

Tablet

The tablet is the most common device used for locating (see Fig. 2.6). It may either be used in conjunction with a graphics display or standalone (called digitizer). It consists of a flat surface and a pen-like instrument called stylus. The stylus is used to indicate a location on the tablet surface.

When used in conjunction with graphics display, feedback from the display is provided by means of a small tracking symbol called a cursor, which follows the movement of the stylus on the tablet surface. Feedback is provided by digital readouts when used as standalone digitizer.

Typically tablets provide two-dimensional coordinate information. The values returned are in tablet coordinates. Software is used to convert the tablet coordinates to world coordinates.

There are different principles used to implement tablets using wires, sound waves and using magnetic principles which are out of the scope of this book.

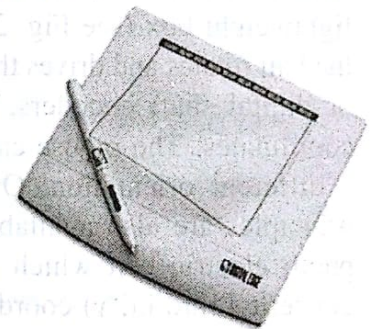


Fig. 2.6 Tablet with Stylus

Joystick

Another locator device is joystick (see Fig. 2.7). A joystick is implemented with two valuator. The valuator controls the movement of the shaft. By using a third valuator to sense rotation of the shaft, a third dimension is incorporated into a joystick. A tracking symbol is normally used for feedback. Joysticks are implemented using forces. The strain in the joystick shaft is measured in two orthogonal directions and converted to cursor movement.



Fig. 2.7 Joystick

Trackball

The trackball is similar to the joystick (see Fig. 2.8). A spherical ball is mounted with a base with half of it projecting above the surface. The ball moves freely in any direction. Two valuator, either potentiometers or shaft encoders, are mounted in the base sense. The movement of the ball controls its relative position. Trackballs are frequently equipped with buttons in order that they can be substituted for a mouse.



Fig. 2.8 Trackball

Touch Panels

Touch panel is another locator device similar to a tablet. Light emitters are mounted on two adjacent edges, with companion light detectors mounted in the opposite edge. Anything interrupting the two orthogonal light beams yields an (x, y) coordinate pair with which location is identified.

Mouse

Mouse consists of an upside-down trackball mounted in a small, lightweight box (see Fig. 2.9). As the mouse is moved across a surface, the ball rotates and drives the shafts of two valuator, either potentiometers or digital shaft encoders. The movement of the shafts provides (x, y) coordinates. The mouse can be picked up, moved and set back down in a different orientation. Optical mouse and mouse based on magnetic principles are also available. These use small light source and a small photo electric cell which produce light pulses which are counted and converted into (x, y) coordinates.

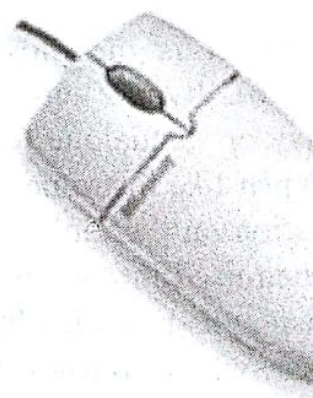


Fig. 2.9 Mou.

Light Pen

Light pen is a pick device. It contains a sensitive photoelectric cell. The basic information provided by the light pen is timing and hence it depends on the picture being repeatedly produced in a predictable manner.

There are many more devices that are useful for graphic applications which are not included in this book. Some of them are control dial, space ball, data glove, function switches, scanners and 3-D digitizers.



Fig. 2.10 Light

2.4 LOGICAL FUNCTIONING OF GRAPHIC I-O DEVICES

We have already discussed some of the physical interactive devices. Now we discuss their logical functional capabilities. One physical device may have more than one logical functional capability. The functional capabilities are classified into four logical types. They are locator function, valuator function, choice function (button function) and pick function.

Locator Function

The locator function provides two or three dimensional coordinate information. Generally, the coordinates returned are in normalized coordinates and may be either relative or absolute. Examples include tablet, touch panel, joystick, mouse, track ball etc.

Valuator Function

The valuator function provides a single value as a real number. This may be bound or unbound. A bound valuator has mechanical or programmed stops within a fixed range while an unbounded valuator has an infinite range.

Button or Choice Function

The choice function selects and activates events or procedures which control the interactive flow or change the underlying task. It generally provides binary information. Keyboard is a specific example of collection of buttons or choice functions.

Pick Function

The pick function selects objects within the displayed picture. It picks up the selected objects.

2.5 OUTPUT DEVICES

Apart from the display devices there are many output devices. Some of them are hard copy devices like inkjet printers, laser printers, plotters etc., the features of some of them are discussed below.

Inkjet Printers

These are raster scan devices and useful for generating low cost color output. The basic idea of these printers is to sprinkle very small drops of ink onto the medium (normally a paper). There are many types of inkjet printers depending on their flow. The resolution of inkjet printers is determined by the size of the drops, i.e. the size of the nozzle of the drops. As the nozzle size is very small, nozzle clogging, air bubbles and dry up of ink are some of the general problems of these printers. Color inkjet printers have four nozzles one for each color and one for black. Each of the three colors is blended together before drying to get the required color.

Laser Printers

A laser printer is also a raster scan device. The print engine contains a drum coated with some material which is photoconductive. The drum is scanned by a semiconductor diode laser. As the drum rotates, the coating is electrically charged and remains charged until it is struck by light from the laser. The light discharges selecting on the drum to form a negative image. A toner, which is a black powder, is attracted to the charged areas of the drum. The toner is fused to the paper using heat and pressure which forms a permanent image.