Lecture 0 :
What is Computation?

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1 Computation

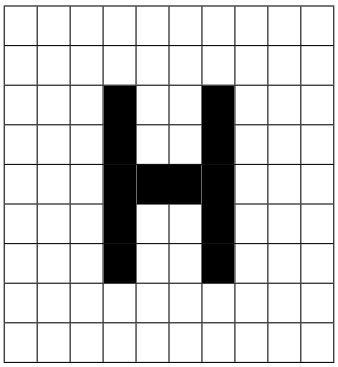
Computation essentially, is the process of **mathematical calculation**. Any type of logical or arithmetic calculation that is well defined. Mechanical or electronic devices that perform these calculations are thus called **computers**. Early computers were simple mechanical calculators, designed to perform fixed operations like addition, subtraction, multiplication and division. The large moving parts that were employed in their design, made them slow and prone to failure.

Modern computers however are built on electronic technology. They contain billions of microscopic electronic switches called **transistors**. These transistors turn on and off billions of times a second to create the modern computing experience of text, sound, images and videos that we commonly share.

1.1 Example : Computer Display

The computer screens that display all our images and videos are made up of **pixels**. Pixel is short for picture element, and it is the smallest addressable element in a display. Each pixel can emit or modulate light and they work together to display images and text on the screen.

A computer screen's resolution is specified by the number of pixels it contains horizontally and vertically. For example, a screen resolution of 1920×1080 means that the screen has 1920 pixels in width and 1080 pixels in height. Below is a simple example of a display grid consisting of 10×9 pixels, displaying a single character "H" :



In the small 10×9 display above, the pixels that are dark are where the corresponding transistors are switched off. Whereas, the bright pixels correspond to the on transistors.

The very screen you are reading this on, works on the same principle, just on a bigger scale. You could imagine each pixel being lit on or off by transistors, displaying all of this text that your are reading.

1.2 Algorithms

An **important point** to note is that computers only know or do, what you explicitly tell them. They need to be told precisely, what is to be done in a step-wise manner. This is where algorithms come in. Informally, an algorithm is a process or a **set of steps** to be followed while performing calculations or other problem-solving operations, especially by a computer.