

Introduction to Computer Science

Tian-Shyr Dai (戴天時)

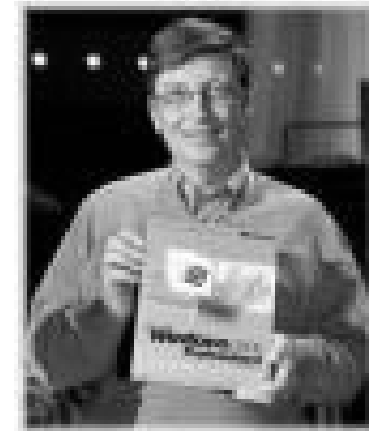
Department of Applied Mathematics

Chuan Yuan Christian University

E-mail: cameldai@cycu.edu.tw

Why is Bill Gates always smiling?

- Why is he always smiling?



Forbes.com: The Top Ten - Microsoft Internet Explorer

檔案(F) 編輯(E) 檢視(V) 我的最愛(A) 工具(T) 說明(H)

← 上一頁 ▾ → × ↺ 搜尋 ☆ 我的最愛 媒

網址(D) http://www.forbes.com/forbes/2003/1006/139.html

Forbes .com
U.S. | EUROPE | ASIA

Jump
Select Section ▾ Search

HOME BUSINESS TECHNOLOGY MARKETS WORK LISTS

Home > Magazines > Forbes Magazine

The Richest People In America

The Top Ten

10.06.03

William H. Gates III
\$46 billion
Microsoft. *Medina, Wash.*
47. Married, 3 children

Microsoft acting more mature--paying out dividends, nixing stock options--but no less formidable: "We're just at the beginning of what we can do with software," proclaimed Gates at company meeting in July. Microsoft's chief software architect pushing to move company beyond PCs into TVs, cell phones, cars, even wristwatches. Flagship Windows operating system runs 94% of the world's desktop computers, but company facing heated pressure from Linux, whose open-source system for servers is growing more quickly than Microsoft's. Expectations high for Windows

Chapter 1

Introduction

OBJECTIVES

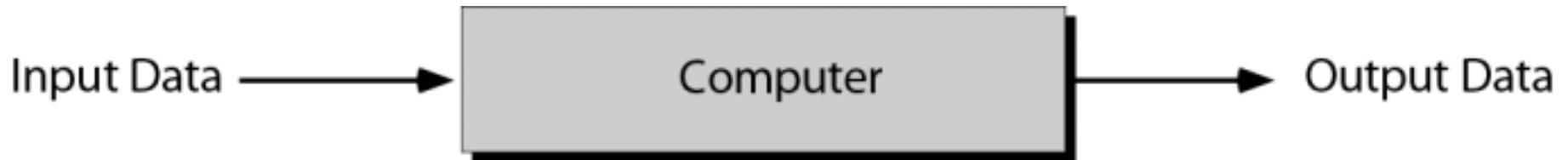
After reading this chapter, the reader should be able to:

- Understand the concept of a black box, a data processor, and a programmable data processor.
- Define the *von Neumann* model and name its components: memory, arithmetic/logic unit, control unit, and input/output.
- Understand the stored program concept.
- Understand the sequential execution of statements in a program.
- Name the components of a computer: hardware, software, and data.

1.1

***THE COMPUTER
AS A BLOCK BOX***

A Computer can be Viewed as a Data Processor



Type of processing:

Specific-purpose computer: Do some specific jobs

Like Calculator

General-purpose computer: Do different type of tasks

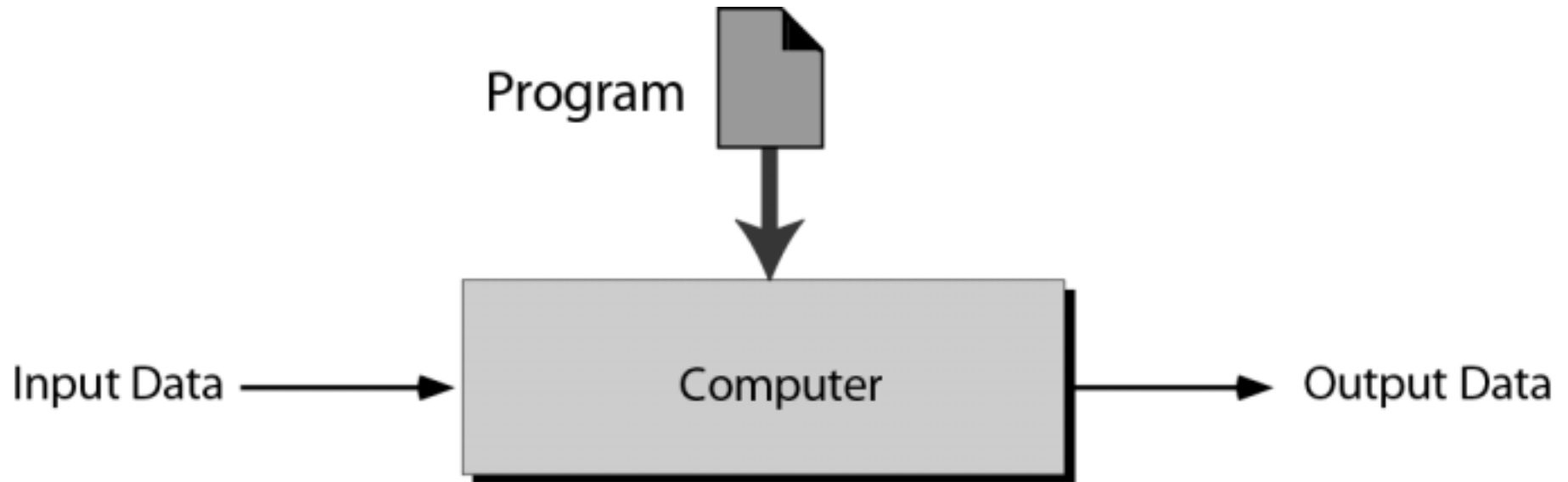
Like PC

Today's meaning of computer

We need a more actual definition.

Figure 1-2

Programmable data processor model



Output data depend on programs and input data.



ns.driver.c - a sample program for calling lns.

September 25, 2003

Program by Kun-Mao Chao & Jinghui Zhang

```
#include <stdio.h>
```

```
#define MAX_LEN 50000
```

```
extern int lns(int *, int, int *);
```

```
int get_num(int *);
```

```
void fatal(char *);
```

```
int main(int argc, char *argv[])
```

```
    int S[MAX_LEN]; /* to store the sequence of numbers */
```

```
    int len_s;      /* the sequence length */
```

```
    int LNS[MAX_LEN]; /* to store the chosen positions */
```

```
    int len_lns; /* the length of the longest nondecreasing subsequence */
```

```
    int i;
```

Figure 1-3

Same program, different input data

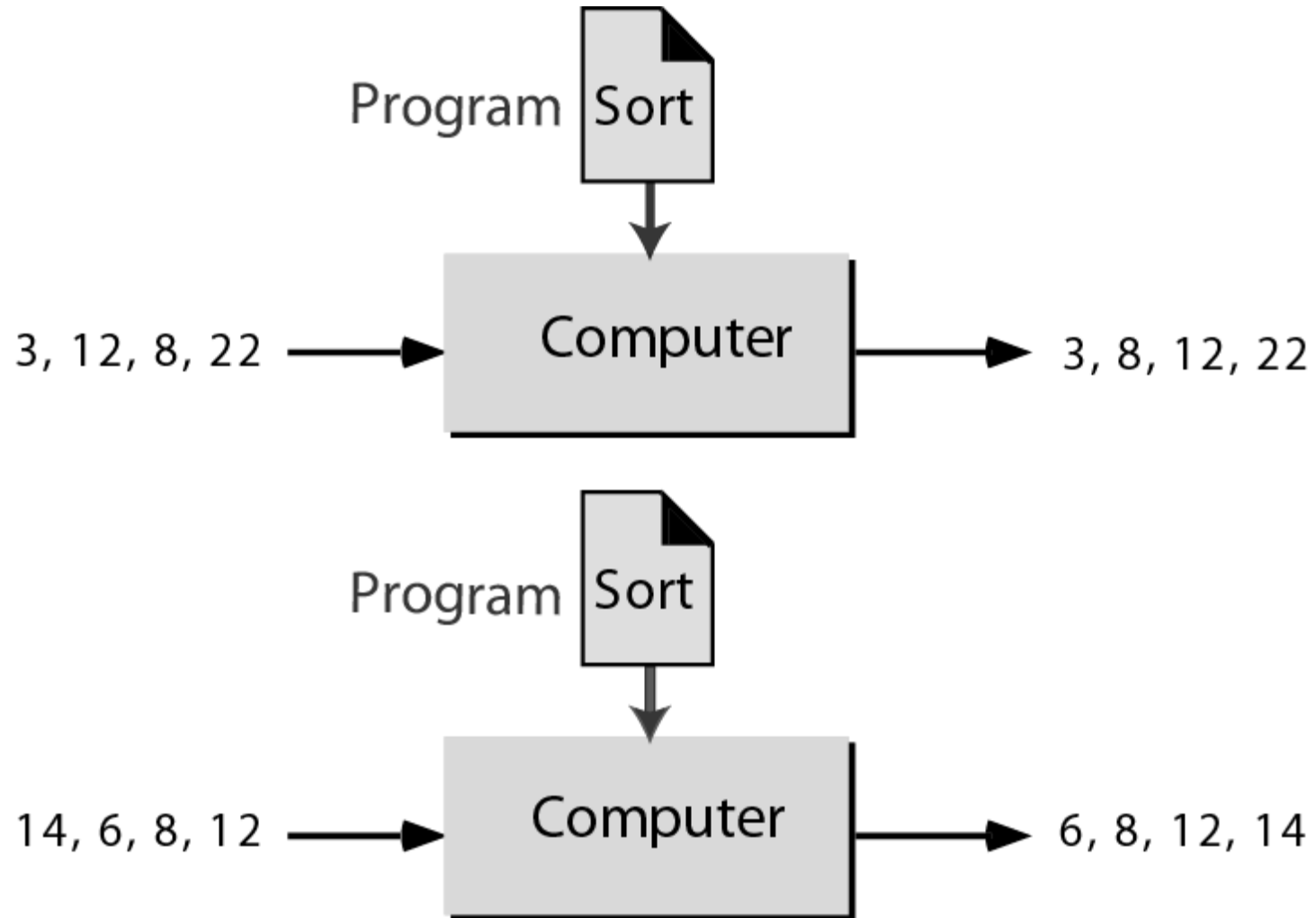
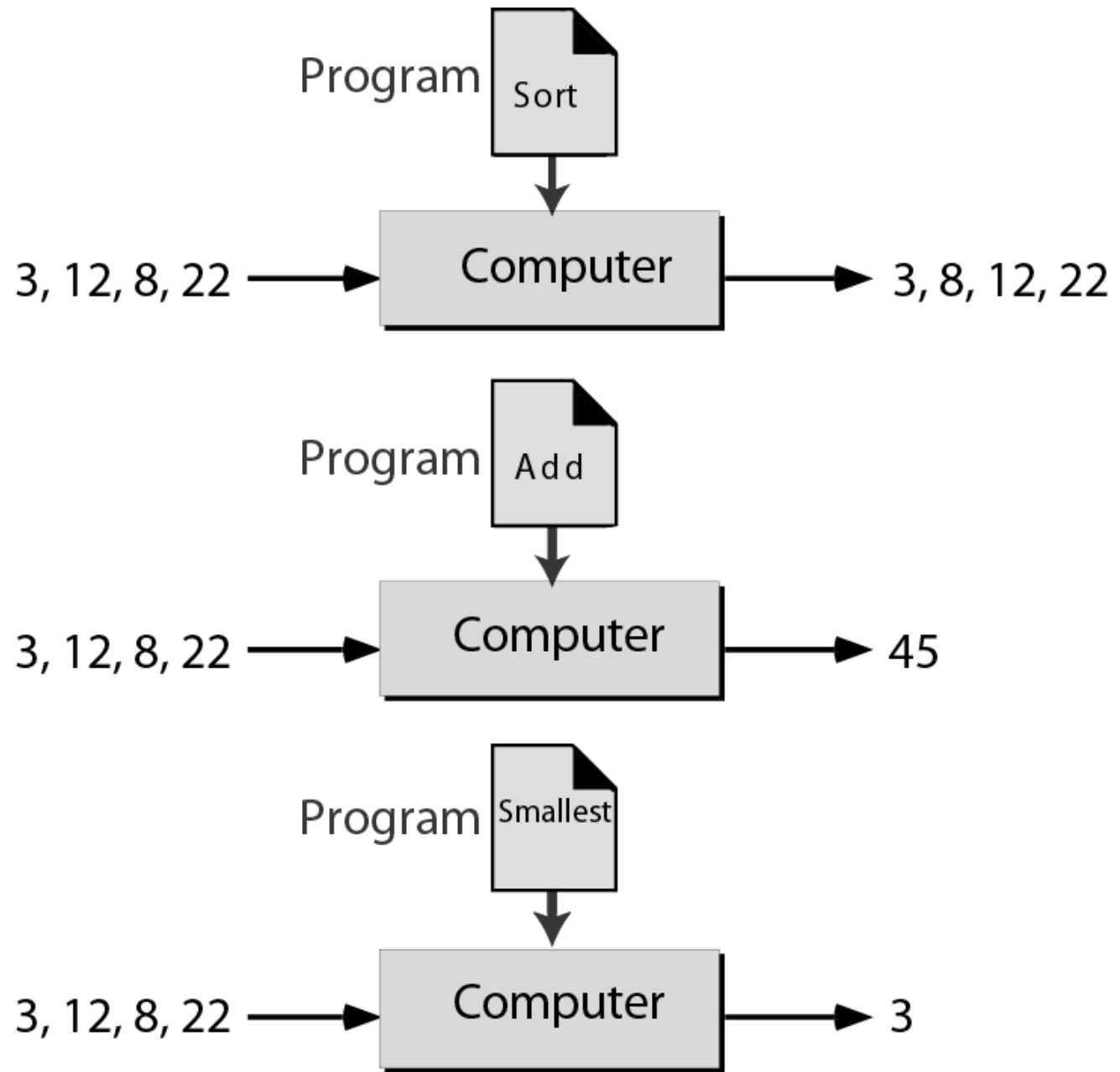


Figure 1-4

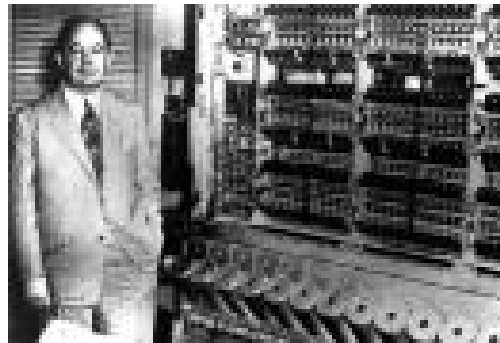
Same data, different programs



1.2

*von NEUMANN
MODEL*

von Neumann



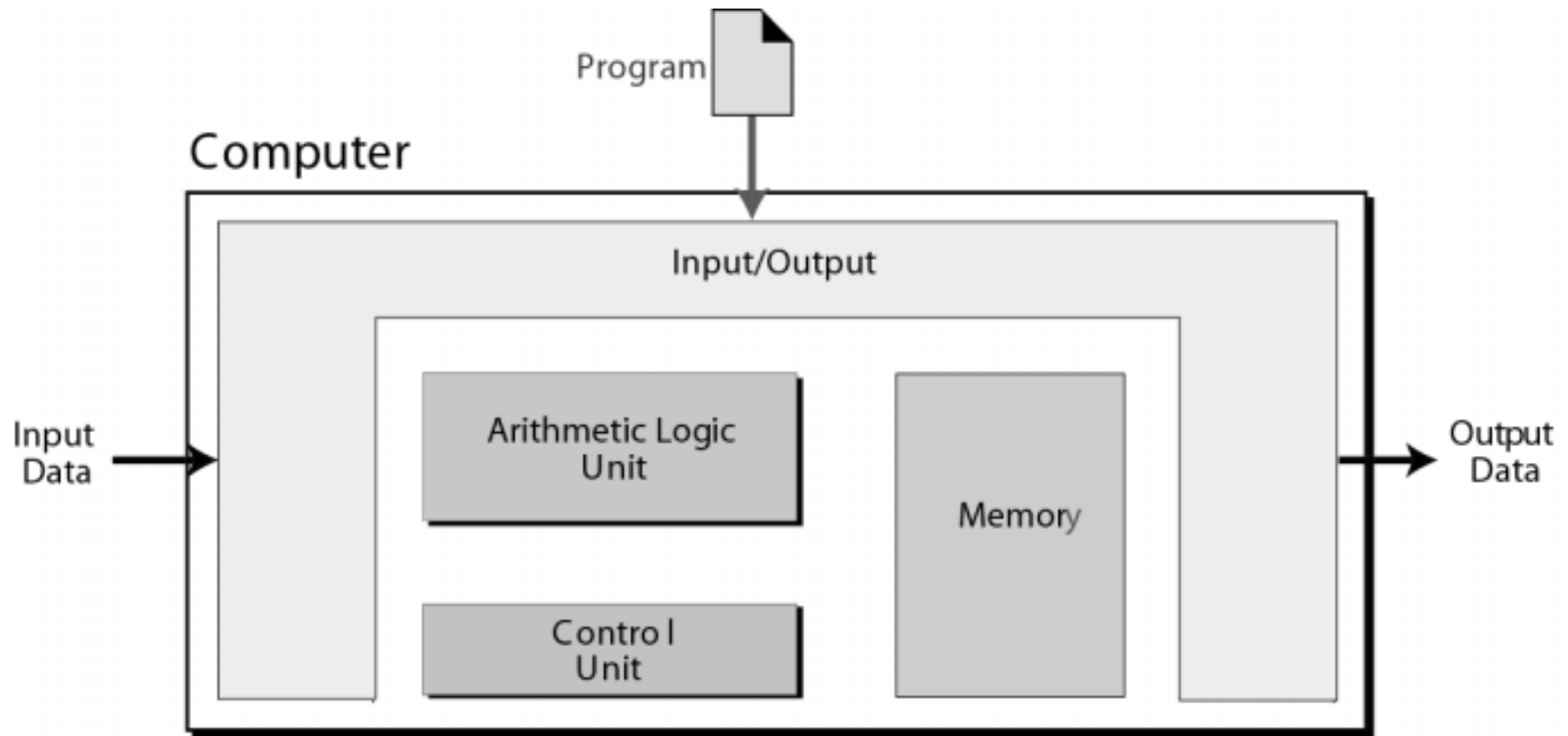
About John Louis von Neumann(馮紐曼)

- **John Louis von Neumann**

- Born 28 December 1903, Budapest, Hungary;
- Died 8 February 1957, Washington DC;
- *Brilliant mathematician, and promoter of the stored program concept→the von Neumann Architecture.*

Figure 1-5

von Neumann model



von Neumann Model

- 四個主要部分
 - Memory (記憶體)
 - Arithmetic Logic Unit (ALU, 運算及邏輯單元)
 - Control Unit (CU, 控制單元)
 - Input/Output (I/O, 輸出入)
- 儲存程式概念 (stored program concept)
- 循序執行指令 (sequential execution of instructions)

1.3

***COMPUTER
HARDWARE***

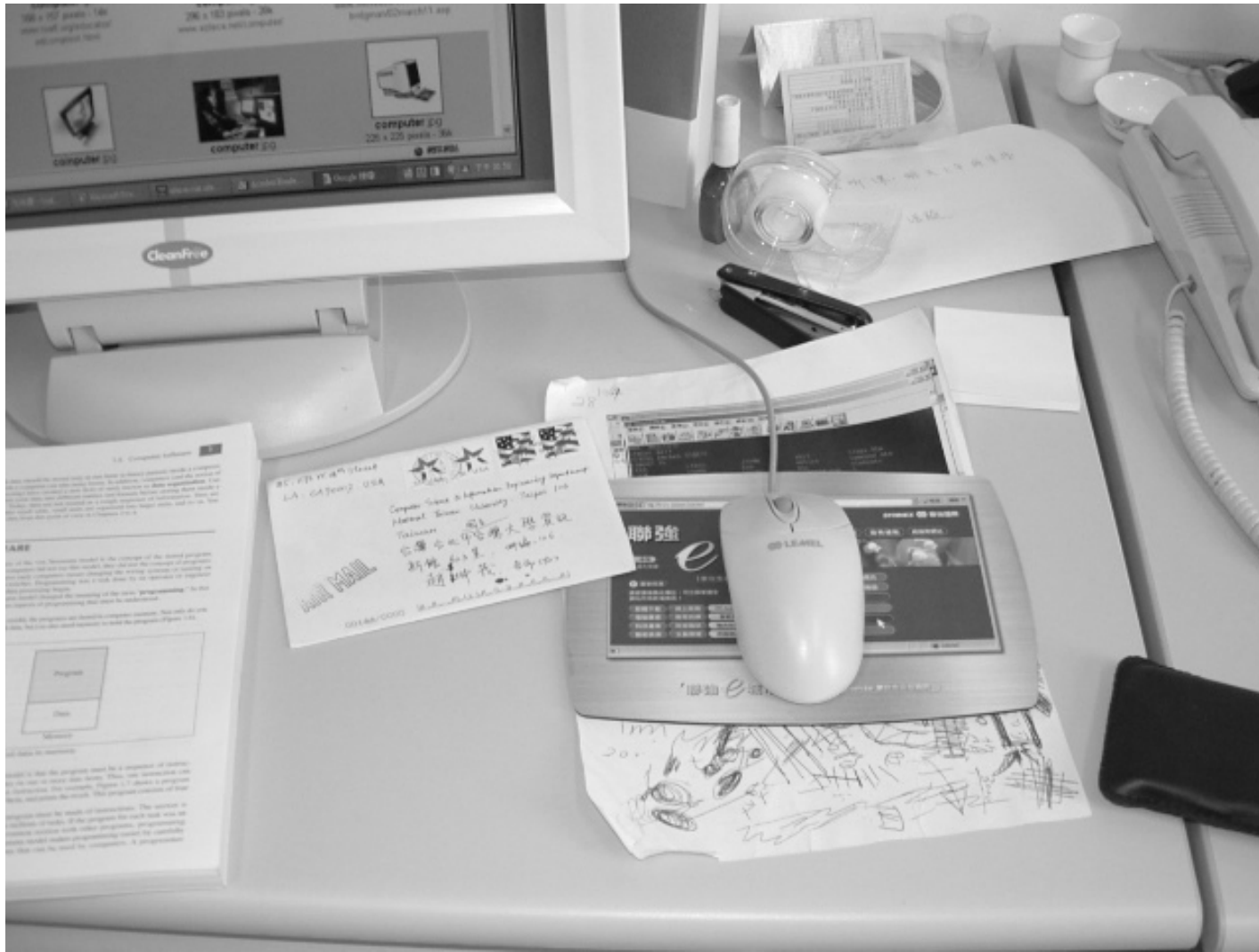
電腦 (計算機, Computer)



螢幕 (Monitor; Screen)



滑鼠 (Mouse)



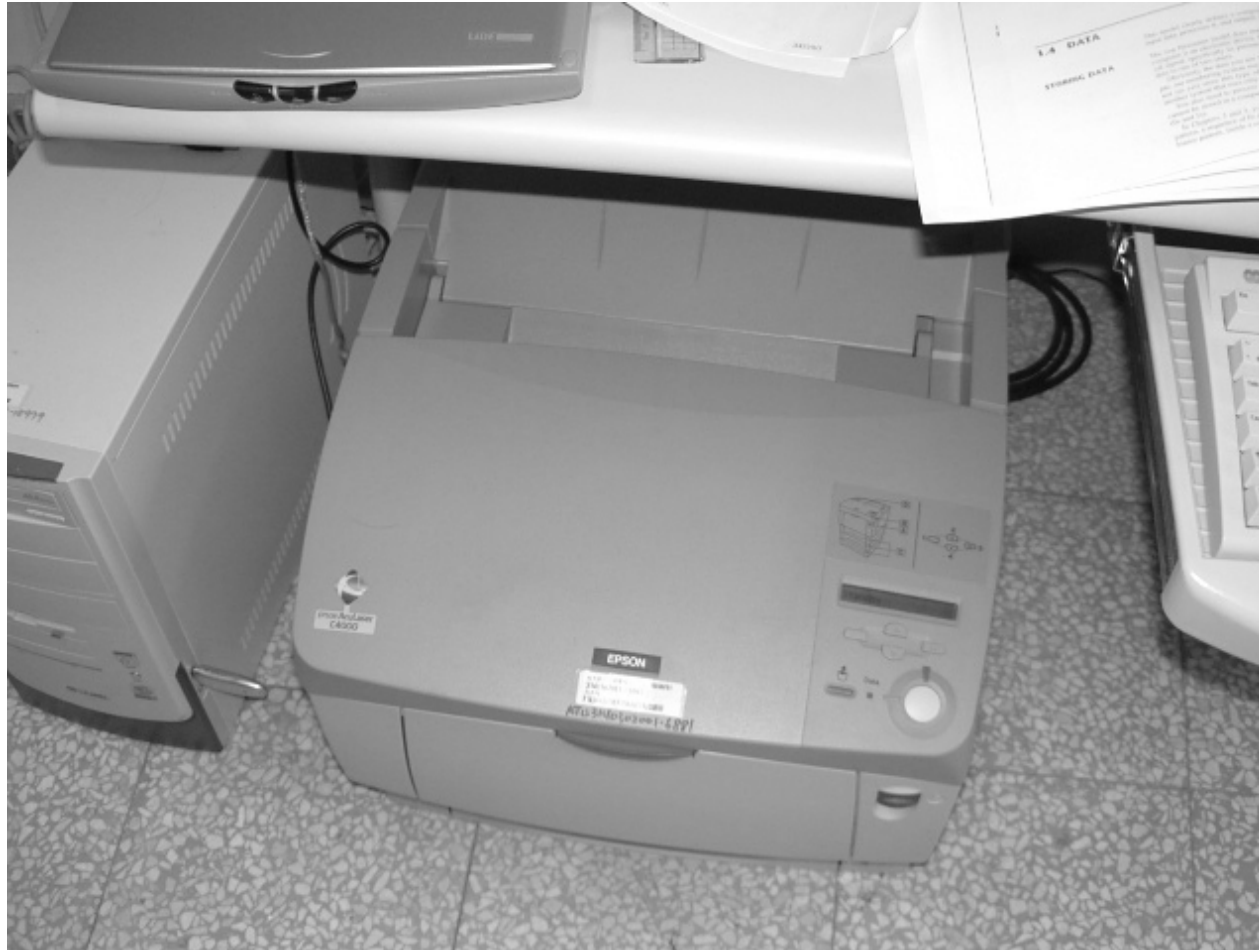
鍵盤 (Keyboard)



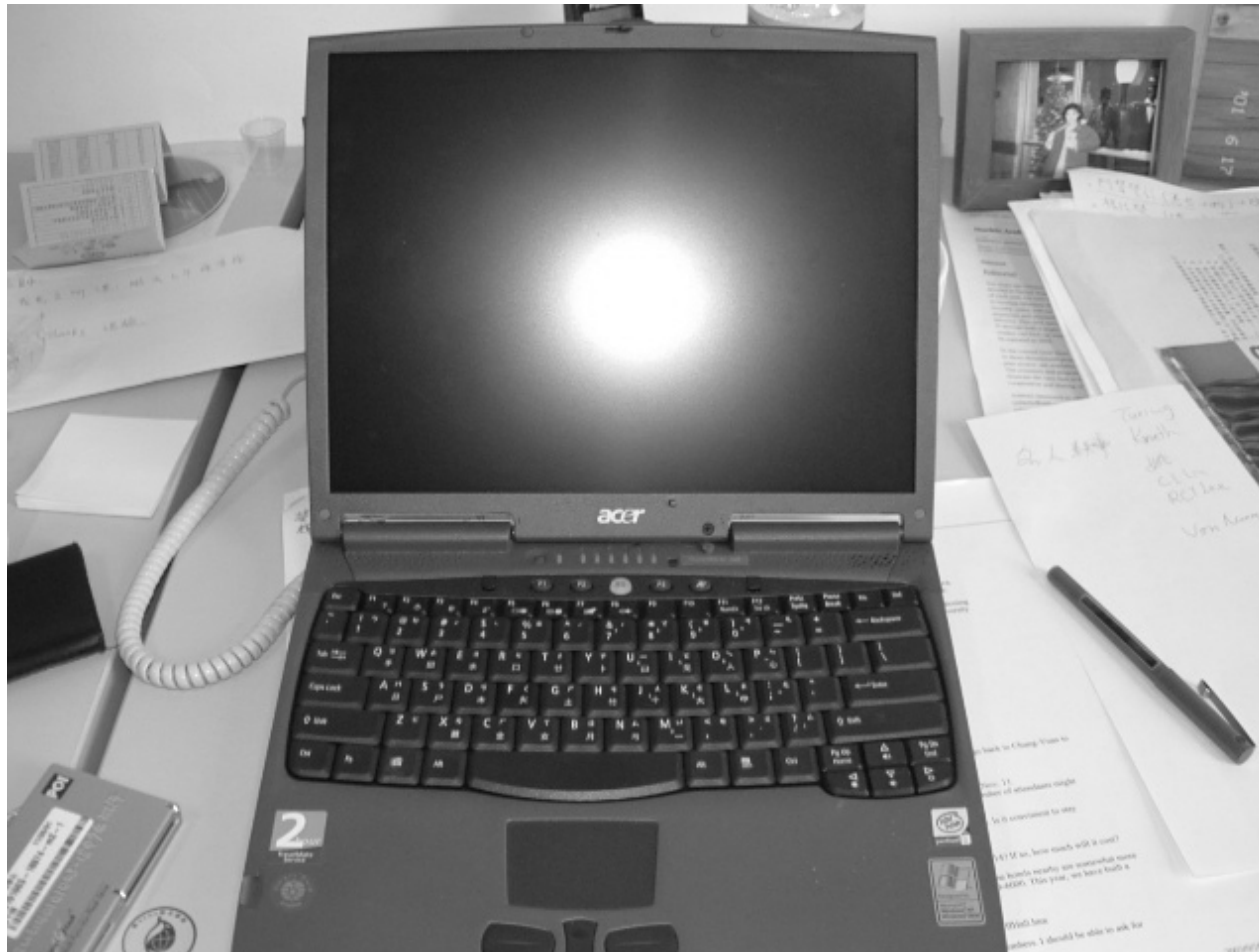
主機 (Computer housing; the computer case; the box)



印表機 (Printer)



筆記型電腦 (Notebook)



無線網卡 (Wireless card)



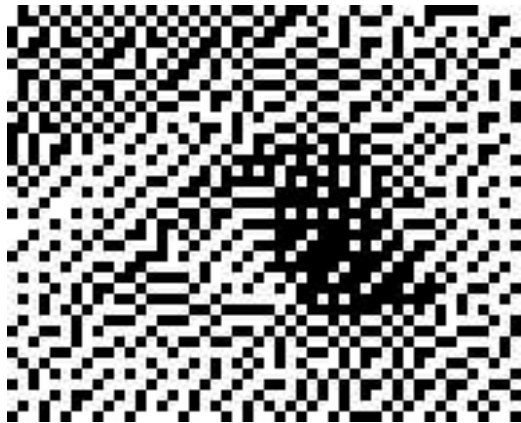
1.4

DATA

Storing Data

- Data can be stored as an electronic signal $\Rightarrow 0,1$
- Other type of data:
 - text, number, image, video, ... \rightarrow transfer to 0,1 signals (binary data)
 - How to represent the data with binary data
 - How to know the type of data the binary data stand for?
 - Use image data as an example.

Representation of Images



- In a picture with only black and white pixels:
 - 1 represents black.
 - 0 represents white.

```
01010101010101010101010110101101001001000111110000
011010101010101010101001011010010110010100000110
100101010101010101010110110001010000101001010100
101101101011011010110101100110010110100010001001
011010010110100101101010001001100100101101010010
100101101100101011010101110110011001010010101100
011010010011010110010010001001100110101010010001
010101101100101100100101110110011001010100100101
010101010101010011011010001001100010100001010100
101010101010101100010010110010001101001110100001
0101010101010100001000101000101101000010000001101
110110101010010100110100011010010011100101101000
101001010100100010100101100101101100001010000010
101011010001001001001001011110101011010100101100
101010000100010010010111110101111100101001001001
010100101001000100101010101110101011010010010000
101001000010011001101111101011101010101000100101
010010010100100011011000011110111011010110101000
000100000001001100100111111111110110111000000010
101000101010010011011000010101011101000010101000
00001000010010110101001111111111111011101000101
001000101001101010100100011101111110100010010000
010010010110001001001001111011110101101100100101
100100100000111010010010010111111111011001001000
```

1.5

***COMPUTER
SOFTWARE***

Figure 1-6

Program and data in memory

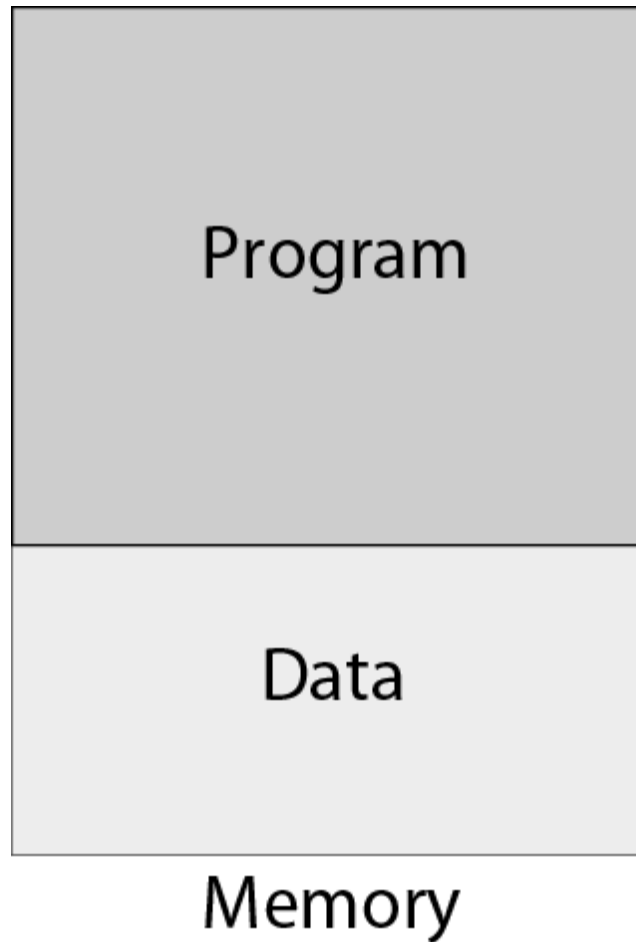


Figure 1-7

Program made of instructions

1. Input first data item into memory.
2. Input second data item into memory.
3. Add the two together and store the result in memory.
4. Output the result.

Program

Terminologies

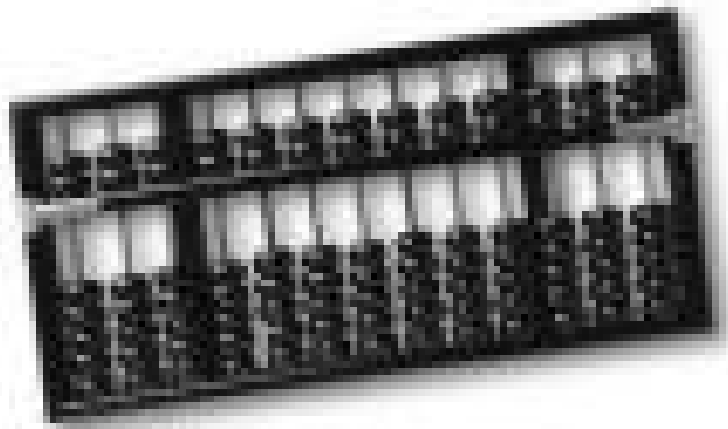
- Algorithms:
 - An **algorithm** is a step-by-step procedure for solving a problem in a finite amount of time.
- Languages:
 - Artificial language, used to communicate with computer.
- Software engineering:
 - Rules and principles improve the efficiency of program development.
- Operating system:
 - Maintain the resources of computer

1.6

HISTORY

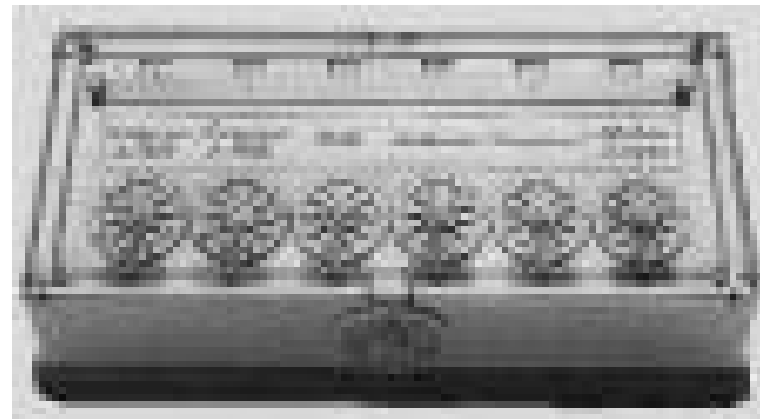
最早的計算工具

- 算盤



Pascaline

- 法國數學家 Blaise Pascal 於西元1642年所發明, 是一種加法器



Difference Engine

- Charles Babbage 西元1823年所發明



打孔卡排序工具

- Herman Hollerith 於1890年所發明



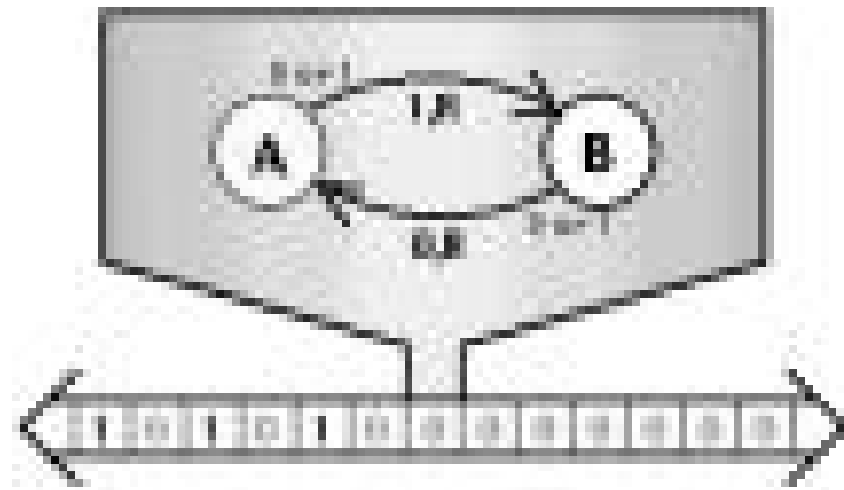
ABC (Atanasoff Berry Computer)

- A specific-purpose computer used to solve linear equation
- John V. Atanasoff 和 Clifford Berry於1939年所發明



Colossus

- Alan Turing在二次大戰時設計，破解了德國的Enigma密碼



Turing Award

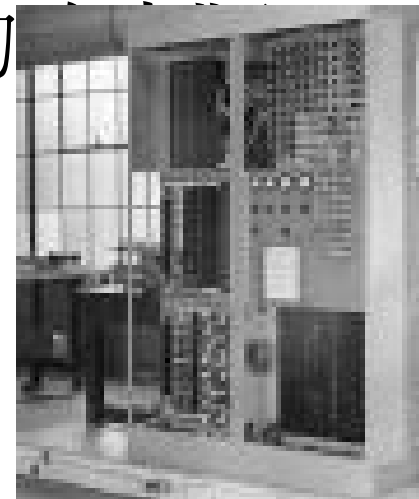
- Nobel prize in computer science
- ACM's most prestigious technical award is accompanied by a prize of \$100,000. It is given to an individual selected for contributions of a technical nature made to the computing community. The contributions should be of lasting and major technical importance to the computer field. Financial support of the Turing Award is provided by the Intel Corporation.
- 西元1966年開始

ENIAC

- Electronic Numerical Integrator and Calculator
- Made in 1946
- 18,000 vacuum tubes (真空管)
- The first general-purpose electronic computer.
- John Mauchly 和 J. Presper Eckert 所發明
- 100(ft)*10(ft) weight 30 ton.

EDVAC

- Electronic Discrete Variable Automatic Computer
- 1950建於賓州大學 (ENIAC的)
- 第一部von Neumann電腦
 - 程式和資料都放在記憶體中



• 第一代到第四代的電腦基礎元件比較

代別 \ 項目	年 代	電 子 元 件	電子元件的大小	速 度 比 較
第一代	1950~1959	真空管	大姆指	毫秒 (10^{-3} 秒)
第二代	1959~1965	電晶體	鉛筆的橡皮頭	微秒 (10^{-6} 秒)
第三代	1965~1975	積體電路	0.5mm 鉛筆心	10 毫微秒(10^{-8} 秒)
第四代	1975~1985	微電腦元件 (VLSI)	比針尖小	毫微秒 (10^{-9} 秒)



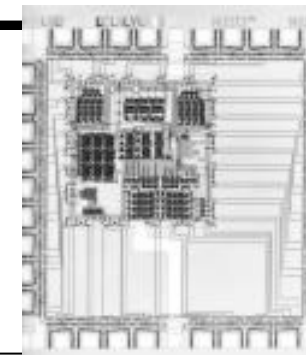
Vacuum tubes
(真空管)



transistor
(電晶體)



IC (Integrated
Circuit; 積體電路)



VLSI