Mouse Devices

Mechanical

The most common found mechanical mouse is also known as a ball mouse. This senses movement with a small ball, approximately 2cm in diameter, which creates frictions with small wheel rollers representing the different axis directions.

These wheels report back to the PC which directions they are moving in, and how fast.

Mechanical mice have become increasingly scarce since the introduction of the optical mouse.

Optical

The optical mouse was an advancement of the Trackball in that it used an optical sensor to detect movement. An LED would shine onto the surface underneath the mouse and this allowed a sensor to detect the detailed surface.

With software, the image seen by the mouse as it moved would have points of highlight that would then be converted into a signal that the PC used to move the cursor.

Laser

This device is similar to the optical mouse, but it uses a much more accurate light source that reads the detail of the surface more effectively.

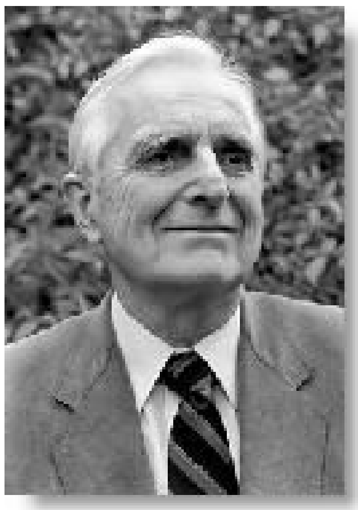
Many new mice from leading peripheral manufacturers use this technology, however optical mice are still predominant today due to slow demand for such accuracy, and the higher price tag.

Trackball

The trackball mouse was different to the mice before it in that there was no wrist movement in order to move the cursor. Instead, a large 3 cm diameter ball was placed on top of the device at the front, which could be moved by the user's fingers.

The first computer mouse

The Mother of All Demos



On December 9, 1968, Douglas C. Engelbart and the group of 17 researchers working with him in the Augmentation Research Center at Stanford Research Institute in Menlo Park, CA, presented a 90-minute live public demonstration of the online system, NLS, they had been working on since 1962. The public presentation was a session in the of the Fall Joint Computer Conference held at the Convention Center in San Francisco, and it was attended by about 1,000 computer professionals.

This was the public debut of the computer mouse.

But the mouse was only one of many innovations demonstrated that day, including hypertext, object addressing and dynamic file linking, as well as shared-screen collaboration involving two persons at different sites communicating over a network with audio and video interface.

Source: Stanford University

The acclamations

He never received any royalties for his mouse invention, partly because his patent expired in 1987, before the personal computer revolution made the mouse an indispensable input device, and also because subsequent mice used different mechanisms that did not infringe upon the original patent.

During an interview, he says, “SRI patented the mouse, but they really had no idea of its value. Some years later I learned that they had licensed it to Apple for something like $40,000.” Financial reward came in 1997 he was awarded the Lemelson-MIT Prize of $500,000, the world’s largest single prize for invention and innovation. He won many awards over the years, and in 1998, he was inducted into the National Inventors Hall of Fame.

Inside a Mouse

The main goal of any mouse is to translate the motion of your hand into signals that the computer can use. Let's take a look inside a track-ball mouse to see how it works:

The guts of a mouse

1. A ball inside the mouse touches the desktop and rolls when the mouse moves.

The underside of the mouse's logic board: The exposed portion of the ball touches the desktop.

Two rollers inside the mouse touch the ball. One of the rollers is oriented so that it detects motion in the X direction, and the other is oriented 90 degrees to the first roller so it detects motion in the Y direction. When the ball rotates, one or both of these rollers rotate as well. The following image shows the two white rollers on this mouse:

The rollers that touch the ball and detect X and Y motion

The rollers each connect to a shaft, and the shaft spins a disk with holes in it. When a roller rolls, its shaft and disk spin. The following image shows the disk:

A typical optical encoding disk: This disk has 36 holes around its outer edge.

On either side of the disk there is an infrared LED and an infrared sensor. The holes in the disk break the beam of light coming from the LED so that the infrared sensor sees pulses of light. The rate of the pulsing is directly related to the speed of the mouse and the distance it travels.

A close-up of one of the optical encoders that track mouse motion: There is an infrared LED (clear) on one side of the disk and an infrared sensor (red) on the other.

An on-board processor chip reads the pulses from the infrared sensors and turns them into binary data that the computer can understand. The chip sends the binary data to the computer through the mouse's cord.

The logic section of a mouse is dominated by an encoder chip, a small processor that reads the pulses coming from the infrared sensors and turns them into bytes sent to the computer. You can also see the two buttons that detect clicks (on either side of the wire connector).

In this optomechanical arrangement, the disk moves mechanically, and an optical system counts pulses of light. On this mouse, the ball is 21 mm in diameter. The roller is 7 mm in diameter. The encoding disk has 36 holes. So if the mouse moves 25.4 mm (1 inch), the encoder chip detects 41 pulses of light.

You might have noticed that each encoder disk has two infrared LEDs and two infrared sensors, one on each side of the disk (so there are four LED/

sensor pairs inside a mouse). This arrangement allows the processor to detect the disk's direction of rotation. There is a piece of plastic with a small, precisely located hole that sits between the encoder disk and each infrared sensor. It is visible in this photo:

A close-up of one of the optical encoders that track mouse motion: Note the piece of plastic between the infrared sensor (red) and the encoding disk.

This piece of plastic provides a window through which the infrared sensor can "see." The window on one side of the disk is located slightly higher than it is on the other -- one-half the height of one of the holes in the encoder disk, to be exact. That difference causes the two infrared sensors to see pulses of light at slightly different times. There are times when one of the sensors will see a pulse of light when the other does not, and vice versa.