Computer Architecture

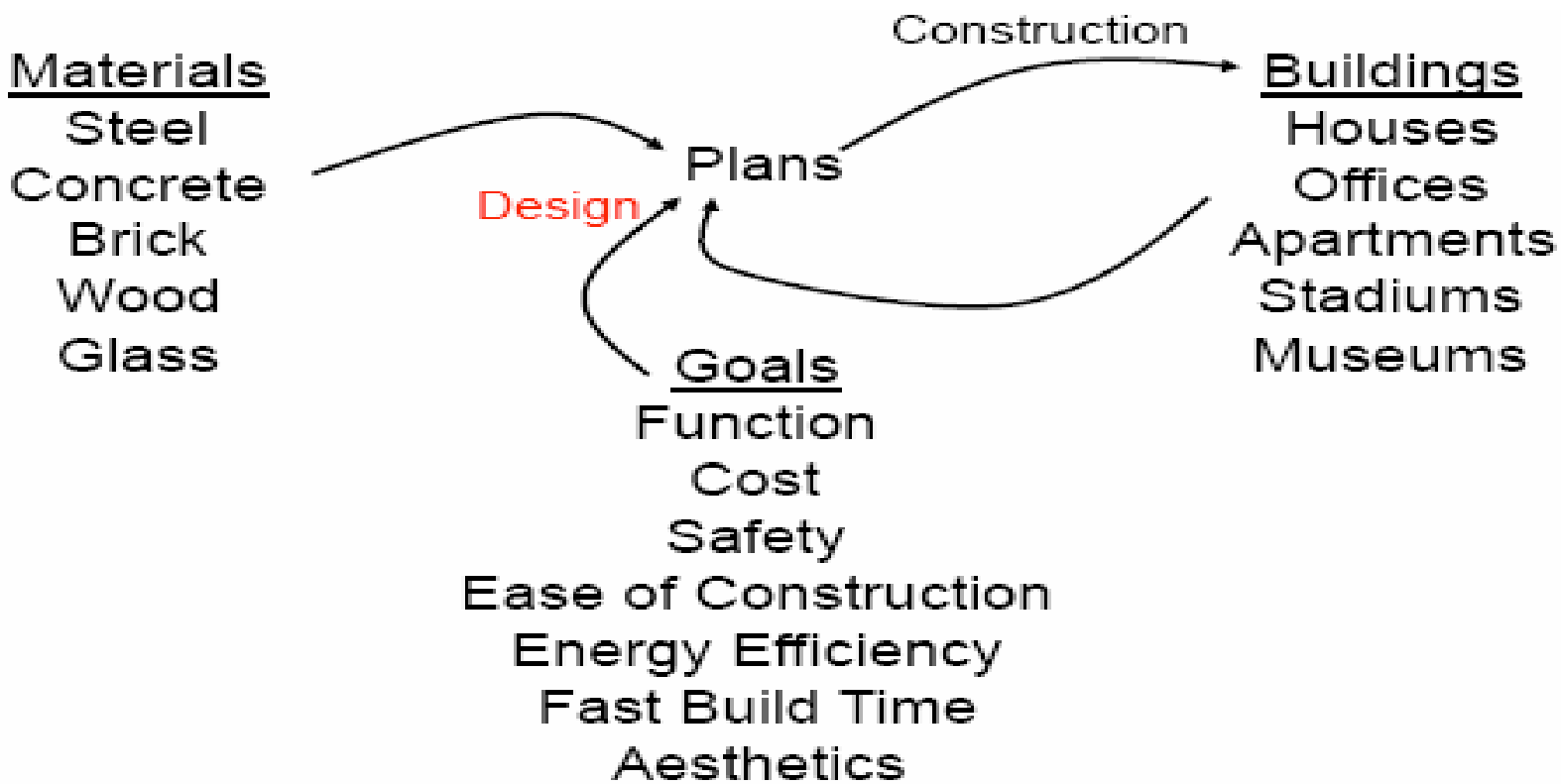
CSE: 3rd Year

Chapter 1

Introduction

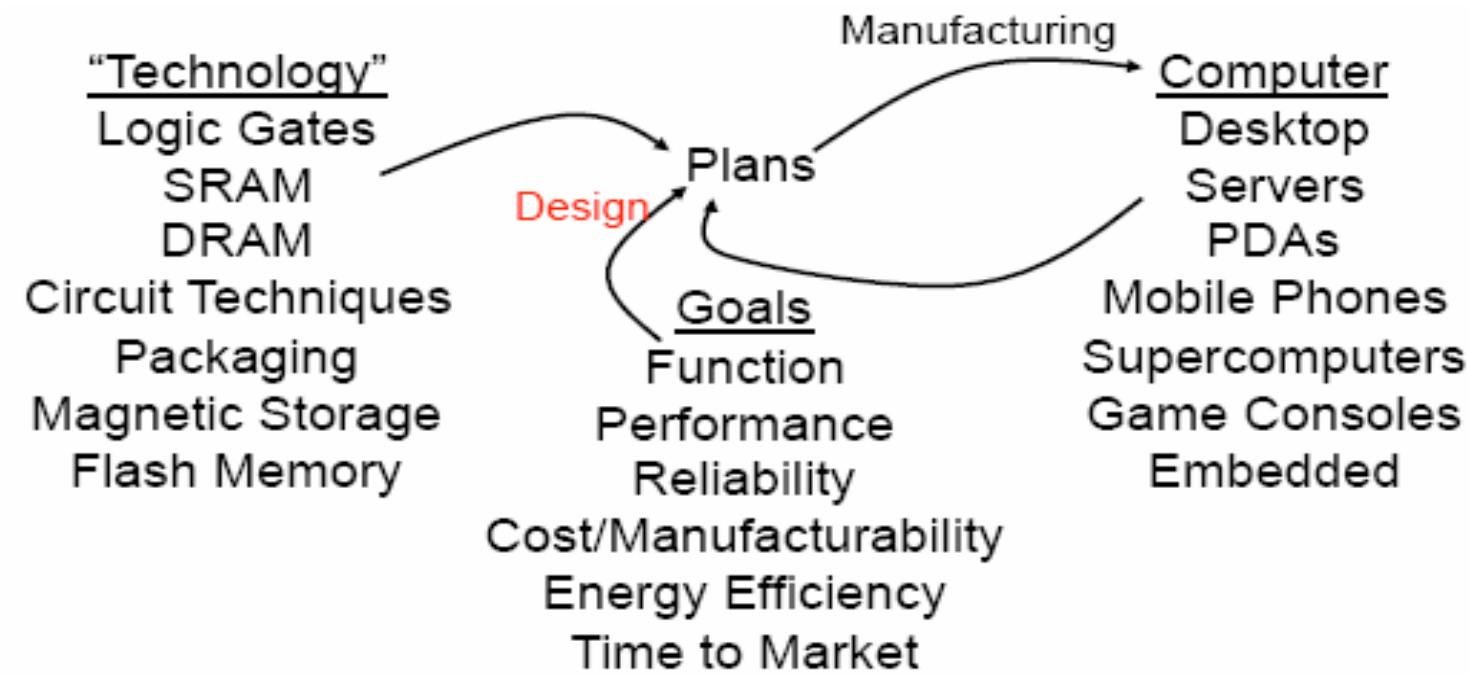
What is Architecture?

- **Architecture** is the science and art of designing and constructing buildings.
- **Role of Building Architect:**



What is Computer Architecture?

- **Computer Architecture** is the science and art of selecting and interconnecting hardware components to create computers that meet functional, performance and cost goals .
- **Role of Computer Architect:**



Structure and Function

- From designer point of view, Computer architecture concerned with:
  - Function
  - Structure

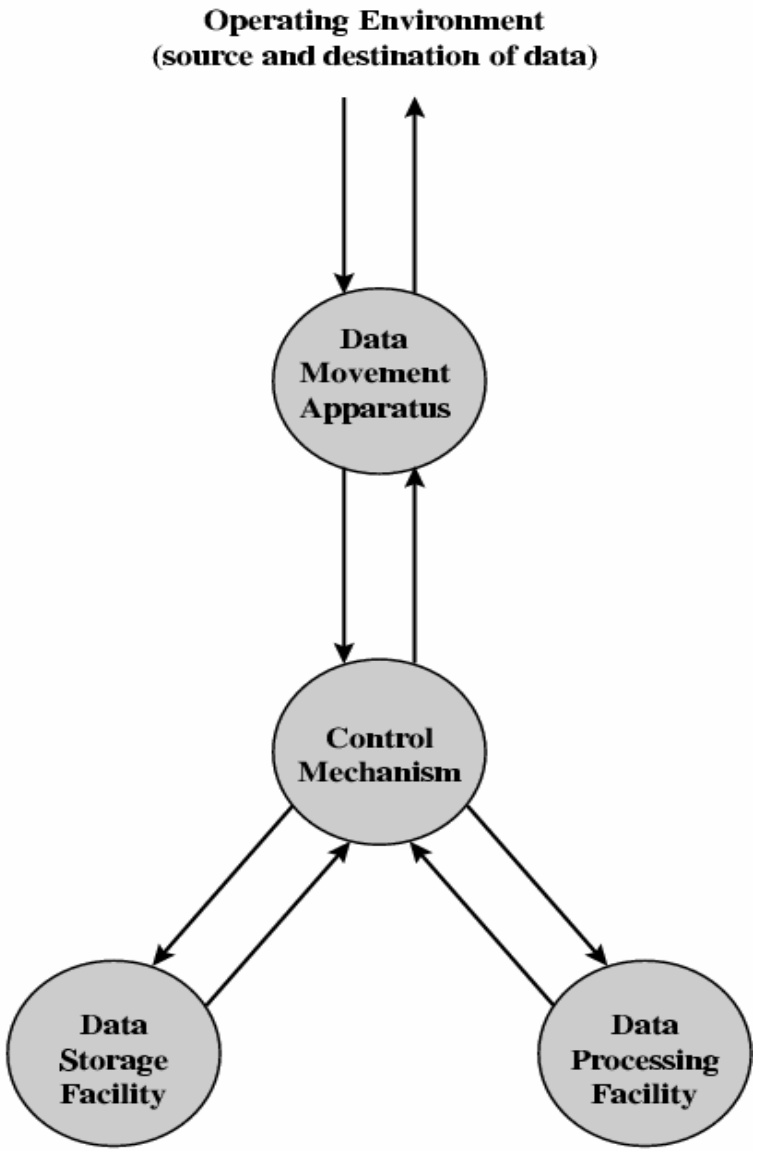
- **Function:** The operation to be performed and the operation of each individual component as part of the structure.

- **Structure:** The way in which the components are interrelated or interconnected to achieve the function.

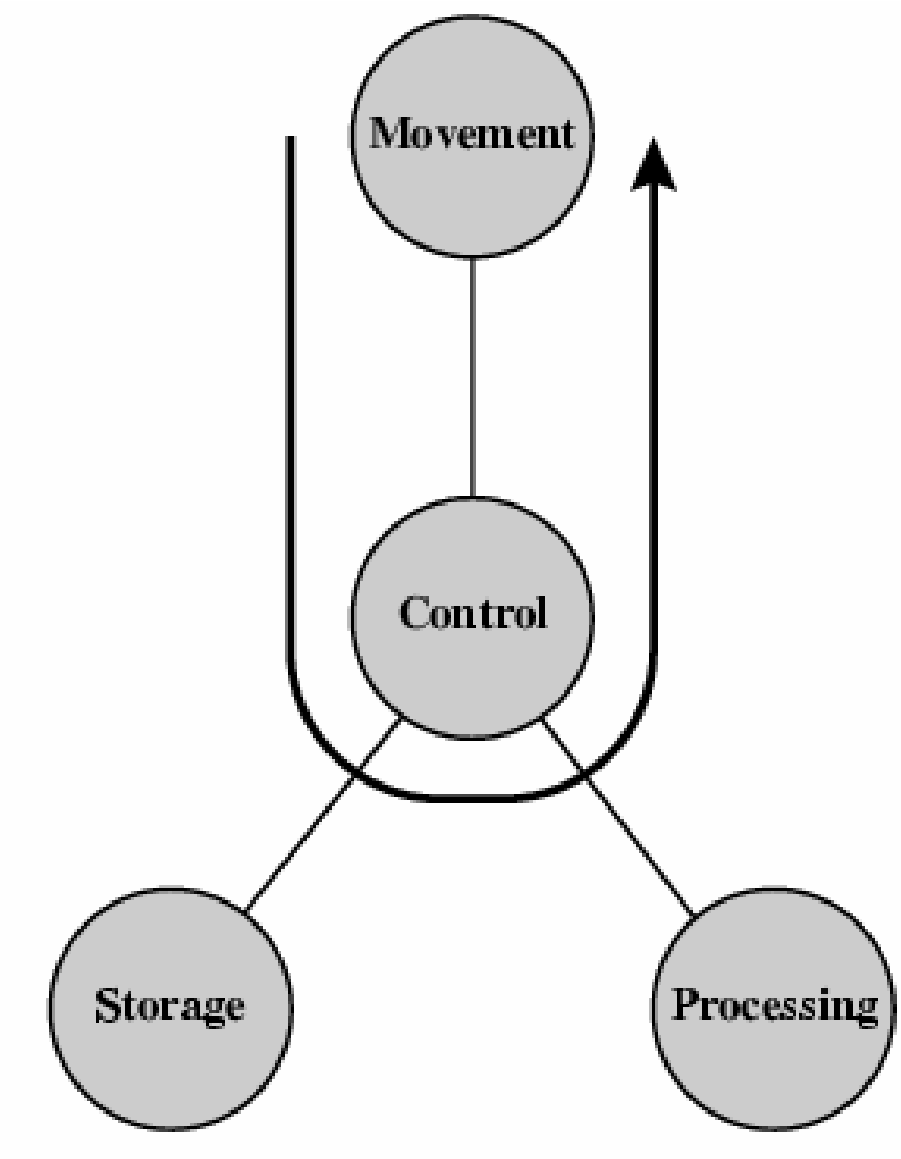
Function

- A computer performs 4 basic functions:
  - **Data movement**
    - **Input data:** getting information into the machine.
    - **Output data:** sending the results out to the user via some display method.
  - **Data storage:** holding the information before and after processing.
  - **Data processing:** performing mathematical and logical operations on the data.
  - **Control:** organize the sequence of the internal operations.

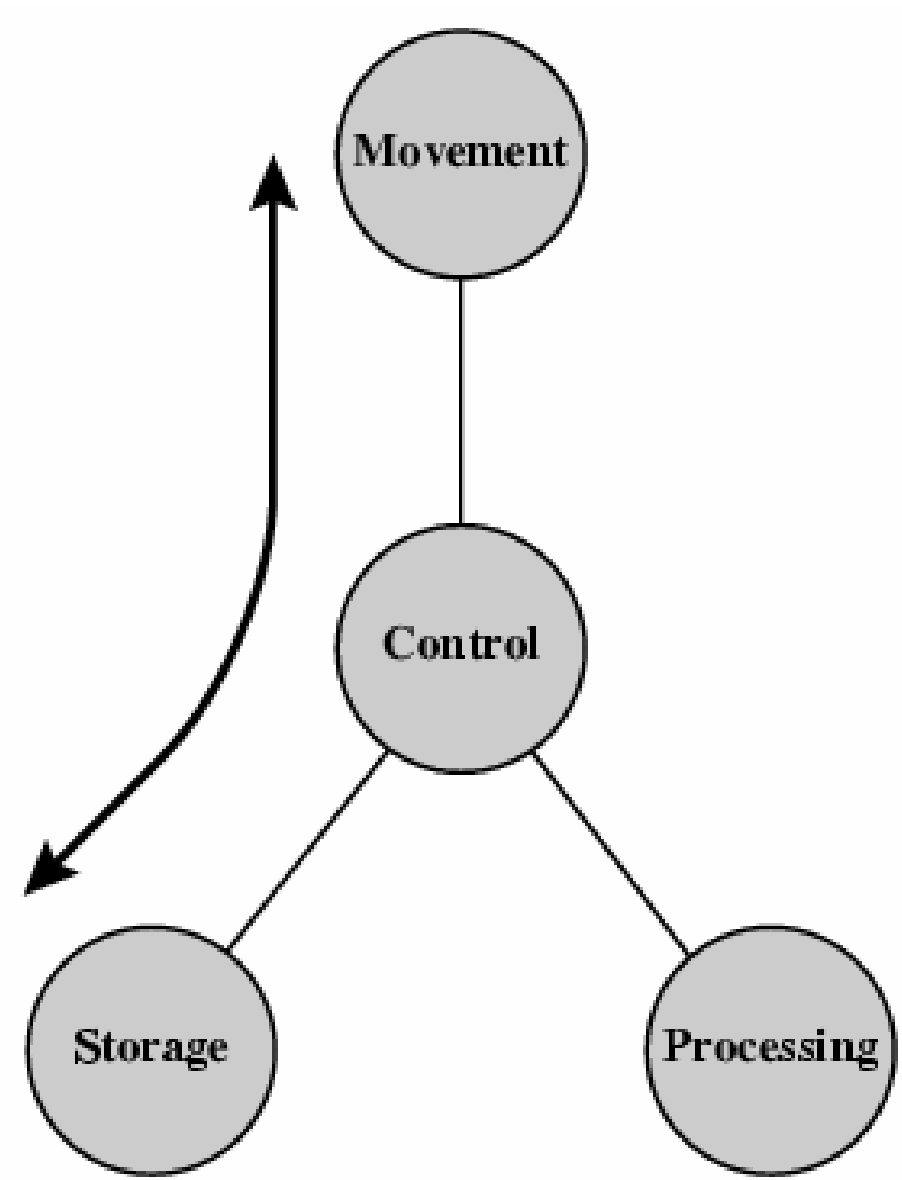
Functional View of a Computer



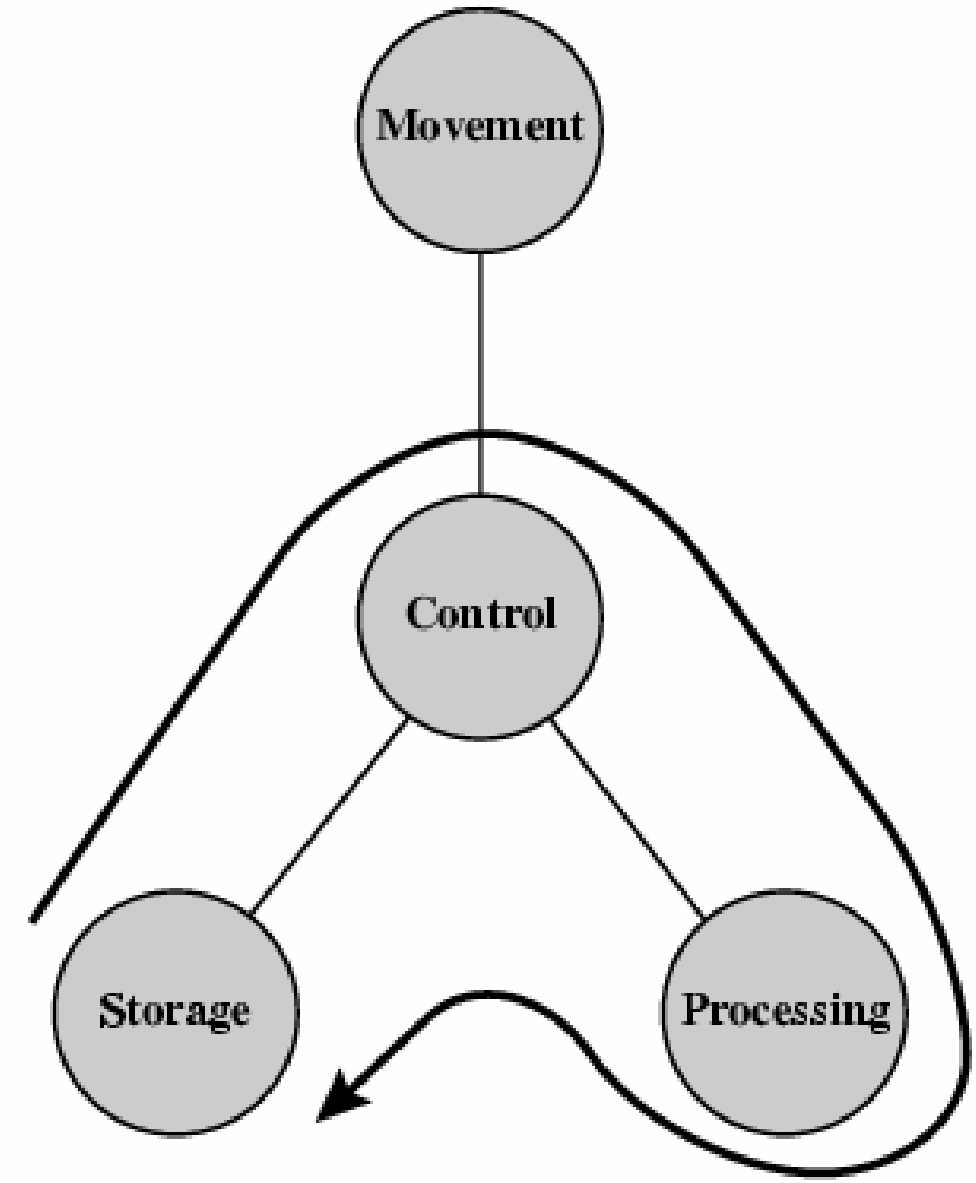
Operations (a) Data movement



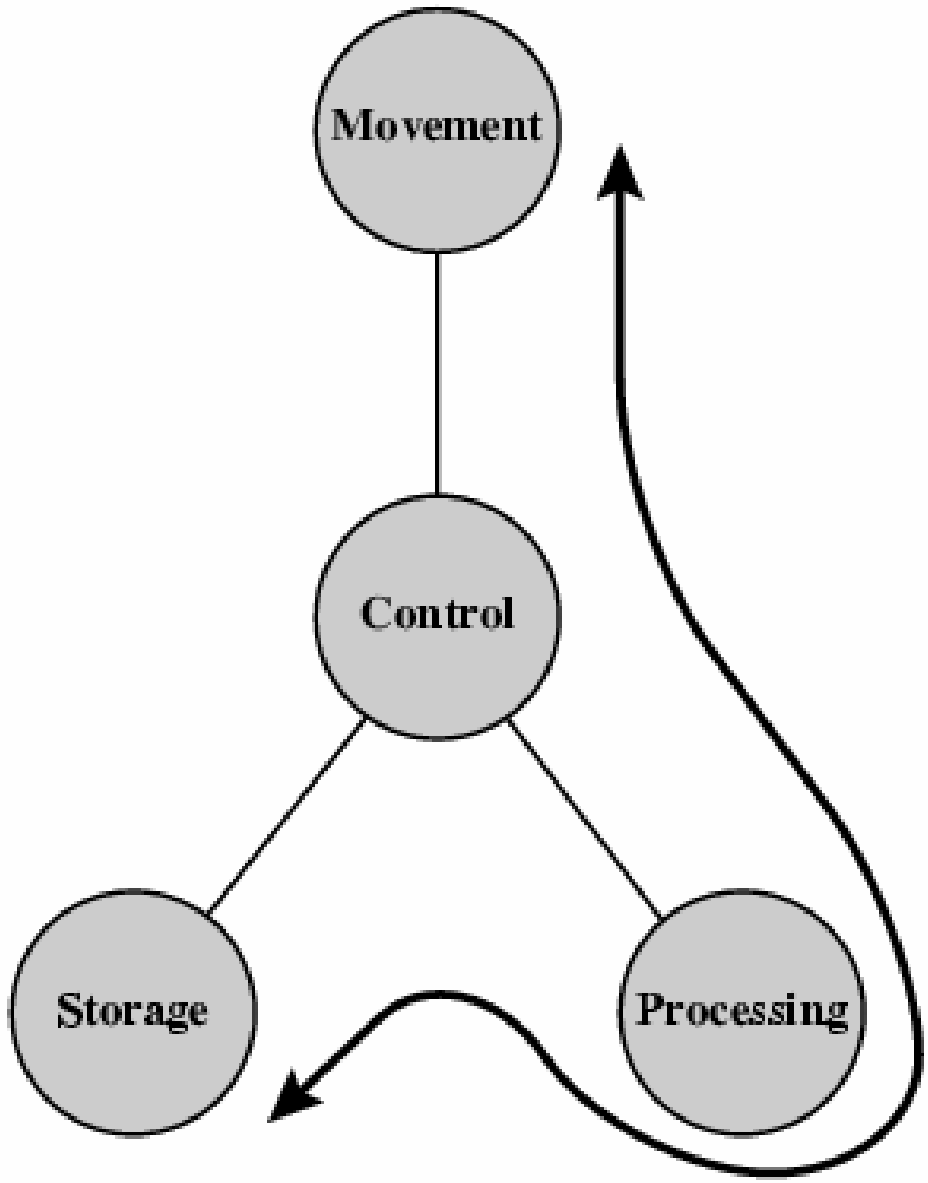
Operations (b) Storage



Operation (c) Processing from/to storage



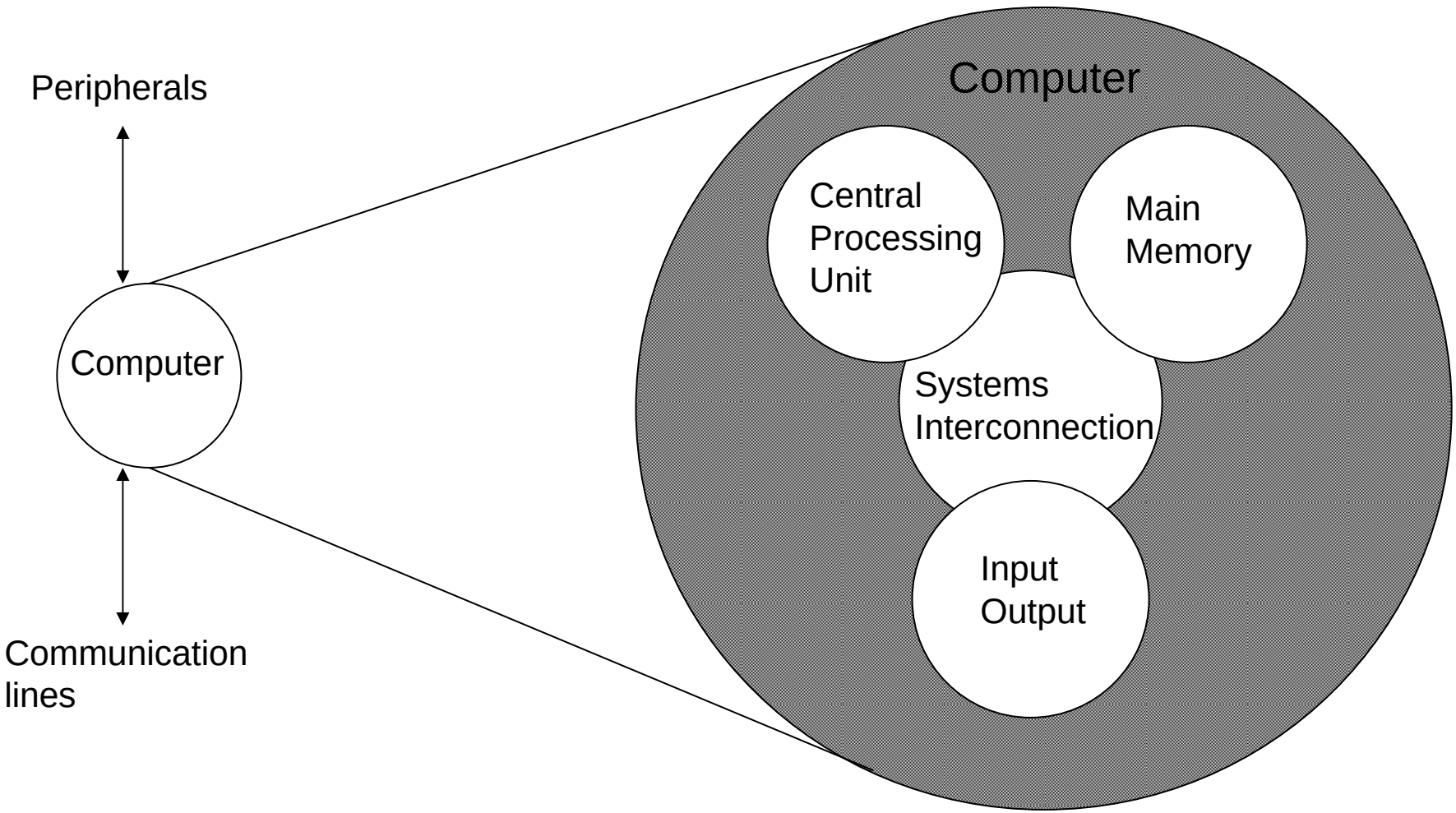
Operation (d)
Processing from storage to I/O



Structure

- **There are four main structural components:**
  - ***I/O units:*** Moves data between the computer and its external environment.
  - ***Main memory:*** Stores data.
  - ***Central processing unit (CPU):*** Controls the operation Of the computer and performs its data processing functions; often simply referred to as processor
  - ***System interconnection:*** Some mechanism that provides for communication among CPU, main memory, and I/O.

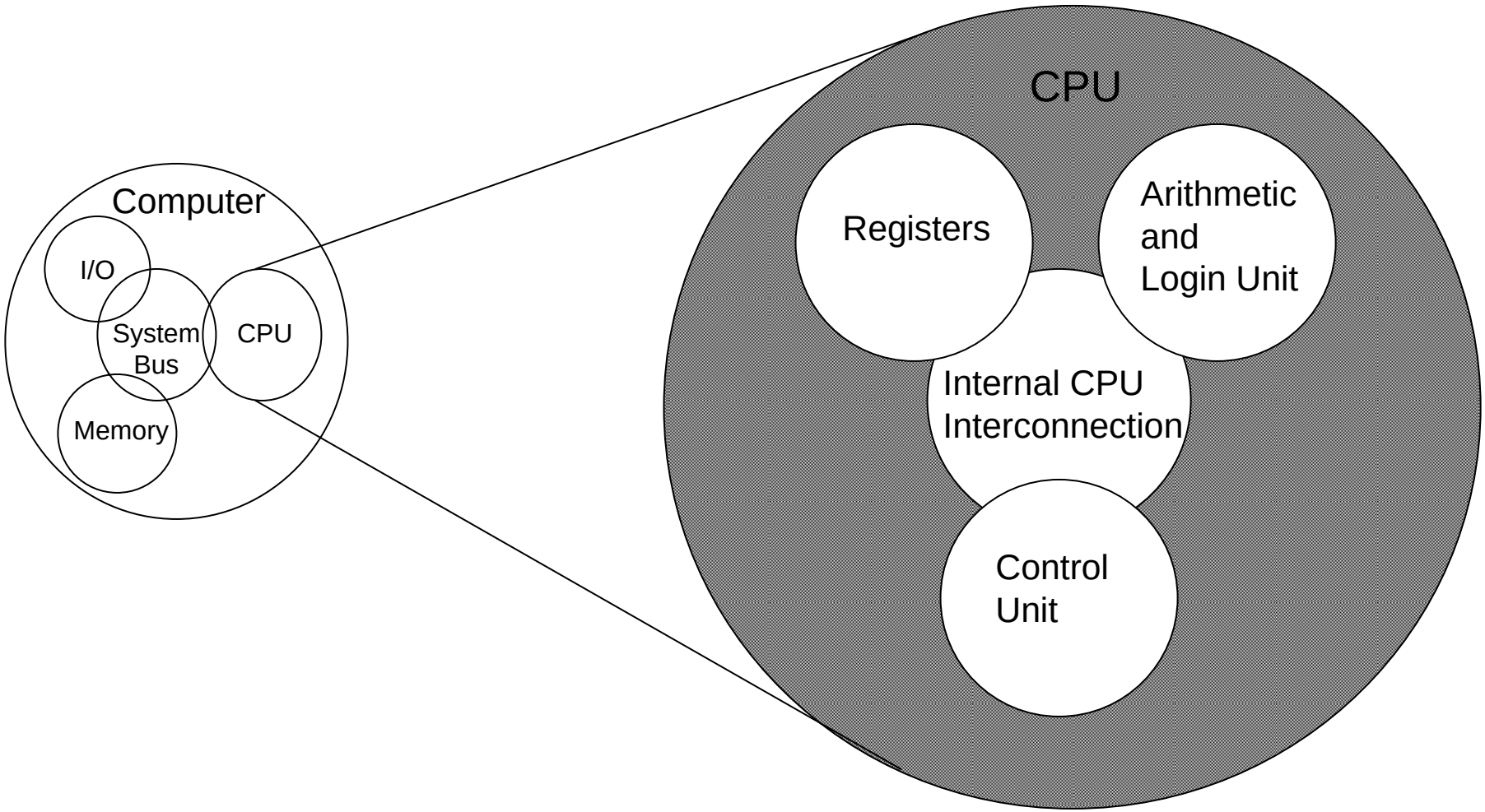
Structure - Top Level



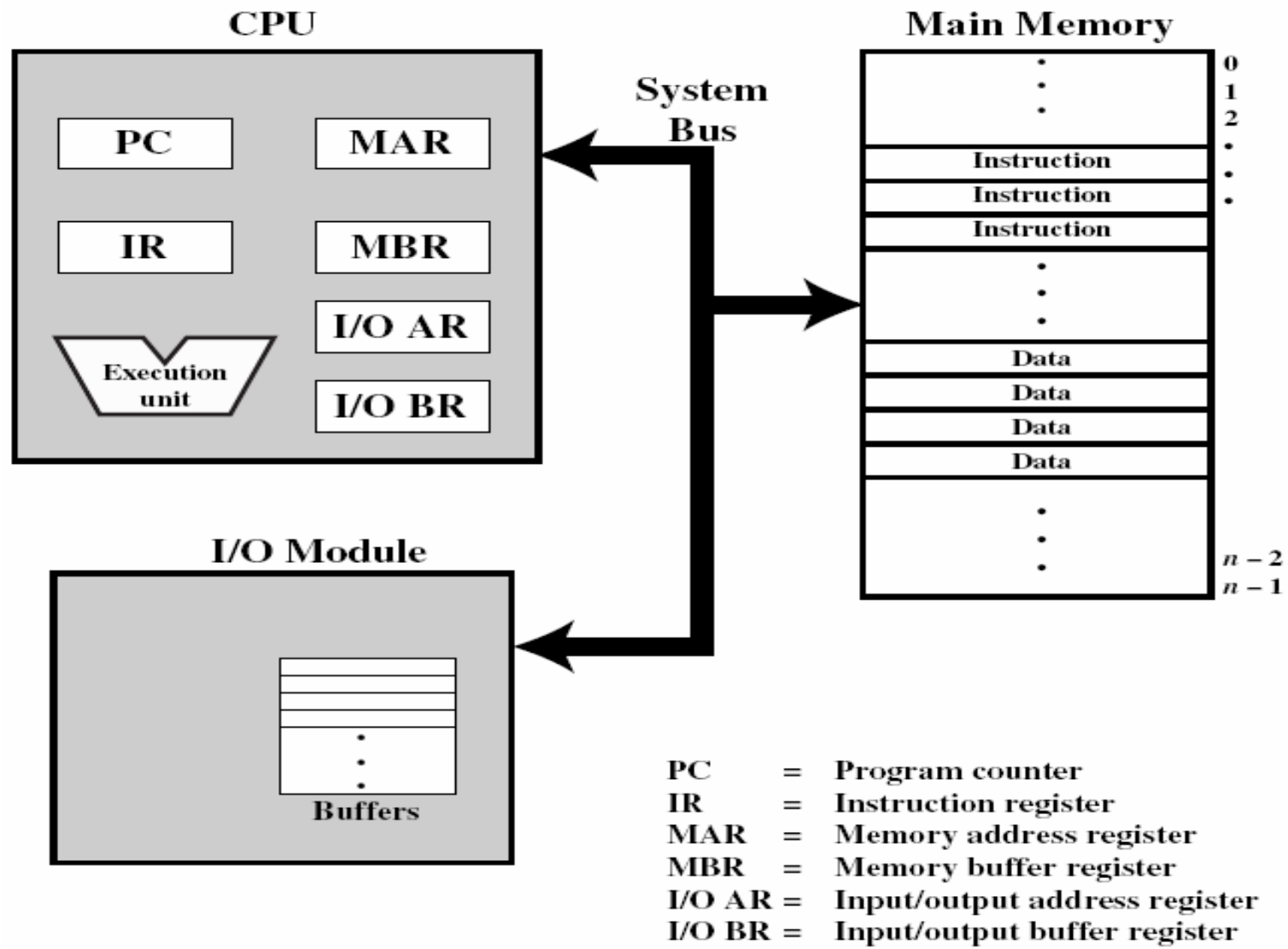
Structure - The CPU

- **The major structural components of CPU are:**
  - ***Control unit:*** Controls the operation of the CPU and hence the computer.
  - ***Arithmetic and logic unit (ALU):*** Performs the computer's data processing functions.
  - ***Registers:*** Provides internal temporary storage to the CPU.
  - ***CPU interconnection:*** Some mechanism that provides for communication among the control unit, ALU, and registers.

Structure - The CPU



Top Level of Computer Components



Outline of the Course

- **The main outline of the computer architecture course is:**

- Input/Output organization. **(Ch. 2)**
- CPU Structure and Function. **(Ch. 3)**
- Internal Memory
  - —Main Memory **(Ch. 4)**
  - —Cache Memory **(Ch. 5)**
- Computer Interconnection Structures. **(Ch. 6)**
- Reduced instruction Set Computers. **(Ch. 7)**
- Superscalar Processors. **(Ch. 8)**

Internet Resources
- Web site for Lecturer

- The Web Site: http://gamal.attiya.free.fr/
- The materials of the course will be uploaded by the end of each chapter at the *Student →Undergraduate* page.
- In this site, you will find:
  - —All the presentations of the Course.
  - —All the sheets of the Course.