UNIT 5

Graphical Input Device and Input Techniques

Graphical Input Device : An input device is any peripheral device (piece of hardware) used to provide data and control signals to an information processing system. All the computers have keyboard which is an input device. The other input devices are Mouse, trackball, joystick, touchpad and Light pen.

Two types of Graphical interaction

1. **Pointing Device**- points item already on the screen
2. **Positioning Device**- positioning new items.

A. Keyboard:

In a computer a "keyboard" is a device that converts letters, numbers and other character into electrical signals that are machine readable by the computer's process. The keyboard may look like a typewriter keyboard to which some special keys have been added.

- It is an Input Device.
- It is design came from typewriter.
- A person can type document access menus, play games and perform variety of tasks.

The keys on computer keyboards are often classified as follows **alphanumeric keys, punctuation keys and special keys.**

B. [Mechanically Operated Use Serial Engineer]

Types of Mouse:

1. Mechanical mouse
2. Opto Mechanical
3. Optical mouse.

Main Goals of Mouse

It is to translate the motion of the hand into signals that the computer can understand and use.

* A mouse is small hand-held box used to position the screen cursor.
* The mechanical mouse uses a rubber coated ball on the underside. The movement of this ball will sends electrical signals to the system.
* The optical mouse uses diodes to emit light on to a metal pad.

Actions:

1. **Pointing**: Points to a particular object on the screen.
2. **Single click**: It selects the object.
3. **Double click**: It opens selected files.
4. **Right click**: Displays a popup menu corresponding to the selected object.
5. **Drag and Drop**: Dragging the one object to another location.

Advantages:

1. Easy to use
2. Low cost
3. No need to type command
4. Easy to select menus and open them

C. Touch Pad: It is pointing devices consists of specialized surface and translate the motion and position of a user's finger to relative position on screen.

* Touchpad's are small sensitive tablets commonly used on laptop computers.
* Most Touchpad supports support an absolute mode to allow Asian language to input or signature.
* Touchpad typically respond in relative mode because of the small size of the pad.

Features

1. They are commonly used for laptops.
2. Used as a substitute for a computer mouse.
3. Touch pads vary in size but are rarely made larger than 40 square centimetres.

A basic touch pad has 3 main components.

1. Touch sensor.
2. Controller.
3. Software driver.

D. Trackball: It is a computer cursor control device that can be rotated with the fingers (or) palm of the hand.It was invented by **Tom Cranston** and **Fred Long**

staff as part of the Royal Canadian Navy's DATAR system in 1952.Compared with a mouse, a trackball has no limits on effective travel; a mouse can reach an edge of its working area. A Trackball is a ball that can be rotated with the fingers to produce screen cursor movement. Potentiometers attached to the ball measure the amount and directions of rotation. Trackball are used for three dimensional positioning and selection operations in virtual systems.

E. Joystick: It is an input device consisting of a stick that pivots on a base and reports its angle or direction to the device it is controlling.

* A joystick consists of a small, vertical level mounted on a base that is used to steer the screen cursor around.
* Most joysticks select screen positions with actual stick movement. Potentiometers mounted at the base of the joystick measure the amount of movement.

F. Light Pen

* Light pen is a pointing device similar to a pen. It is used to select a displayed menu item or draw pictures on the monitor screen. It consists of a photocell and an optical system placed in a small tube.
* When the tip of a light pen is moved over the monitor screen and the pen button is pressed, its photocell sensing element detects the screen location and sends the corresponding signal to the CPU.

G. Track Ball

* Track ball is an input device that is mostly used in notebook or laptop computer, instead of a mouse. This is a ball which is half inserted and by moving fingers on the ball, the pointer can be moved.
* Since the whole device is not moved, a track ball requires less space than a mouse. A track ball comes in various shapes like a ball, a button, or a square.

Graphical Input Techniques: The Co-Ordinate information of the object can be entered using input devices. Once the information has entered in it can be modified to re-arrange (or) reshape the object. We see several techniques available in Graphical packages to construct the interactive pictures using input devices.

Positioning Techniques

Positioning involves the user in the first moving cursor (or) tracking cross to the desired spot on the screen and then notifying the computer by pressing a button (or) key. A single positioning operation can be used to insert a symbol as in the picture and two succession can be defined the end points of a line.

The user indicates a position on the screen with an input device and this position is used to insert a symbol. Positioning is also known as locating.

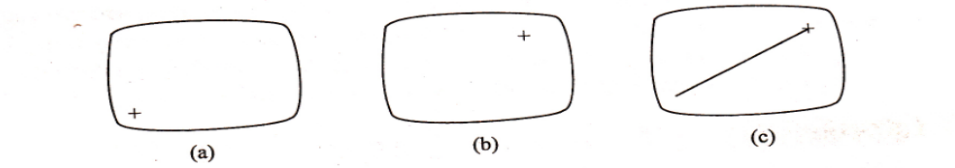
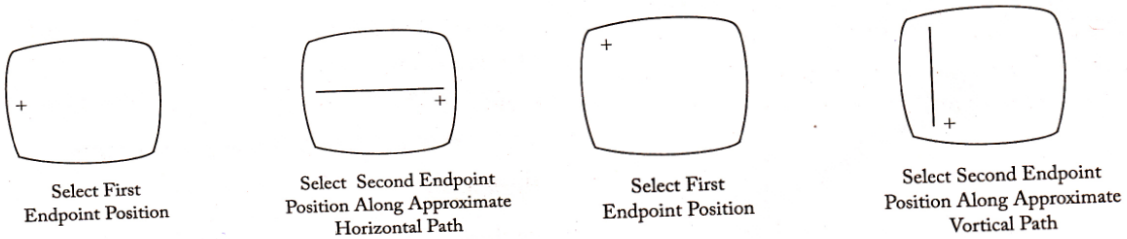


Figure 7.1 (a) Press Button for first line endpoint (b) Press Button at second line endpoint (c) Line Displayed between the two chosen endpoint

Constraints

There are many kinds of constraints functions that can be specified, but the most common constraint is a horizontal (or) vertical alignment of straight line.

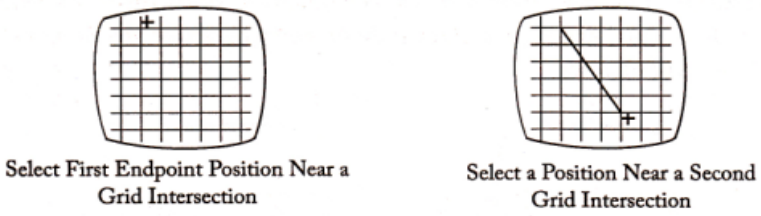


Horizantal line constraint

Vertical line constraint

Grids

Any input co-ordinate position is rounded to the nearest intersection of 2 grid lines each of the 2 cursor position is shifted to the nearest grid position point and the line is drawn between these grid points.



Select First Endpoint Position Near a Grid Intersection

Select a Position Near a Second Grid Intersection

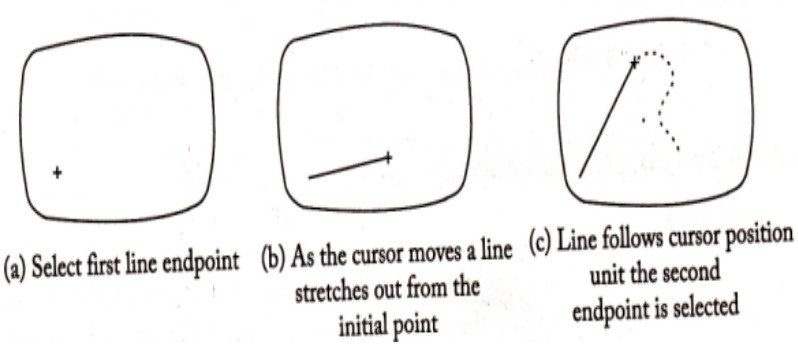
Gravity Field

When constructing a picture, we sometimes need to connect lines at position between endpoints. Since exact positioning of the screen cursor at the connecting point can be difficult, graphics packages can be designed to convert any input position near a line to a position on the line

Any selected position with the gravity field of a line is moved to the nearest position on the line.

Rubber – Band Method

Straight lines, Rectangles & circles can be constructed and positioned using Rubber-Band-Methods. We first select a screen position for one end point of the line, as the cursor moves around the line stretches out from the starting position to the current position of the cursor. When we finally select second position then it constructs line.



(a) Select first line endpoint

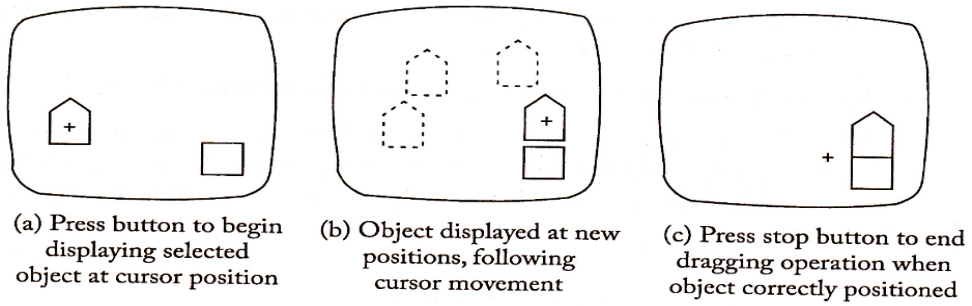
(b) As the cursor moves a line stretches out from the initial point

(c) Line follows cursor position unit the second endpoint is selected

Dynamic Manipulation

Dragging is a technique used in interactive picture construction is to move objects by dragging them with the screen cursor. First select an object, then move the cursor in the

direction we want the object to move, the selected object follows the cursor path and finally place to object somewhere on the screen.



(a) Press button to begin displaying selected object at cursor position

(b) Object displayed at new positions, following cursor movement

(c) Press stop button to end dragging operation when object correctly positioned

Painting and Drawing

Options for sketching and drawing and painting comes in a variety of forms curved drawing can be provided using standard curve shapes such as circular arcs with free hand sketching procedures. In free hand drawing curves are generated by following the path of styles on graphic tablets (or) the path of the screen cursor on a video monitor.

Pointing & Selections

Pointing and selecting technique is used to select the picture parts that need modification.

Selection

Selection is a useful tool in the hands of the user for selecting the images.

Different types of selection techniques are

1. Use of selection points.
2. Defining a bounding rectangle.
3. Multiple keys for selections.
4. Prefix commands.
5. Modes.

1. Use of selection points.

In order to select a Graphical unit the user points to a specific spot such as the centre of a circle (or) an endpoint of a line selection points can be provided for symbols and larger sub pictures.

2. **Defining a bounding rectangle.**

   The user can define two opposite corners of a rectangle and in this way select an object that lines within the rectangle. This techniques is useful for multiple selection.

3. **Multiple keys for selections.**

When the user has positioned the curser over the object to select, we can press one of the several keys according to the type of object. The selection can be one key to select a line, another to select a point and a third one to select a symbol.

4. **Prefix commands**

The type of object to be selected can be determined by the user priori/previous choice of command. The command is given before the selection and many specifies which type of object is to be selected.
For Eg:- There are 3 different DELETE commands are available.
i.e., DELETTE POINT, DELETE LINE, DELETE SYMBOL

5. **Modes**

The user may be able to change the selection mechanism by setting different modes of operation. In one mode the program allow only line selection and in another program allow only the symbol selection.

Multiple Selections

The user must be able to select more than one element at a time. Multiple selection can be provided in a no. of ways.

(i) To indicate the first and last element in the line sequence to be selected.

(ii) To select the element by specifying a bounding rectangle.

(iii) The user must select each one.

Menu Selection

Menu is displayed on the screen and the user points to the selection with a graphical input device. Menus can be used for a variety of reasons.

1. They allow the user to choose an element for insertion.
2. To change the mode of operation of the program.
3. To issue a command.
4. They protect the user from making an invalid selection.

Multiple Selection

The user must be able to select more than one item at a time. Multiple selection capability can be provided in a number of ways.

1. To indicate the first and last item in the sequence to be selected.

2. To select the item by specifying a bounding a rectangle.

Selection By Name

In this technique the user must type the name of the choice. If the user knows the names of various objects, then referring to them by name would be reasonable and faster than pointing method.

Selection by naming is also the best method for experienced and regular users. When the name typed does not match one in the system, other name close to the typed name must be presented to the user as alternatives.