CS50 Computers and Computing

Overview

A **computer**, in the most general sense, is just a device that accepts data or input, and processes it in some way to automatically produce a result. When a computer is doing any kind of work, whether it's opening an application, editing an image, or playing a song, it is computing. **Computing**, in the most general sense, means calculating. In order for a computer to operate correctly, many different parts of the computer have to communicate and interact with one another in just the right way.

Inputs and Outputs

A computer starts by taking in some sort of data or information, called input. **Input** can take a variety of forms—mouse clicks, keyboard presses, taps on a touch screen, or button presses, for instance. Input can also take less traditional forms: such as the way smoke detectors take in information from the environment, or the way cars take input from a steering wheel in order to determine which way to turn.

Computers use the inputs provided to them in order to generate a result. In computer science, this result is called the **output**. In the case of a traditional desktop computer, output might take the form of whatever is displayed on the user's screen. But output can take many other forms, such as producing sound or causing motion.

Somehow, computers need to translate inputs into outputs, by processing the information in the input in order to generate the necessary output. This processing takes the form of an **algorithm**, which is just a set of rules that a computer must follow in order to translate inputs into the desired outputs. **Programming** is the process of providing a computer with a set of instructions, or an algorithm, in order to perform a particular task.

The Computational Process

The process of translating inputs into outputs is known as the **computational process**, and will likely involve performing a series of calculations in the form of an algorithm.

The computational process can range in its complexity and in the number of steps required to complete a task. Sometimes, the computational process is relatively simple, like the process of calculating 5+3. In other cases, many computational tasks are much more complicated. All tasks computers perform, like a GPS calculating a route from home to work, or an alarm going off at a certain time, require computation.

How Computers Work

Each part of the computer serves a specific function, and together they allow for computers to perform tasks. Computers require a combination of **hardware**, the physical parts that make up the computer, and **software**, the programs and instructions that run on the computer. Much of a computer's hardware is attached to the computer's motherboard (or logic board), which contains the hardware that helps different parts of the computer communicate with each other.

Computers require electricity to function, so they must have a power supply— desktop computers plug into an electrical outlet, and laptop computers can use a battery. When the power button on a computer is pressed, the power supply begins providing electricity to the computer, which begins the process of starting up the computer's hardware.

After the computer's hardware has started up, the next step is getting the computer's software ready, beginning with the **operating system**, which is the software that manages the execution of other programs on the machine (common operating systems include Windows, macOS, and Linux). The operating system, as well as other software and computer files, are stored on the computer's hard drive, which is the computer's primary form of storage. Each computer also has a Central Processing Unit (**CPU**), often referred to as the "processor," which is responsible for running the computer's software and executing computations.