기초공학설계

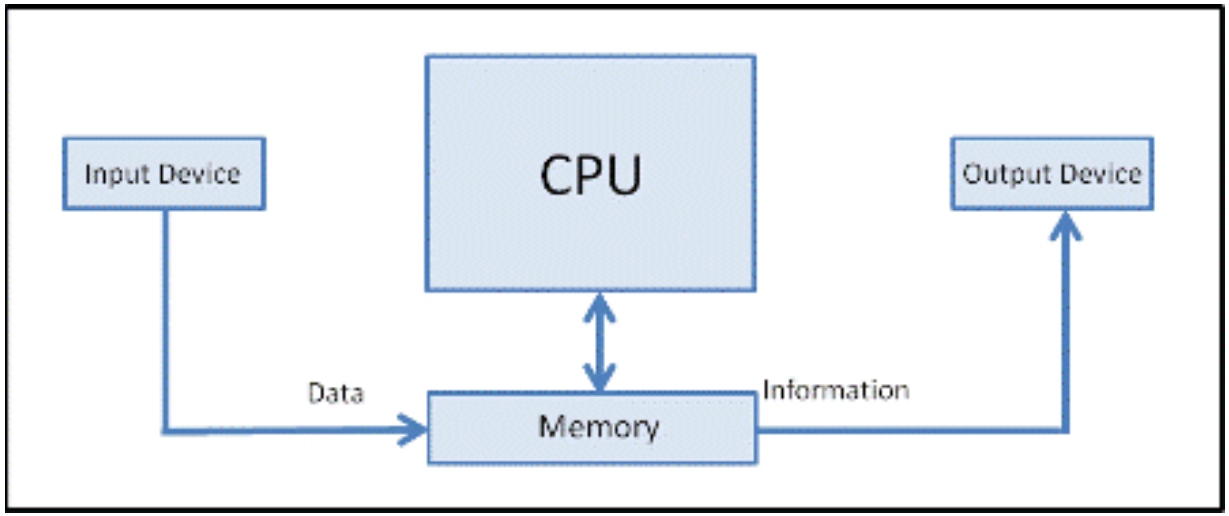
Introduction to Computers

한국항공대학교
소프트웨어학과

Outline

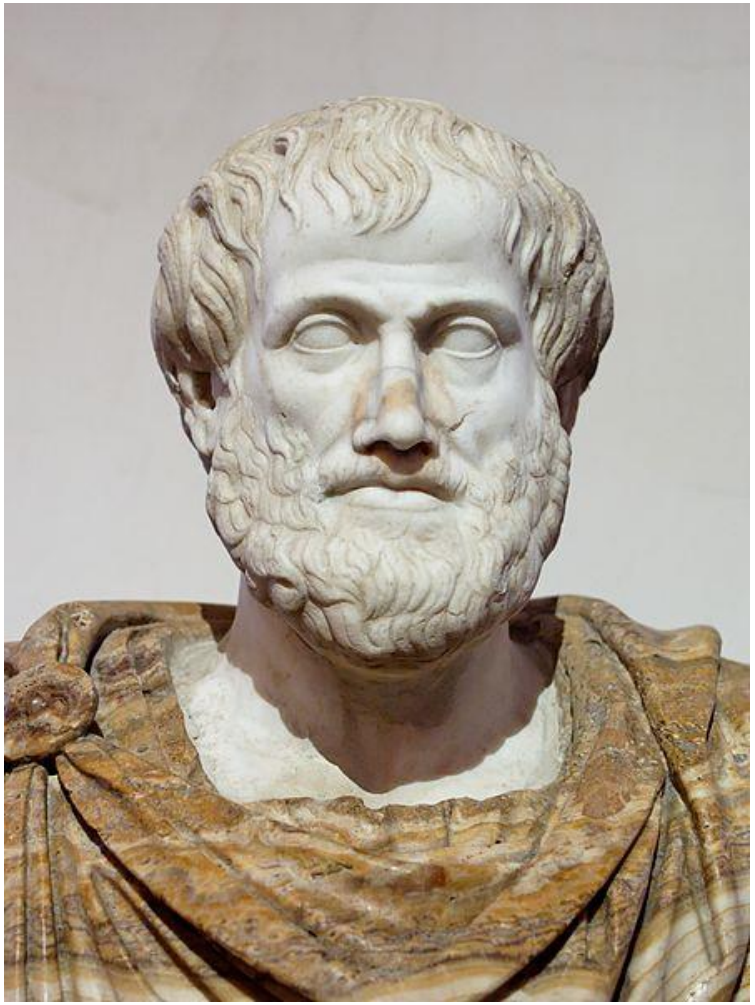
- What is a computer?
- Types of computers
- Computer Hardware
- Computer Software

What is a Computer?



- A basic computer consists of 4 components: An input Device, a CPU , output devices, and memory
- The data is inserted using an input device
- The central processing unit (CPU) converts data to information
- The information is put on an output device
- A memory is a device for storing data and information

아리스토텔레스



폰 노이먼

컴퓨터공학 및 인공지능 가계도

Von Neumann

J.H. Holland

B.P. Zeigler

S.D. Chi

바로 여러분 !

Computer System

- The minimum requirements for a computer system
  - a keyboard,
  - a case containing a CPU and memory
  - a monitor
- The data is usually entered via the keyboard and the information is usually presented through a screen
- information can also be presented through speakers, braille (점자) displays, or any other output devices

Input and Output Device

- Input and output device (I/O) provide a way to interact with a computer. Some examples of I/O devices are:
  - Computer keyboard used to input text.
  - Computer mouse
  - Touch pad
  - Camera
  - Display, or computer monitor
  - Speakers, for audio output
  - Touchscreen, for simultaneous input and output

CPU and Memory

- CPU (or processor)
  - the component of a computer that performs arithmetical and logical operations of the computer system
- Examples of tasks performed by a CPU include:
  - Input/output directions (reading data from an input device/writing information to an output device)
  - Storing data in memory
- Memory (or storage)
  - a place to store information that it might need in order to operate
  - Something stored in memory might be:
    - Text document, photo, operating system, application program, etc.

Types of computers

Super Computer

Titan: Oak Ridge National Laboratory

No. 1 system in November 2012

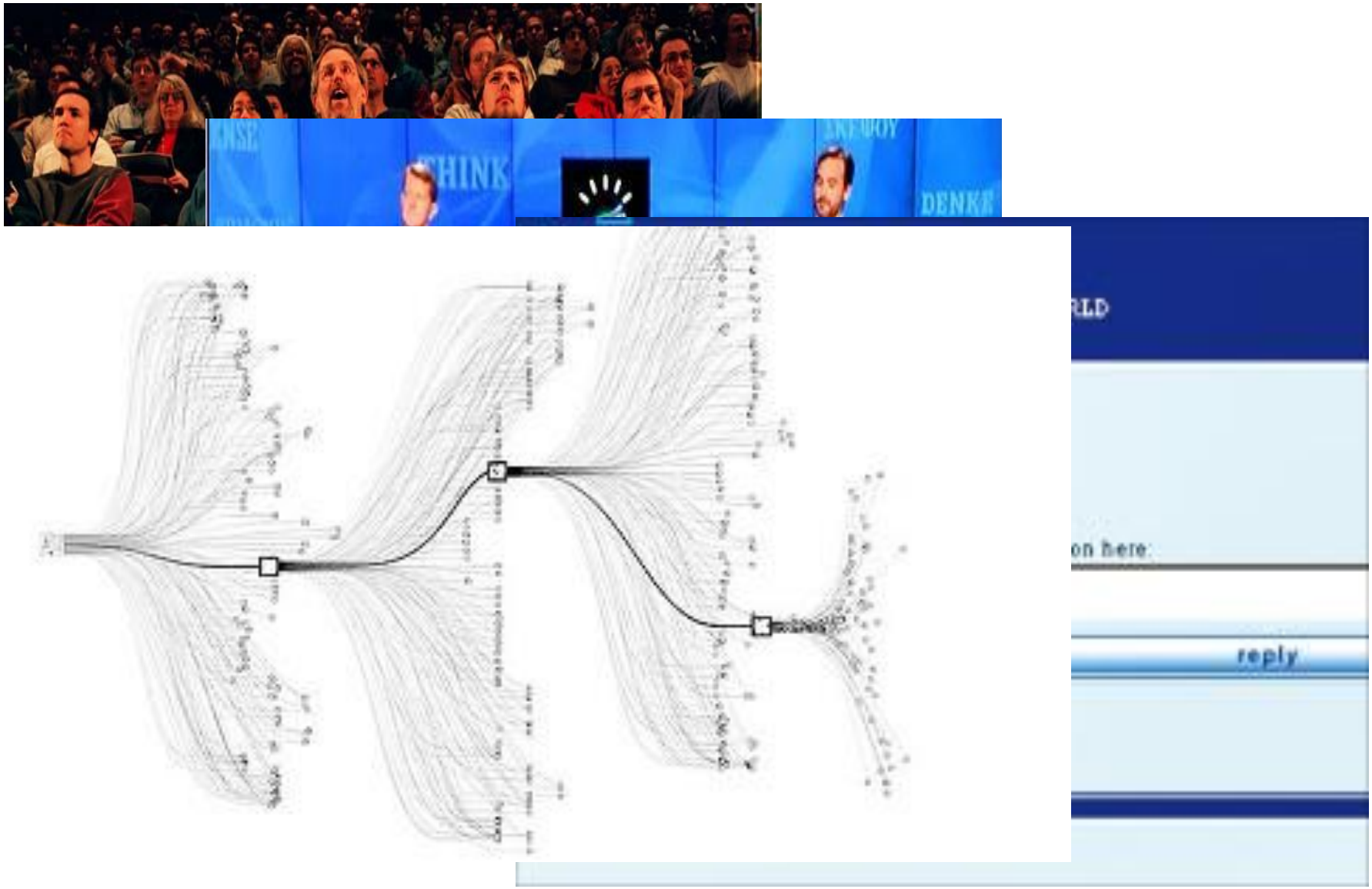
Tianhe-2 (MilkyWay-2): National Super Computer Center in Guangzhou

No. 1 system since June 2013

33.86 petaflop/s

- the fastest and the most expensive computers
- solve very complex science and engineering problems
- Supercomputers get their processing power by taking advantage of parallel processing
  - use lots of CPUs at the same time on one problem
  - Performance (in FLOP)
    - Tianhe-2 : 33.86 Peta FLOP/s = 33,860,000 Giga FLOP/s
    - Intel Core i7 4770K : 99.72 Giga FLOP/s

Computer vs. Human



Server Computer

Inside of a Rack unit Server

- Don't focus on trying to solve one very complex problem, but try to solve many similar smaller ones
- A central computer that contains collections of data and programs
  - A network server allows all connected users to share and store electronic data and applications
  - Two important types of servers are file servers and application servers.
- Some servers have applications on them instead of just files, like Wikipedia and Google Documents

Workstation Computer

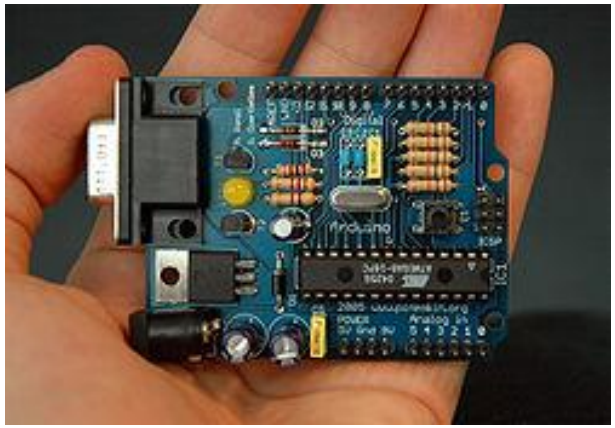
HP Workstation
- Targets AutoCAD Users

- high-end, expensive computers that are made for more complex procedures and are intended for one user at a time
- Some of the complex procedures consist of science, math and engineering calculations and are useful for computer design and manufacturing

Personal Computer (PC)

- Today a PC is an all-around device that can be used as a productivity tool, a media server and a gaming machine.
- The modular construction of PC allows components to be easily swapped out when broken or upgraded.

Microcontroller



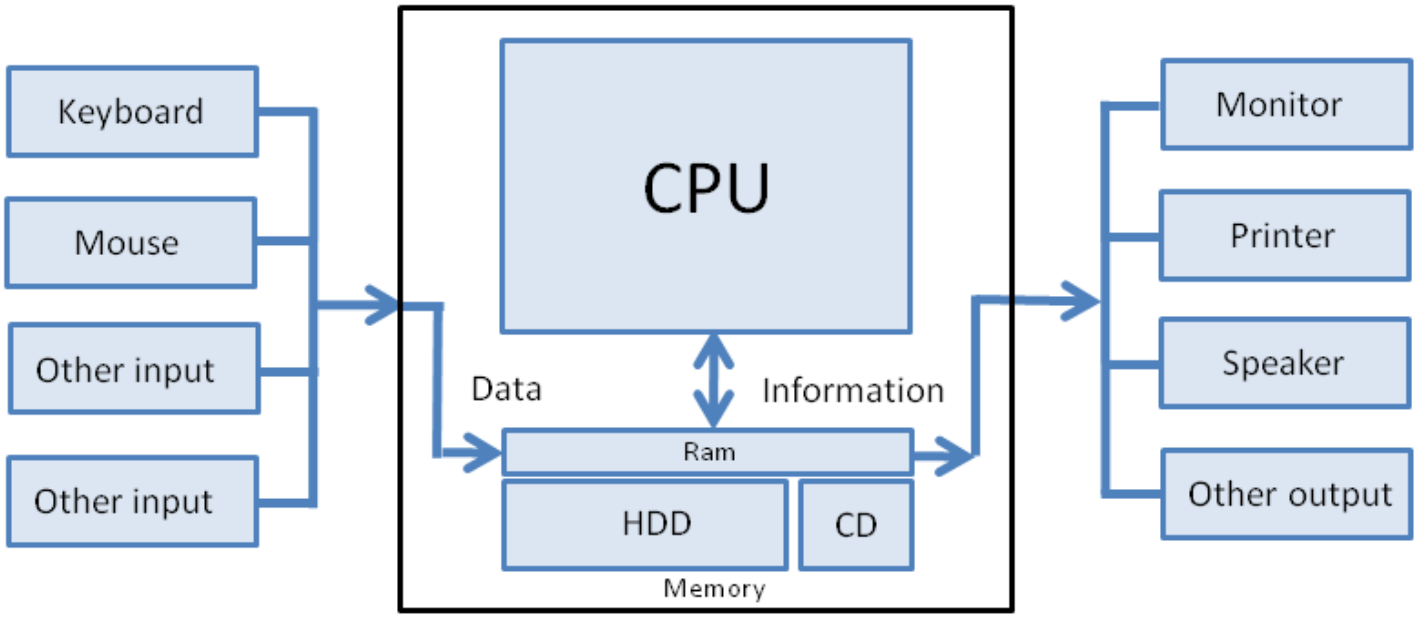
An Arduino, a common programmable microcontroller

- mini computers that enable the user to store data and execute simple commands and tasks
- have minimal memory and program length
- but are normally designed to be very good at performing a niche task ➔ embedded systems

Computer Hardware

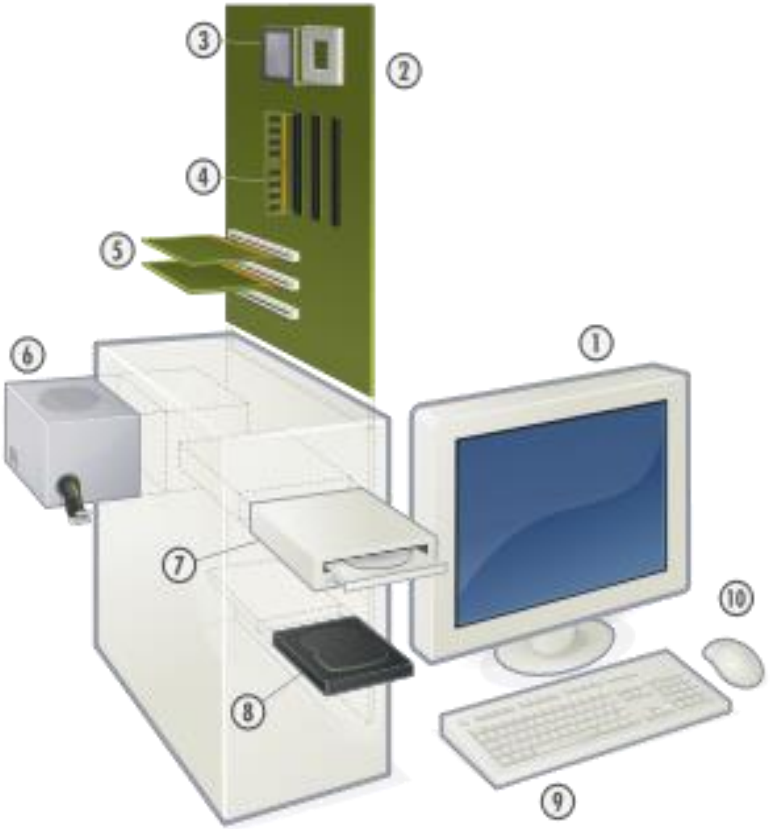
I/O and Memory Unit

- I/O
  - Input unit: keyboard, mouse, flashdrive, etc.
  - Output unit: monitor, printer, speaker, etc.
- Memory unit
  - short term memory (RAM)
  - long term memory (HDD, SSD, Compact Disk(CD))



Inside a PC

1. Monitor
2. Motherboard
3. CPU (Microprocessor)
4. Main memory (RAM)
5. Expansion cards
6. Power supply unit
7. Compact disk drive (CDD)
8. Hard disk drive (HDD)
9. Keyboard
10. Mouse



Computer Software

What is software?

- Software
  - A piece of computer software is a set of computer instructions that tell a computer how it should do something.
- System software
  - An operating system (OS), which defines some of the basics about how your computer should act.
  - Windows, Mac OS, Linux, etc.
- Applications
  - A program or piece of software designed and written to fulfill a particular purpose of the user.

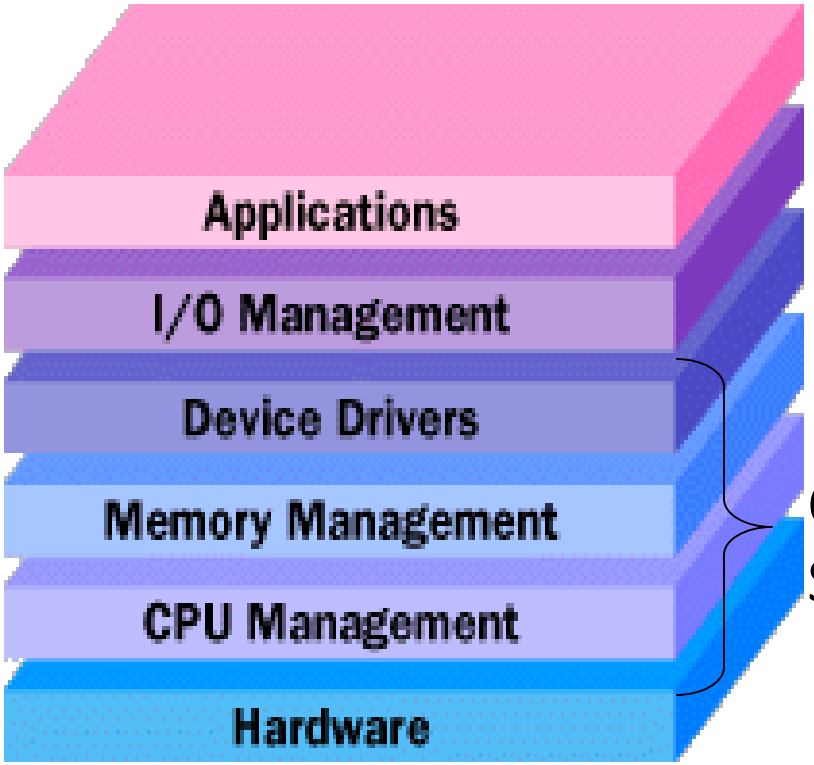
Operating System

- The **minimum** software layer that enables user and/or programs to **operate** the hardware parts.
  - execute a program (processing)
  - retrieve data from a hard disk (storage)
  - print a file, send a file to remote server (I/O)

Android

Linux

The Relationship



Booting Up to OS – (1)

- Microprocessor On
  - It starts to read ‘instructions’ from **BIOS**
  - BIOS (Basic Input/Output System)
    - ROM containing the hardware configuration utility etc
- Going Through BIOS
  - Hardware configuration
    - Interrupt required
  - Hardware testing
  - Go to read from the **boot sector** of the hard

Booting Up to OS – (2)

- Read From Boot Sector
  - Boot sector
    - Containing a special small boot-up program
  - Small boot-up program loaded up to RAM

- Going Through RAM
  - The microprocessor begins to execute the instructions on RAM
    - *The microprocessor to fetch more instructions from the hard disk to RAM*
  - The microprocessor then executes these instructions on RAM
    - *The microprocessor to fetch even more instructions from the hard disk to RAM*

  … and the process repeats until the entire **OS** is loaded

Computer System and OS