Introduction to CSE

ESC108A Elements of Computer Science and Engineering
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Objectives

- At the end of this lecture, student will be able to
  - Explain the types of computers and their ubiquitous presence
  - Explain the nature and types of computation
  - State the nature of requirements by computer applications
  - Identify and appreciate the need to study Elements of CSE for his/her professional development

Contents

- Computers
- Computation
- Computer Applications
- Why Study CSE?
- Summary

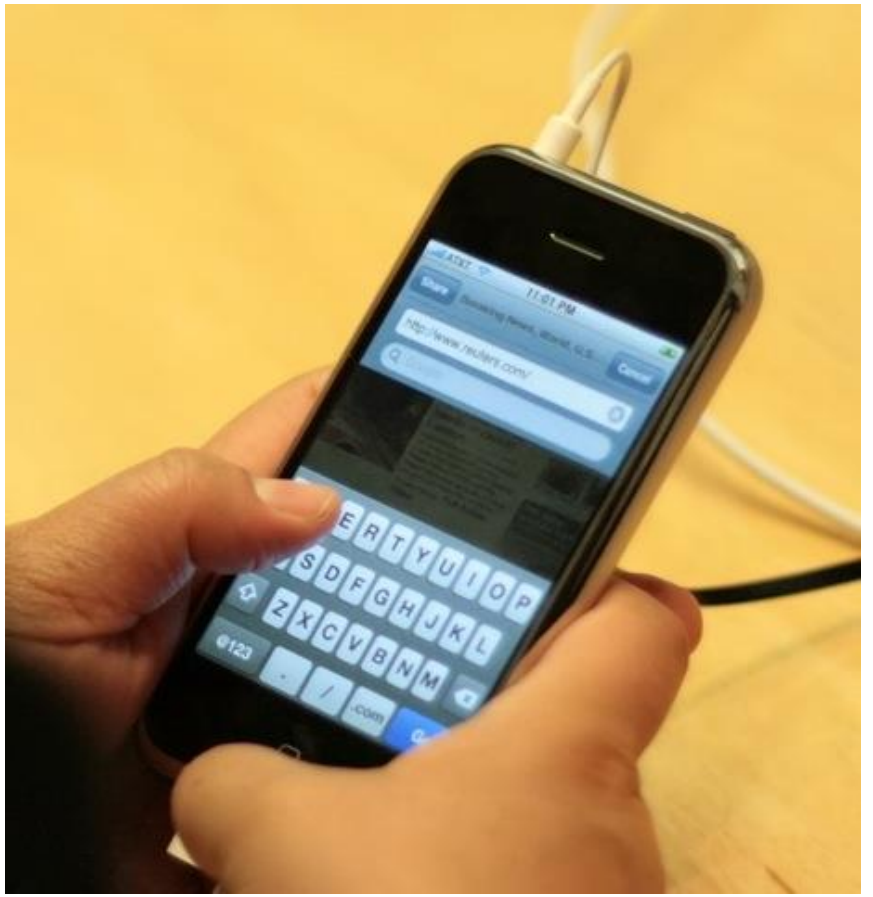
COMPUTERS

Computer

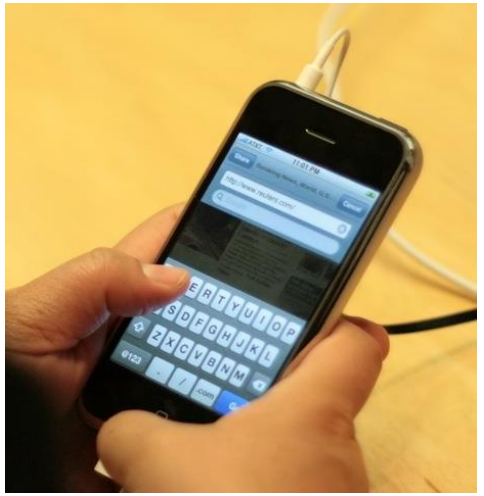
- An electronic device capable of performing computations and making logical decisions at high speed
- Accepts data and instructions, stores in its memory, processes and gives the results to the user
- The term computer is derived from the Latin word *compute* which means to calculate or to manipulate
- Charles Babbage developed the Analytical Engine

Computers are Everywhere and Come in Various Types

Is this a Computer?



Newer and More Ubiquitous Types



- Mobiles, Tablets
- Wearable devices

Computers Need Not be Single Units

- Distributed computers
- Data farms
- Computing grids and clouds

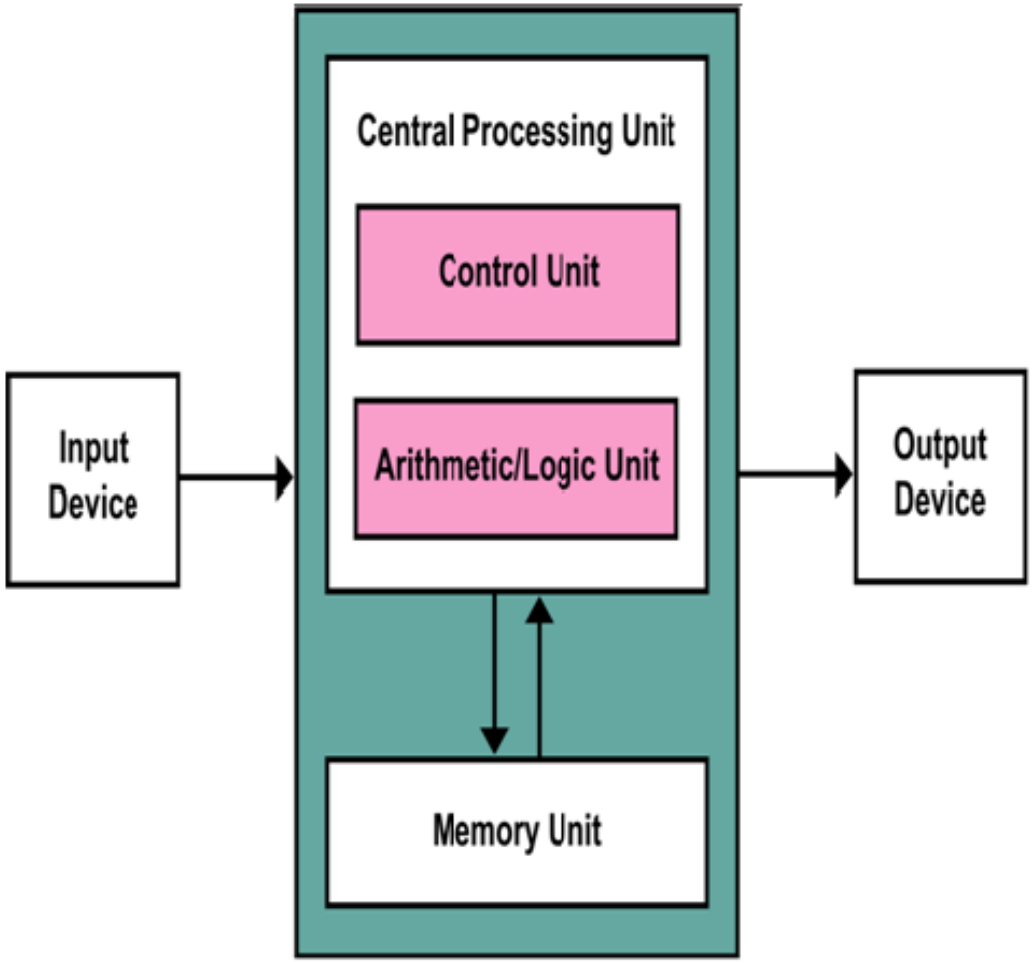
COMPUTATION

Types of Computation

Different types of computations are needed by applications

- **Numerical computation**
  - Forms a major component of all Science and Engineering applications
- **Data processing**
  - Largely string processing
  - Storage, search, access and update
- **Input and Output**
- **User interface**
  - Textual or graphical
  - Web based
- **Communication**

Basic Functional Units of a Computer



Basic Functional Units of a Computer contd.

- Input unit
  - Obtains information (data and computer programs) from input devices
  - keyboard, mouse, etc.,

- Output unit
  - Takes information that has been processed by the computer and place it in different output devices
  - Printer, screens, etc.,

Basic Functional Units of a Computer contd.

- CPU – computer's coordinator and is responsible for supervising the operations of other sections
  - Control unit – coordinates the activities of various components
  - Arithmetic unit –operations such as addition and subtraction
  - Logic unit – operations result in either TRUE or FALSE

- Multiprocessor

  Multiple processing units and hence, can perform many operations simultaneously

Basic Functional Units of a Computer contd.

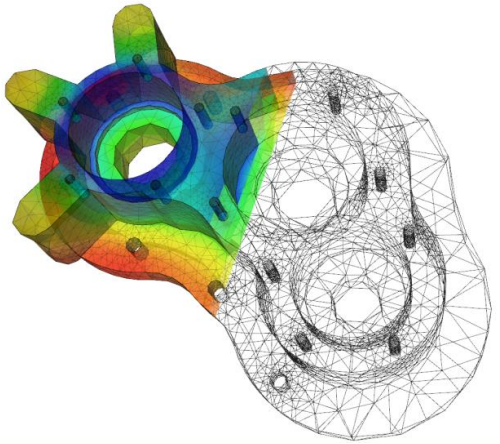
- Memory unit - A storage device
- Memory is classified into
  1. **Main** memory – primary memory, temporary memory
     - Rapid access, relatively low capacity, costly
     - RAM,ROM
  2. **Secondary** memory – permanent memory
     - Long-term, high capacity, cheaper
     - disks, pen drive, etc.,
  3. **Cache** memory
     - placed between CPU and main memory

Computer

- System
  - A combination of components which cooperate and coordinate for a specific operation
- Hardware
  - Physical devices that you can see and touch in a computer system
  - Keyboard, screen, memory, DVD, etc.,
- Software
  - Programs and instructions makes the hardware to work

COMPUTER APPLICATIONS

Computer Applications for Every Conceivable Activity



- Indirect use
  - Phone booking, Voice search on a mobile, Navigation , Driving a car, ...

WHY STUDY CSE?

Need for Elements of CSE

Q. Why should every Engineer study the Elements of CSE?

- For developing computational routines for solving engineering problems
  - Mostly numerical computation
  - But also need data processing, communication and user interface
- More complete applications would need development by a (large) team over multiple stages (versions)
  - Need an understanding of software development process
  - Able to integrate the developed software into an application
  - Be part of developer team (most engineering jobs are software development in nature)

Need for Elements of CSE, *Contd.*

Q. Why should every Engineer study the Elements of CSE?

- *As future professional technical leader and manager* required to make decisions involving answering
  - What aspect of the problem is computational in nature?
  - What should be delegated to dedicated software developers?
  - What would be the effort involved in the development process?
  - What should be the specifications and functionality of the software?
  - …
- Hence, exposure to the nature and practice of CSE is a required foundation for future engineer professionals
  - Computer programming ability is an core requirement
  - Exposure to modern computing systems and CSE methods is essential, too

Summary

- Computers are ubiquitous and are employed in all aspects of human activities in the Information Age
- There are a wide variety of the types of computers, from mobile handsets through workstations and servers to distributed computers
- Computers are employed in every conceivable area of human endeavour, either directly or indirectly, from creating new things to simulating real or imaginary worlds
- A computation is what happens when a computer is put to use by running a computer application
- Computer applications are mainly software that reside in a computer to be run

Summary, *Contd.*

- A wide variety of computations are performed by applications: numerical computation, data processing, input/output, user interface and communication
- Computers are designed to perform a basic set of computation: fetch, operate & store information from memory and perform input/output operations
- All the variety of applications can be built from this basic computation by use of abstractions
- There are several reasons for every engineer to studying CSE: From need to develop numerical computational routines, through interfacing applications to developing complex applications
- Future professional requirements demand that engineers are exposed to the methods of CSE as well as modern computing systems