

Introduction to Computers

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1 Introduction

A computer is a device that can be instructed to carry out sequences of arithmetic or logical operations automatically via computer programming. Modern computers have the ability to follow generalized sets of operations, called programs. These programs enable computers to perform an extremely wide range of tasks. Conventionally, a modern computer consists of at least one processing element, typically a central processing unit (CPU), and some form of memory. The processing element carries out arithmetic and logical operations, and a sequencing and control unit can change the order of operations in response to stored information. Peripheral devices include input devices (keyboards, mice, joystick, etc.), output devices (monitor screens, printers, etc.), and input/output devices that perform both functions (e.g., the 2000s-era touchscreen). Peripheral devices allow information to be retrieved from an external source and they enable the result of operations to be saved and retrieved.

1.1 Concept of modern computers

The principle of the modern computer was proposed by Alan Turing in his seminal 1936 paper, "On Computable Numbers, [Turing, 1937]. Turing proposed a simple device that he called "Universal Computing machine" and that is now known as a universal Turing machine, as shown in Figure 1. He proved that such a machine is capable of computing anything that is computable by executing instructions (program) stored on tape, allowing the machine to be programmable.

1.1.1 Classification of Computers

- Workstation
- Personal Computer
- Laptop
- Mainframe Computer
- Supercomputer

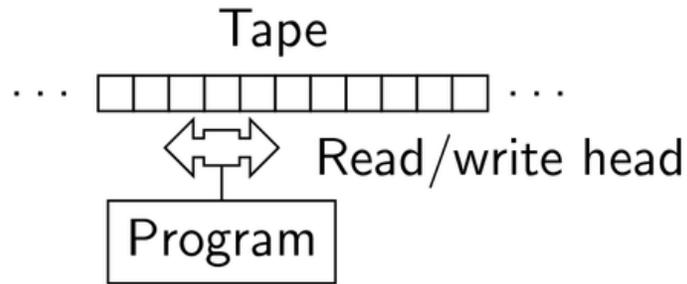


Figure 1: A representative Turing machine with a read/write head.

Table 1: Types of computer CPU

CPU Type	Micro architecture
4 bit	Intel 4004
8 bit	Intel 8008
16 bit	Zilog Z8000
32 bit	Pentium

2 Computer Hardware

The core of the computer is the central processing unit (CPU). Some types of CPU are listed in Table 1

The time t taken to execute a program on a CPU is given by Equation 1.

$$t = IC \times CPI \times F \quad (1)$$

IC = Instruction count CPI = Average number of cycles required to execute instruction F = Clock frequency.

3 Applications of computer

Some applications of computer are listed below.

1. Banks and financial
2. Business
3. Communication
4. Education
5. Defense and military

References

[Turing, 1937] Turing, A. M. (1937). On computable numbers, with an application to the entscheidungsproblem. *Proceedings of the London mathematical society*, 2(1):230–265.