The Evolution Of Human-Computer Interface

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A computer interface consists of two major parts, an input device, which receives data, usually from a human, and converts it into a signal that a computer can understand through some sort of algorithm, and an output device, which converts a signal from a computer into something that humans may perceive, such as visual information displayed on a screen.

The first computers used punched cards as an input and an output. When punched cards were combined with typewriters, key punchers were created. A further evolution was using keypunchers directly on magnetic tape (the recording medium of the time), thus rendering punched cards largely redundant. A more practical input device evolved from the typewriter/key puncher. It is known as the "qwerty" keyboard. Many types of keyboards exist today, from the diminutive "thumb board", to the almost completely virtual "laser keyboard", which uses a laser to display a keyboard on any flat surface and an infrared sensor to detect keystrokes.

A pointing device is any computer hardware component that allows a user to input spatial data to a computer. Movements of the pointing device are echoed on the screen by movements of the mouse pointer and other visual changes. A contemporary computer mouse, with the most common standard features: two buttons and a scroll wheel. The two most common types of mouse are the mechanical, which uses a ball to change the movement of the mouse into a signal that the computer can understand, and the optical, which uses an LED and an optical sensor to take successive pictures of the surface they are moving on and turn that into a digital signal.

A slightly newer input style is video. This includes webcams, barcode readers, various flavors of MRI, and even three dimensional scanners. They use some sort of specific peripheral device and an algorithm to digitize their data, which allows the computer to store, recreate and analyze it.

The newest step is the brain-computer interface (or direct neural interface), which utilizes an electronic sensor to analyze neural activity and respond with the appropriate input to the computer. There are several types of BCI, Invasive, Partially invasive, and Non-invasive. Invasive BCIs are implanted directly into the grey matter of the brain during neurosurgery. As they rest in the grey matter, invasive devices produce the highest quality signals of BCI devices but are prone to scar-tissue build-up, causing the signal to become weaker or even lost as the body reacts to a foreign object in the brain. Partially invasive BCI devices are implanted inside the skull but rest outside the brain rather than within the grey matter. They produce better resolution signals than non-invasive BCIs where the bone tissue of the cranium deflects and deforms signals and have a lower risk of forming scar-tissue in the brain than fully-invasive BCIs. Non-invasive implants are easy to wear, but produce poor signal resolution because the skull dampens signals, dispersing and blurring the electromagnetic waves created by the neurons. Although the waves can still be detected it is more difficult to determine the area of the brain that created them or the actions of individual neurons. BCIs have been used to help people with physical disabilities, ranging from blindness to paralysis.

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