Understand Computers

Part 1: Computer and Information Literacy

What is Computer?

- **Computer** is an electronic devices that under a program's direction and control, perform four basic operations: **Input**, **Processing**, **Output** and **Storage**, which called **IPOS**.
- **Computer Program** is a list of instructions, written in a programming language, that tell the computer how to perform these four simple operations in order to accomplish a task.
- Computer system is a collection of related components that have all been designed to work together smoothly.

Typical Computer System

Hardware and Software

- Hardware is the physical component of the computer
  - ◆E.g. Hard disk, CPU,
- Software is the program that run on the computer
  - ◆E.g. Operating system, Editor

Introducing Personal Computer

- A Personal Computer (PC) is designed to meet an individual's computing need.
- PC also called Micro -computer
- Two commonly used types of PC:
  - ◆ Apple computer Macintosh system
  - ◆ IBM-compatible personal computers

Understanding what Computer do

- Input
  - ◆ Accepting data that has been represented in a way that the computer can use.
    - ◆ Example:
      - • Keyboard
      - • Mouse
      - • Microphone
      - • Scanner
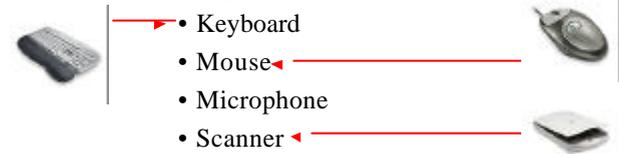
Understanding what Computer do

- Processing
  - ◆ Performing arithmetic or comparison (logic) operations on the represented data.
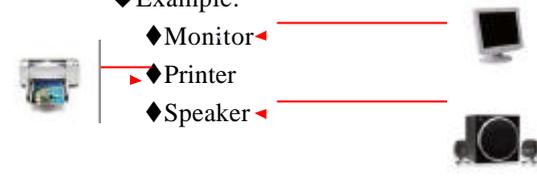   - ◆ Example:
      - • Central Processing Unit (CPU): perform processing tasks under the direction of a program.
      - • Random Access Memory (RAM): store data for direct accessible for processing.

Understanding what Computer do

- Output
  - ◆ Display or output the results to users
  - ◆ Example:
    - ◆ Monitor
    - ◆ Printer
    - ◆ Speaker

Understanding what Computer do

- Storage
  - Storing results for later reuse
  - Example:
    - Magnetic Storage Device:
      - Hard Disk, Floppy Disk, Zip Drive, Compact Flash (CF), Smart Media (SD)
    - Optical Storage Device
      - CD-ROM, DVD-ROM

Types of Computers

- Professional Workstation
  - Provide powerful tools for engineers, architects, circuit designer, financial analysts, and other professional who need exceptionally powerful processing and output capabilities.

Types of Computers

- Desktop Computer
  - Personal computers designed for an individual's use.
  - Help individuals accomplish their more productively.
  - Gain access to the resources of computer networks.

Types of Computers

- Notebook Computer
  - Small enough to fit in a briefcase
  - Many of them are as powerful as PC and include nearly all PC's components.
- Laptop Computer
  - Portable computers that are a bit larger to fit into a briefcase.
- Sub-notebook Computer
  - Omit some components to cut down the weight and size.

Types of Computers

- Handheld Computer
    - Also called Personal Digital Assistant (PDA)
    - Pack much of notebook's power into a much lighter package.
    - Most include built-in software for appointments, scheduling, and electronic mail, and pen computers accept hand written input.

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Computers for Organizations

- Supercomputer
    - Ultra-fast computers designed to process huge amount of scientific data and then display the underlying pattern that have been discovered.

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Computers for Organizations

- Mainframe
    - Huge, multi-user systems designed to handle gigantic processing job in large corporations or government agencies, such as handling an airline's reservation.
    - Some mainframes support over 10,000 concurrent users.
    - People login mainframe using terminals
    - Mainframe are usually stored in special, secure room that have a controlled climate.

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Computers for Organizations

- Minicomputer
    - Multi-user system that can handle the computing needs of a small corporation or organization.
    - Support up to 1,000 concurrent users.

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Computers for Organizations

- Server
  - Serves aren't designed to be used directly.
  - Make programs and data available for people hooked up a computer network, a collection of computer connected together so that they can exchange data.
  - To use sever, user run desktop programs called clients, to contact the server and obtain the need information.
  - The use of desktop clients and centralized servers is called **Client-Server Computing**.

The World of Computer Software

- Without computer programs, computer is useless because it cannot operate.
- When turn on a computer, an automatic program called a bootstrap loader, is fed into the computer memory.
- The program guides the rest of startup process, involves moving more essential programs from hard disk to memory.
- Program must to present in memory before their instructions can be executed (performed).

System & Application Software

- System Software
  - System software includes all programs that help computer function properly
    - Example: Operating System
- Application Software
  - Application software consists of all the programs you can use to perform a task
    - Example: Internet Browser, Word Processor

Introducing Information Systems

- Information System includes customized hardware and software, and data that's central to the company's mission, trained users who know how to use the system to serve customers better, and procedures that outline precisely how to accomplish a take without error.

Understand Computers

Part 2: History of Computer Technology

Abacus

■ In ancient time, from Egypt to China, merchants used a computer called **Abacus** to calculate figures.

Jacquard's Loom

■ For modern computing, the most important early innovation was not the clockwork calculator, but an unrelated development in a different area: weaving.

■ In nineteenth century, a French mill owner **Joseph Marie Jacquard** developed a loom that could be programmed.

■ The loom used large card with holes punched in them (punched cards) to control the pattern woven into materials.

■ Jacquard's Loom were responsible for automating the textile industrial and Jacquard pattern are still produced today

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Baddage's Folly

■ **Charles Baddage**, an English scientist and mathematician, created the world's first fully modern computer design.

◆ Different Engine is stream-power machine made from clockwork gears, could calculate mathematical tables and print the results.

◆ Analytical Engine is a full-fledged modern computer with a recognizable IPOS cycle and would used punched cards for input.

■ Although Baggage unable to get his machines to work, computer scientists realize he discovered almost all of the fundamental principles that underlie today's computers. He is called "Father of Computing"

Herman Hollerith's Tabulating Machines

- Herman Hollerith, the World's First Statistical Engineer, design the Tabulating Machines for the Automated Census Bureau.
  - ◆ In 1790 it took the United States' Census Bureau less than 9 months to complete the first census.
  - ◆ By 1860 the population increased almost tenfold since 1790, from 3.8 million to 31.8 million.
  - ◆ In 1887 the Census Bureau completed the 11th census 7 years after it began.
- He founded the Tabulating Machine Company in 1986 to continues his work, and his company becomes IBM today.

Foundations of Modern Computing

- In 1973, a U.S. court declared John Atansoff, a professor at Lowa State University, to be the "Inventor of the Electronic Computer", based on an an electronic calculator Atansoff built in the late 1930s.
- Most computer scientists believe that the foundations of modern computing were laid by many inventors, each making an important contributions.

ENIAC

- Electronic Numerical Integrator and Computer (ENIAC) was the first large-scale electronic digital computer, which also led directly to the world's first commercial computer system.
- World War II create a need for the American military to calculate the missile trajectories quickly. However, ENIAC was not completed until the end of war.

Problems in ENIAC

- It was frustrating to use because it wouldn't run for more than a few minutes without blowing a tube and cause the system stop working.
- When a new problem had to be solve, the staff had to enter the new instructions by rewiring the entire machine.

Stored-Program Concept

- With the stored-program concept, the computer, as well as data, is stored in the computer's memory.
- Advantages:
  - Computer can easily go back to a previous instruction and repeat it.
  - Convenience: no need to rewire the computer to perform different task.
- All computers that have been sold commercially have used stored-program concept.

The Computer's Family Tree

The Generations of Computer Development

Generation	Years	Circuitry	Characterized By
First	1950s	Vacuum tubes	Difficult to program; used only machine language
Second	Early 1960s	Transistors	Easier to program (high-level languages); could work with business tabulating machines; cheaper
Third	Mid-1960s to mid-1970s	Integrated circuits (SSI, MSI, LSI)	Timesharing, minicomputer
Fourth	Mid-1970s to present	VLSI and the microprocessor	Personal computer; graphical user interface; LANs; Internet

The First Generation (1950s)

- The First Generation computers use Punched Card for input, Vacuum Tubes for memory, and Magnetic Tape for storage.
- Eckert and Mauchly delivered the first UNIVAC to the U.S. Census Bureau in 1951.
- Punched cards were used for input, although it accept magnetic tape. Power-hungry vacuum tubes provide the memory. Employee the stored-program concept, provide a supervisory typewriter for controlling the computer, and use magnetic tape for unlimited storage.
- Although the stored-program concept make UNIVAC easily to use, machine language is used for programming.

The Second Generation (Early 1960s)

- The Second Generation computers were created with Transistors instead of vacuum tubes, these computers were faster, smaller and more reliable.
- Use Punched Card for input, had Printers, Tape Storage and Disk storage.
- High-level programming languages were developed to enable programmer writing program instructions using English-sounding commands and Arabic numbers: COBOL (Common Business-Oriented Language) and FORTRAN (Formula Translator).

The Second Generation (Early 1960s)

- In 1959, an important development in business computing was General Electric Corporation's Electronic Recording Machine Accounting (ERMA) in 1959, the first technology that could read special characters.
- In 1963, an important development of the first computer industry standard was American Standard Code for information Interchange (ASCII), a character set that enables computers to exchange information.

The Third Generation (Mid-1960s to Mid 1970s)

- Second-generation computer run only one job at a time, called Batch Processing, was time-consuming and inefficient.
- The key innovation in Third-generation was Timesharing to allow many people do the task simultaneously.
- User access computer remotely by terminals, using a keyboard and a video display.

The Third Generation (Mid-1960s to Mid 1970s)

- The Key technological event was the development of computers based on Integrated Circuit (IC), which incorporates many transistors and electronic circuits on a single wafer or chip silicon.
- The earliest IC using a technology called Small-Scale Integration (SSI) could pick up to 10 – 20 transistors on a chips.
- By the late 1960s, engineers had achieved Medium-Scale Integration (MSI) could place 20 – 200 transistors on a chip.
- In the early 1970s, Large-Scale Integration (LSI) was achieved to hold up to 5,000 transistors.

The Third Generation (Mid-1960s to Mid 1970s)

- Another important innovation was the development of standard for Computer Network.
- In 1960s, the U.S. Advanced Research Projects Agency (ARPA) had support a project to develop a Wide Area Network (WAN). This project create a test network called ARPANET, which is the first generation of the Internet.
- In 1973, ARPANET fully implemented the Internet protocols (TCP/IP), the standards that enable the Internet to work. Xerox Corporations's Palo Alto Research Center (PARC) develop the standard of Local Area Network (LAN), a direct-cable network that could tie in all computer in a building called Ethernet.

The Fourth Generation (1975 - 1991)

- Development of Very-Large-Scale integration (VLSI) that could place more than 5,000 transistors on a single chip.
- The World's First Microprocessor: Intel 4004
- The World's First Microcomputer, which use microprocessor for CPU: Intel 8080
- In mid-1970s, Steve Jobs and Steve Wozniak develop Apple I and found the Apple Computer Inc. Then they developed Apple II with keyboard, monitor, floppy drive and operating system, and become one of the leading forces in the microcomputer market.

The Fourth Generation (1975 - 1991)

- VisiCalc introduces the first spreadsheet software in 1979.
- The IBM Personal Computer (PC), with a microprocessor chip, Intel 8080, made by Intel Corporation and operating system called MS-DOS (Microsoft Disk Operating System) was released in 1981.
- The first microcomputers weren't easy to use. To operate them, users had to cope with the computers' command-line user interface. That's why Graphical User Interface (GUI) is such an important innovation.

The Fifth Generation?

- For years, experts have forecast that the trademark of the next generation will be Artificial Intelligent (AI), in which computer exhibit some of the characteristic of human intelligence.

References

- Computers in Your Future (Ch. 1)