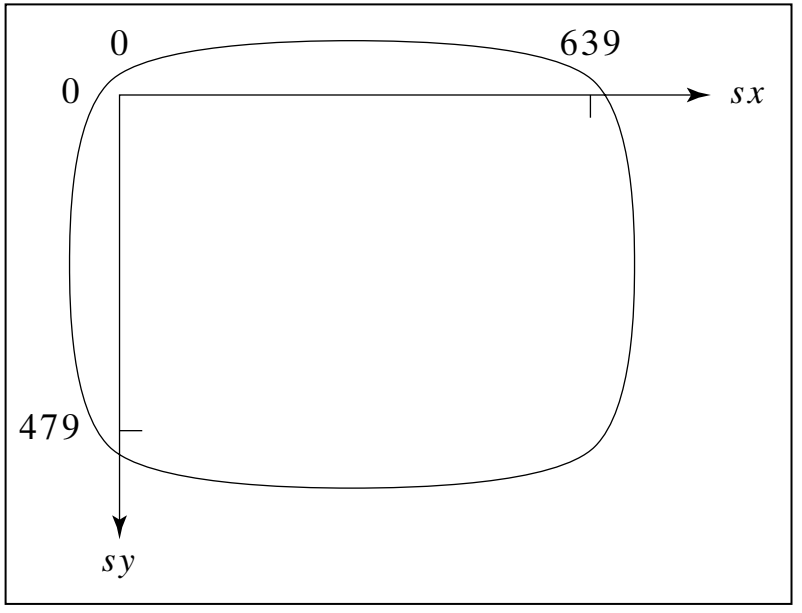
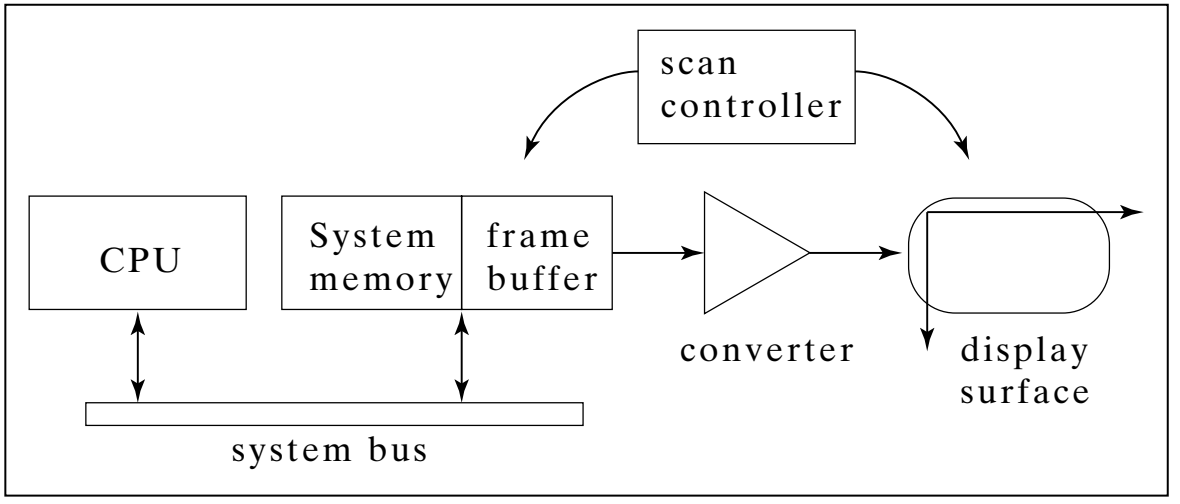


FIGURE 1.36 Block diagram of a computer with raster display.



The Scanning Process

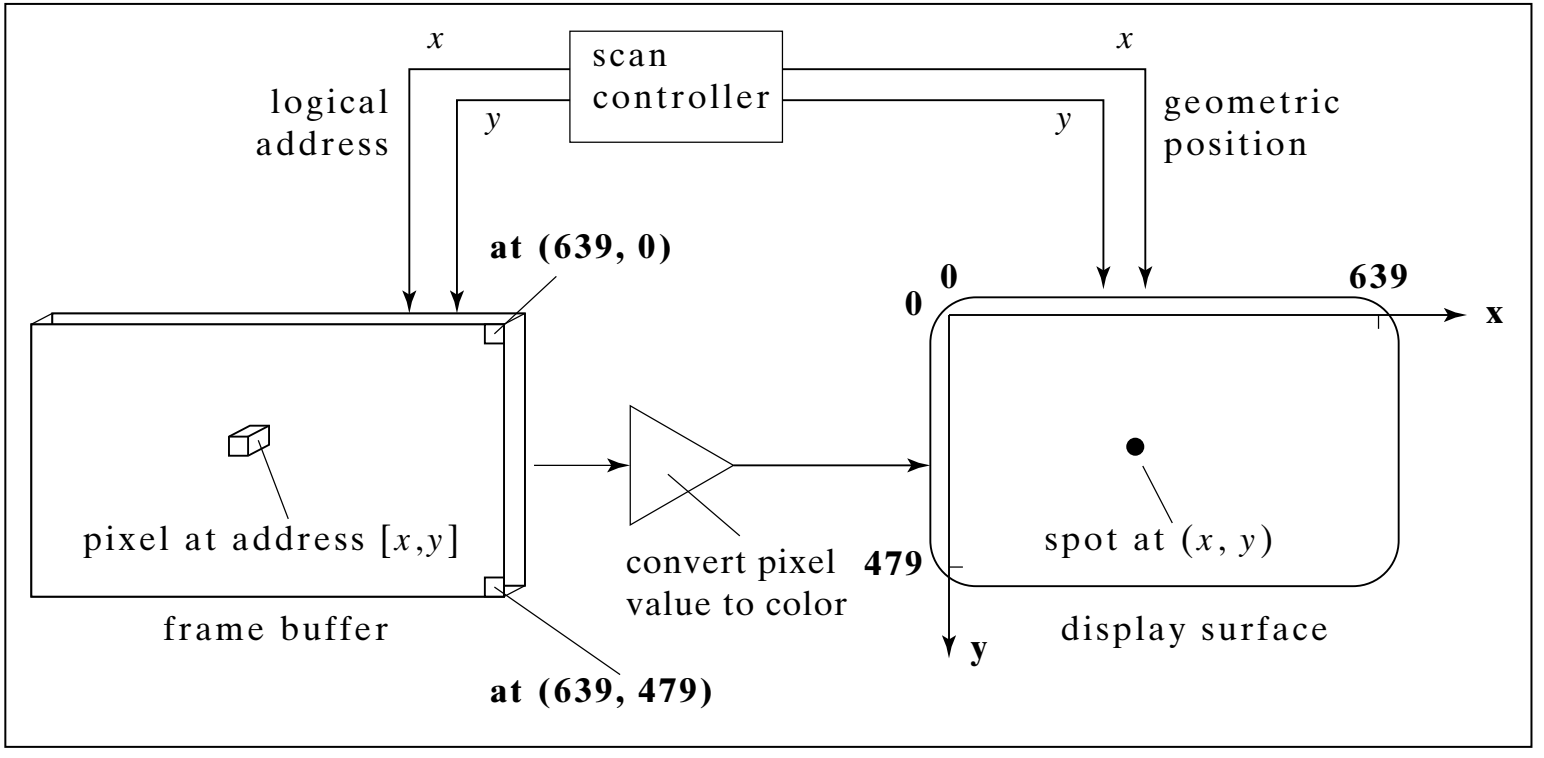


FIGURE 1.37 Scanning out an image from the frame buffer to the display surface.

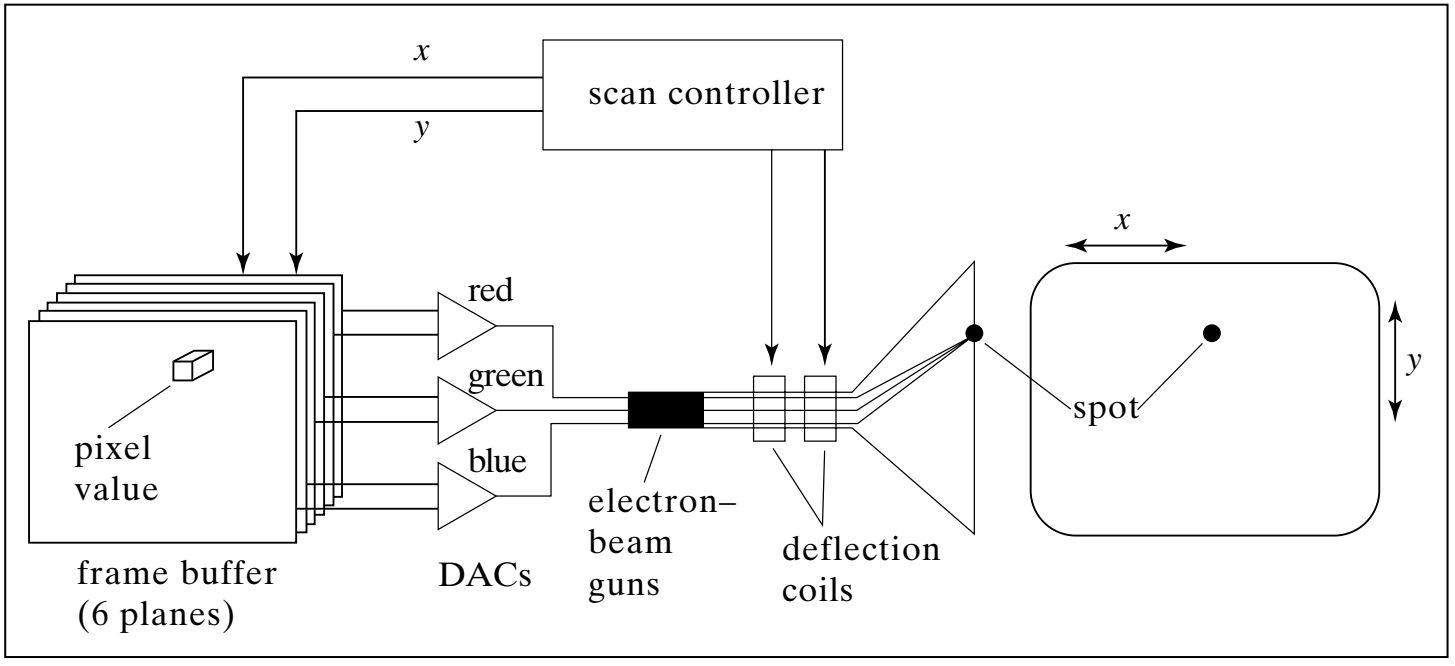


FIGURE 1.38 Operation of a color video monitor display system.

FIGURE 1.39 Input–output characteristic of a two-bit DAC.

Input	Voltage/brightness
00	0 * Max
01	0.333 * Max
10	0.666 * Max
11	1 * Max

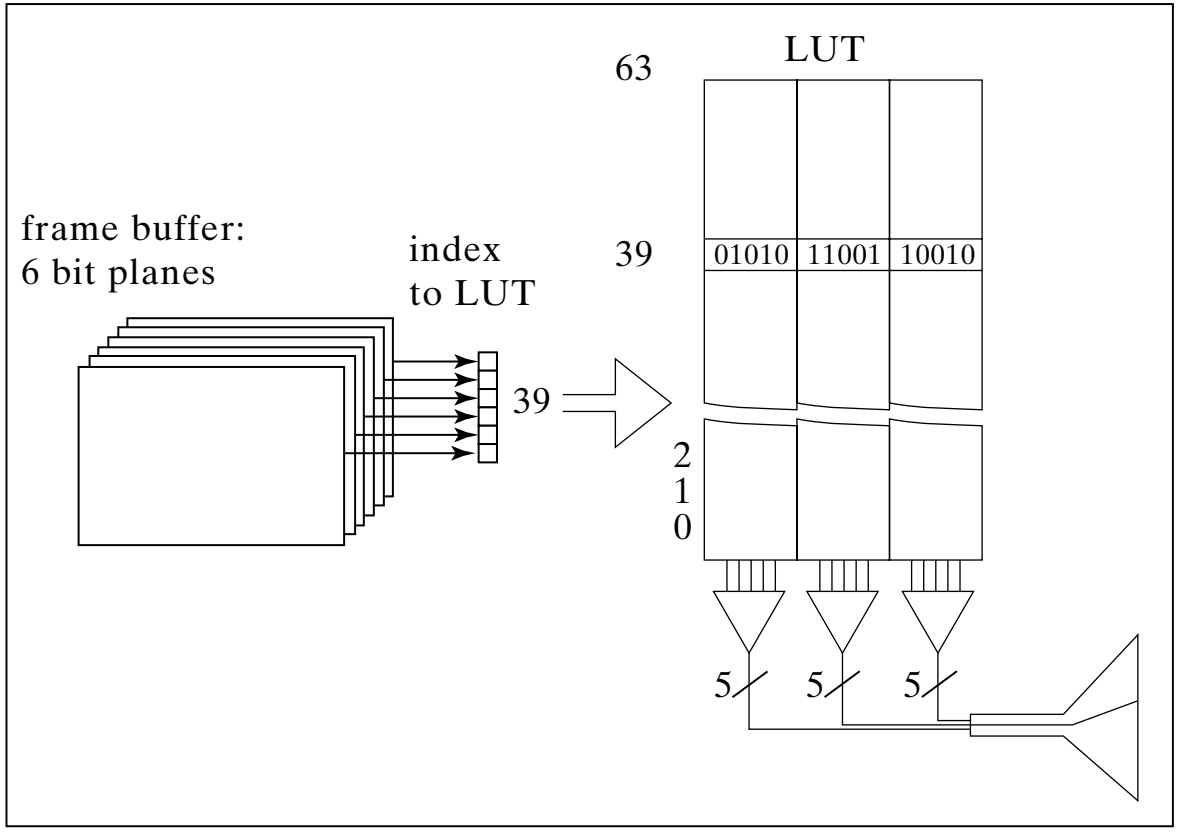


FIGURE 1.40 A color display system that incorporates an LUT.

FIGURE 1.41 Comparison of two raster display systems.

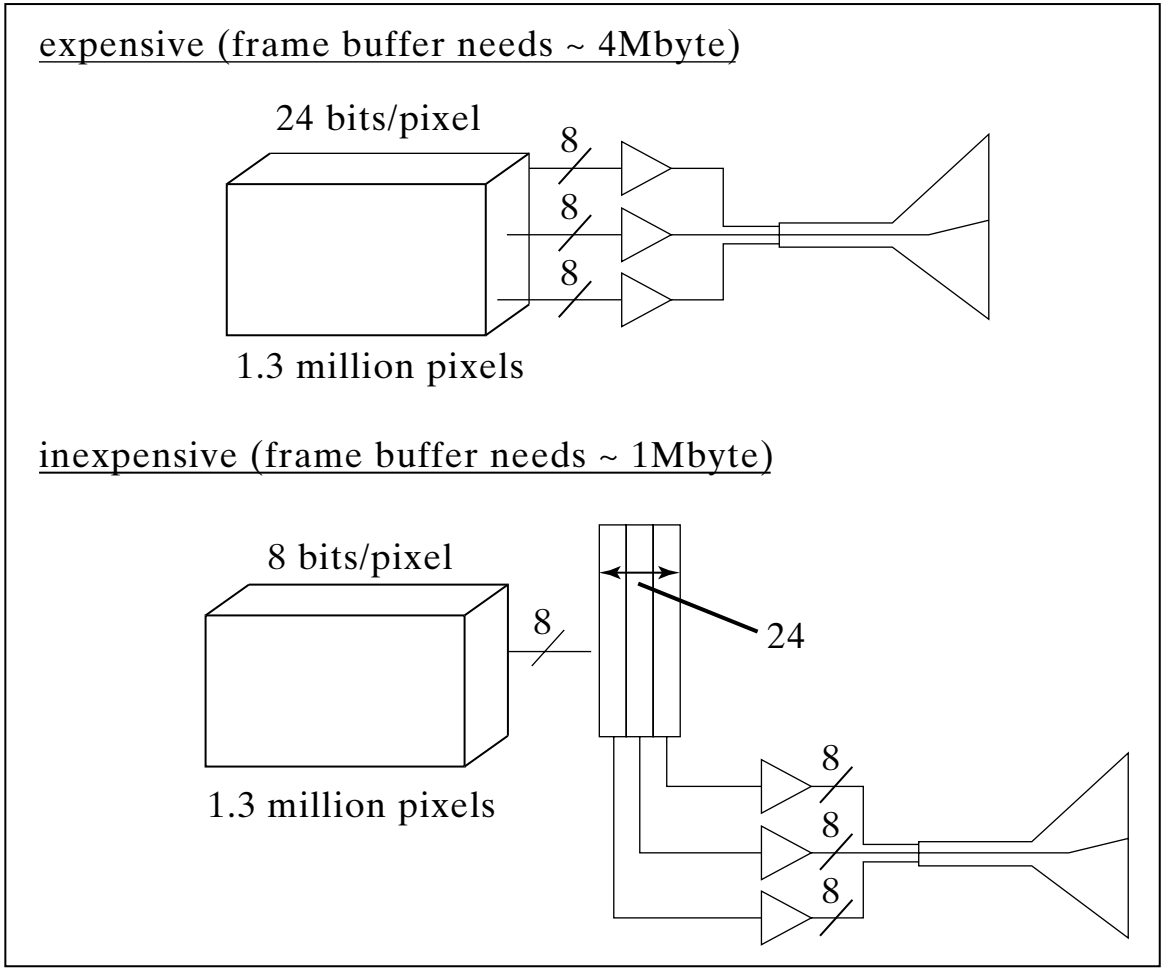
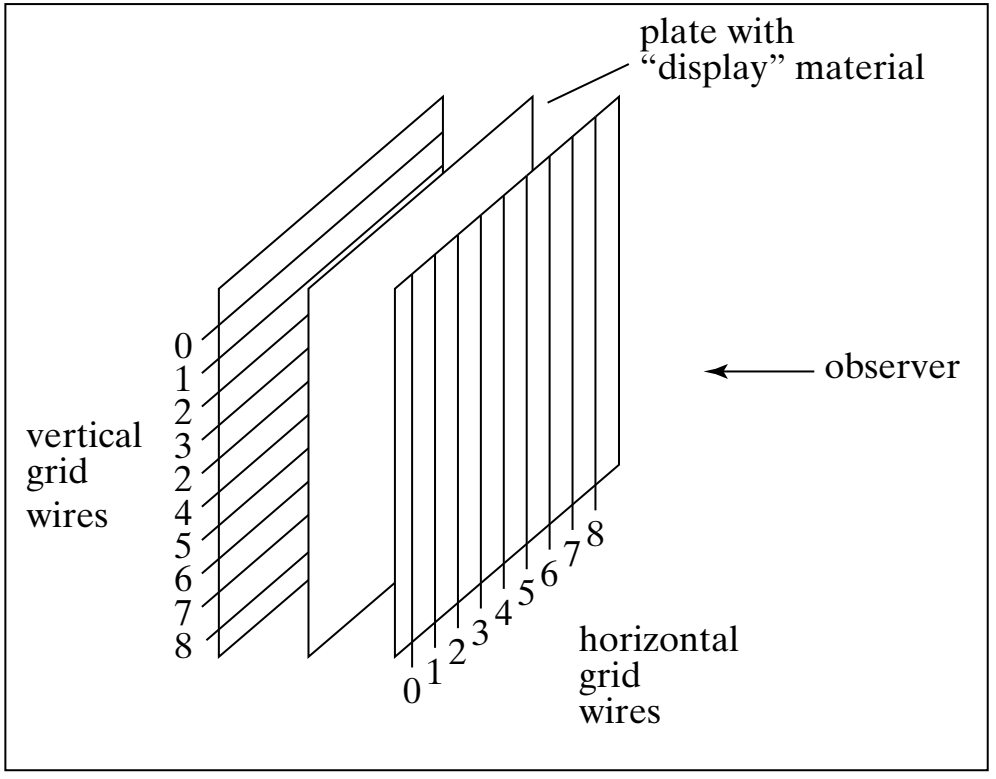


FIGURE 1.42 Flat-panel displays.



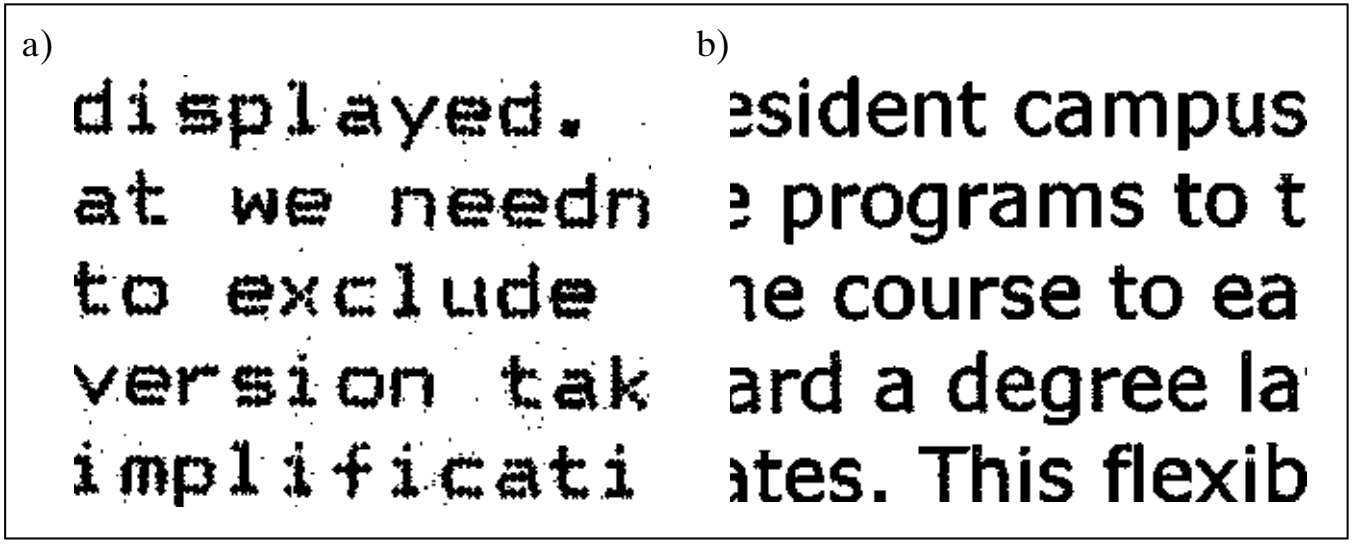


FIGURE 1.43 Blowups of dot matrix and laser printer images.

a) PostScript script

```
200 300 moveto
200 300 200 60 0 arc
closepath
.7 setgray fill
showpage
```

b) Resulting picture

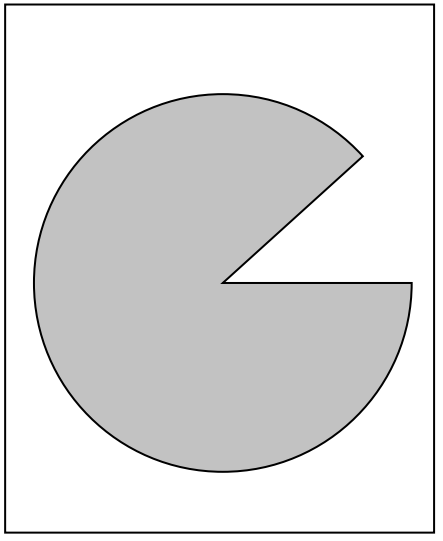


FIGURE 1.44 A PostScript script and the resulting image.

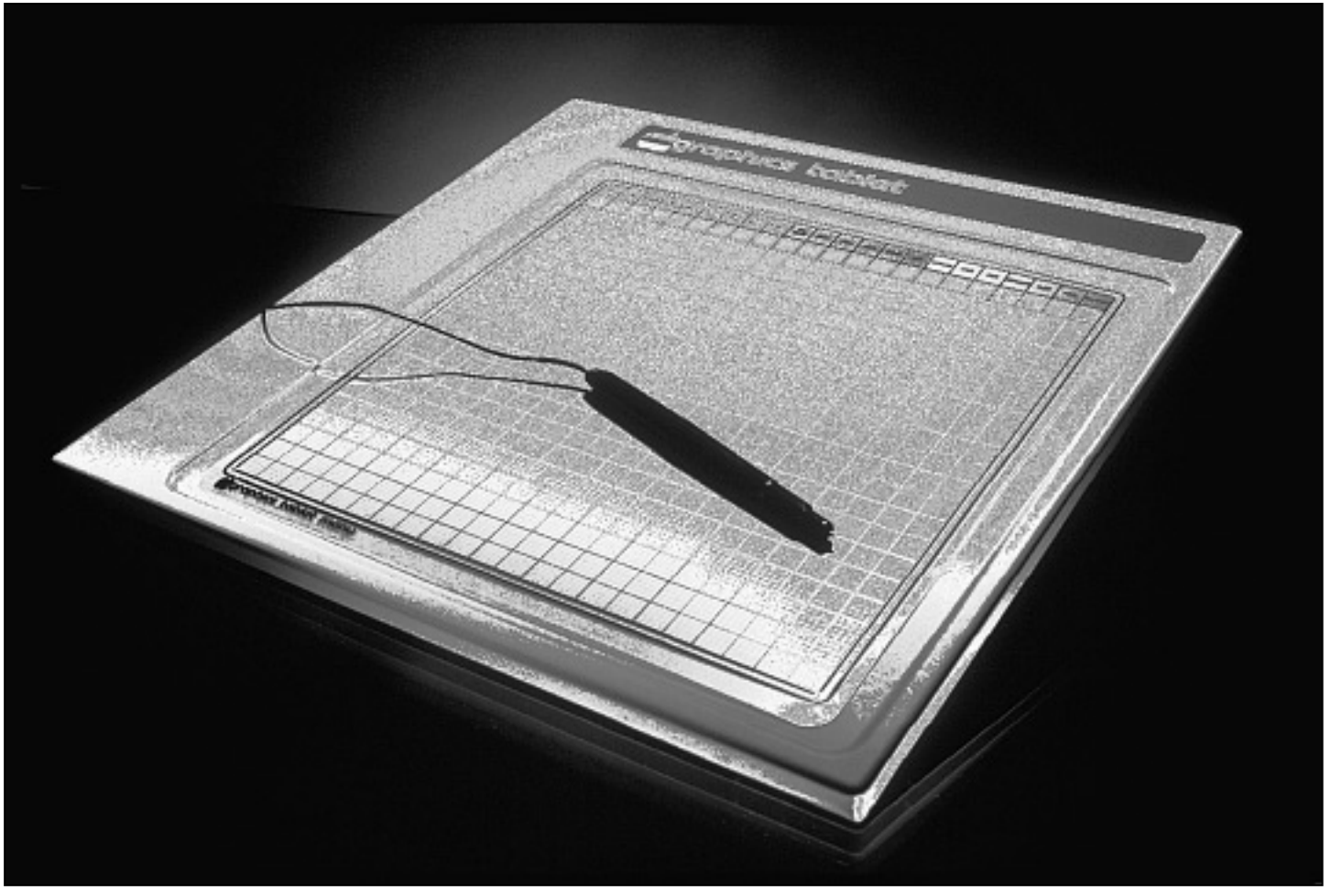


FIGURE 1.45 A graphics tablet.

FIGURE 1.46 Joystick and trackball.

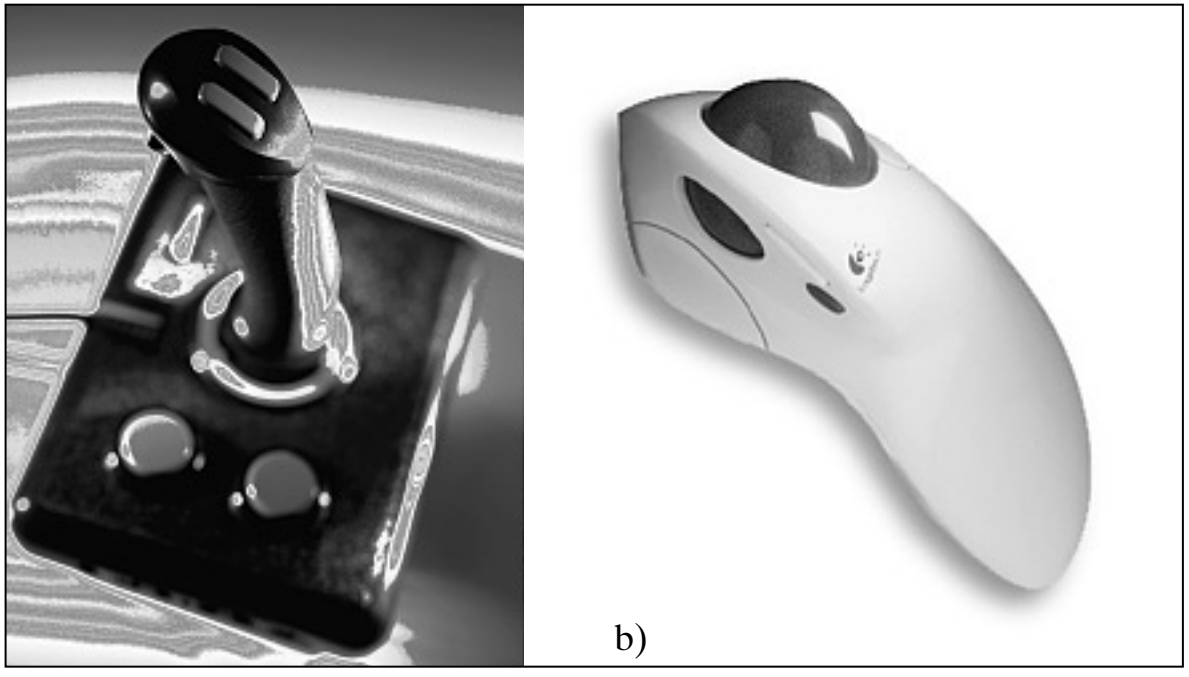


FIGURE 1.47 A bank of knobs. (Courtesy of Tektronix, Inc.)

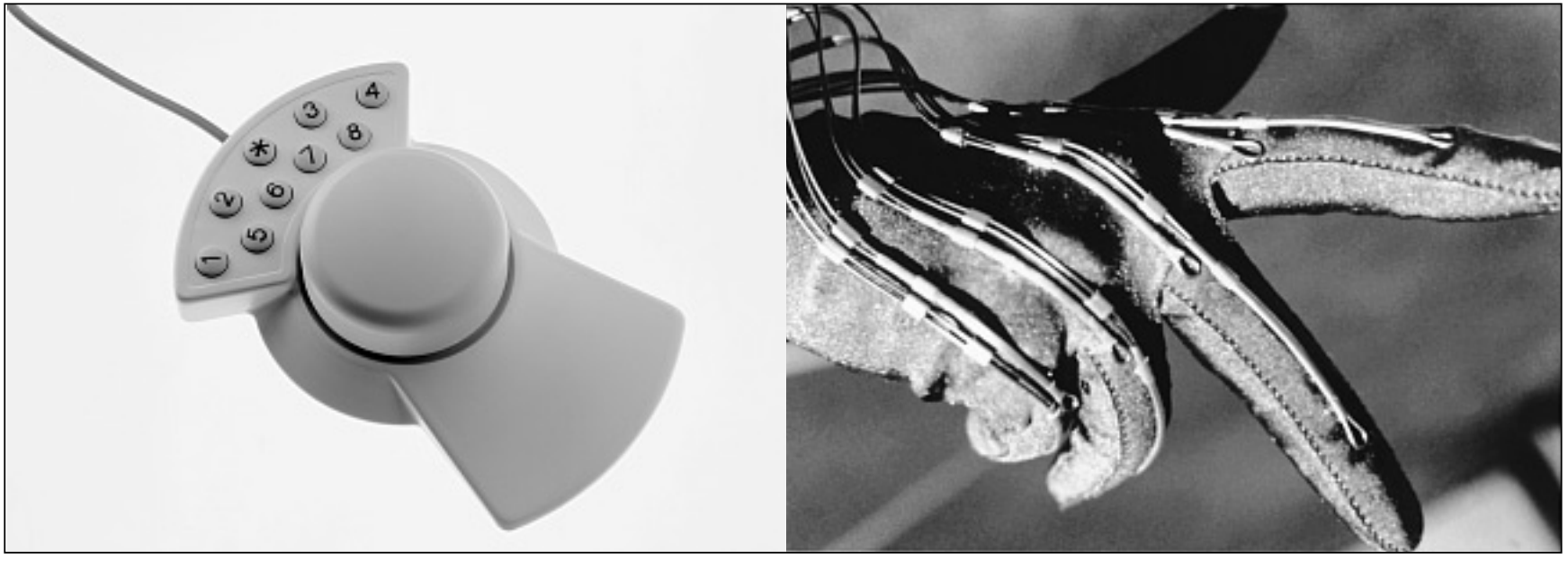
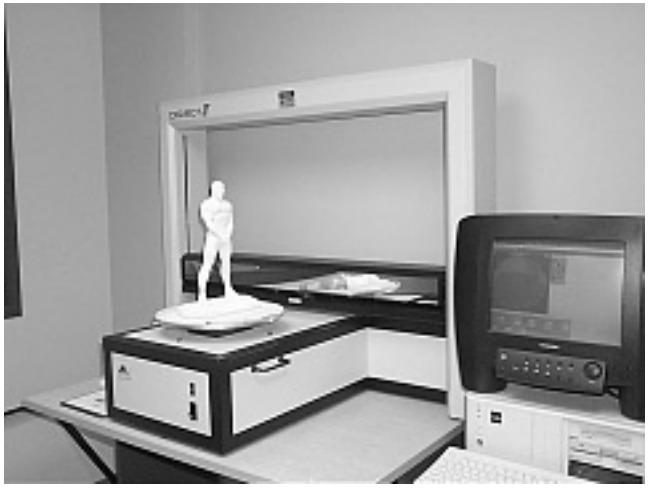


FIGURE 1.48 The space ball (Courtesy of Logicad 3D, a Logitech Company) and data glove (Courtesy of NASA Headquarters).

a)



b)

FIGURE 1.49 Digitizing a three-dimensional shape (Courtesy of Digiboties, Inc.)

FIGURE 1.50 Capturing a dancer's motion (Courtesy of Motion Analysis, Inc.).