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PHYSICAL PRINCIPLES OF THE COMPUTER MOUSE

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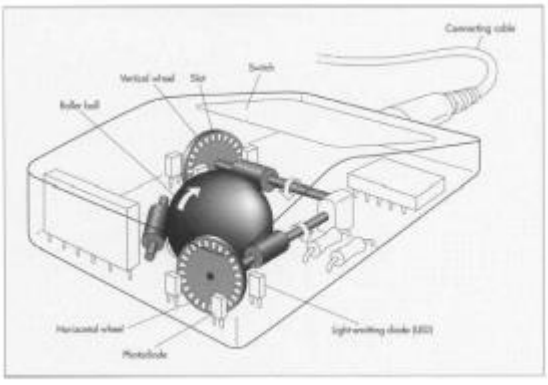
Now computers are used in a lot of types of human work. To make the interaction with computers user-friendly it was developed new type of user interface, called GUI (Graphical User Interface). However, they have to create new devices to interact with the new type of user interface. This work is devoted to the study of the physical operation principles of a ball-style computer mouse, (this type isn't used nowadays), and an optical mouse (which we are using every day). Thanks to the mouse, we can control the cursor and execute some commands by using the buttons on the corpus.

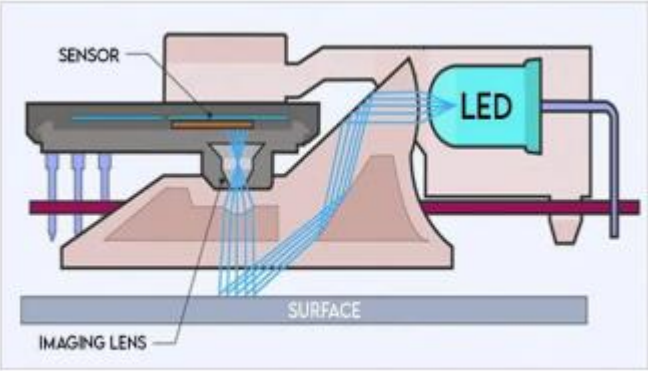
Computer mouse have become necessary tools for almost all computer users, making interacting with computers easier. Over time, the technology behind the computer mouse has changed, with earlier iterations featuring the ball mouse. These devices operated on a mechanical principle, built-in a heavy rubber or plastic ball that made contact with the surface, typically a table or a specialised mouse pad. The gravitational force acting on the ball caused it to rotate, generating rotational movements relative to the ball's centre when users applied mechanical force to move the mouse across the surface.

The ball mouse further used two rollers - one detecting movement along the X-axis and the other along the Y-axis (pict. 1). As the ball rotated, these rollers touched the ball's surface, and friction between the ball and the rollers transferred rotational force to them. The rollers were connected to a shaft, which, in turn, rotated a disk with perforations. Located on both sides of the disk infrared LEDs transmited light. The perforations in the disk broke the infrared beam of light, and infrared sensors detected the resulting pulses of light. These pulses were then converted into binary code by a chip inside the mouse and it transmitted to the computer through the mouse's cord.



Picture 1 ball mouse inside

In contrast, the optical mouse represents a more advanced technology. They use an infrared LED to emit light, which passes through a lens (pict. 2). The lens modifies the path of the light beam due to differences in optical width within the medium - a phenomenon known as refraction. The light beam is directed at an angle onto the surface, illuminating it. The reflected light is then detected perpendicular to the surface by a photoelement placed in front of a lens that focuses and captures details of the surface.



Picture 2 optical mouse inside

The photoelement receives an impressive number of images - around 17,000 per second - at a resolution of 40x40 pixels. These images are not stored, instead, they are swiftly sent to a digital signal processor (DSP). The DSP compares each new image with the previous one, determining the direction and magnitude of the mouse movement. The processed data is then transmitted throw the mouse's cord to the computer.

In summary, while the ball mouse relies on mechanical components and friction, the optical mouse integrates optical and electronic elements for a more complicated and precise method of cursor control, displaying the continuous evolution in the design and functionality of these universal computer peripherals.

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