Pointing and Positioning Techniques

Pointing technique refers to look at the items already on the screen whereas the positioning technique refers to position the item on the screen to a new position, i.e., the old current position. The user indicates a position on the screen with an input device, and this position is used to insert a symbol.

There are various pointing and positioning devices which are discussed below:

1. Light Pen
2. Mouse
3. Tablet
4. Joystick
5. Trackball and spaceball

**1. Light Pen:** It is a pointing device. When light pen is pointed at an item on the screen, it generates information from which the item can be identified by the program. It does not have any associated tracking hardware instead tracking is performed by software, making use of the output function of the display. All light pen programs depend on a rapid response from the pen when it is pointed at the screen fast response light pens can be build by using a highly sensitive photocell such as a photomultiplier tube.

**2. Mouse:** It is a positioning device which consists of a small plastic box resting on two metal wheels whose axes are at right angles. Each wheel of the mouse is linked to a shaft encoder that delivers an electrical pulse for every incremental rotation of the wheel. As the mouse is rolled around on a flat surface, its movement in two orthogonal directions is translated into rotation of the wheels. These rotations can be measured by counting the pulses received from the shaft encoders. The connected values may be held in registers accessible to the computer on written directly into the computer memory. It is simple and low cost, and there is no need to pick it up to use it. The mouse sits on the table surface. But the mouse cannot be used for tracing data from paper since a small rotation of the mouse will cause an error in all the reading and it is complicated handprint character for recognition by the computer.

**3. Tablet:** It is also a positioning device and is used to describe a flat surface separate from the display, on which the user draws with a stylus. There are two types of tablets:

1. **Acoustic Tablet:** It depends on the use of strip microphones which are mounted along two adjacent edges of the tablet. The styles have a small piece of ceramic mounted close to its tip, and at regular intervals, a small spark is generated across the surface of the ceramic between two electrodes. The microphones pick up the pulse of sound produced by the spark and two counters record the delay between creating the spark and receiving the sound. These two delays are proportional to the stylus distance from the two edges of the tablet where the microphones are mounted.
2. **Electro-acoustic Tablet:** In this technique, the writing surface is a sheet of magnetostrictive material acting as a row of delay lines. An electric pulse travels through the sheet first horizontally and then vertically and is detected by a sensor in the stylus. A counter is used to determine the delay from the time the pulse is issued to the time it is detected; from this value, the position of the stylus can be determined. The electro-acoustic tablet is quieter in operation than its acoustic counterpart and is less affected by noise or air movement.

**4. Joystick:** A joystick consists of a small that is used to steer the screen cursor around. The distance that the stick is moved in any direction from its center position corresponds to the screen-cursor movement in that direction. Pressure sensitive joysticks have a non-moveable stick. Pressure on the stick is measured with strain gauges and converted to the movement of the cursor in the direction specified.

**5. Trackball and spaceball:** Trackball is a ball that can be rotated with the fingers to produces screen-cursor movement potentiometers, attached to the ball, measure the amount and direction of rotation. Trackballs are after mounted on keyboards, whereas space-ball provides six degrees of freedom. Spaceballs is used for three-dimensional positioning and selection operation in virtual reality system, modeling, animation, CAD and other applications.