程序设计基础及语言
——C++大学教程

东南大学

计算机科学与工程学院

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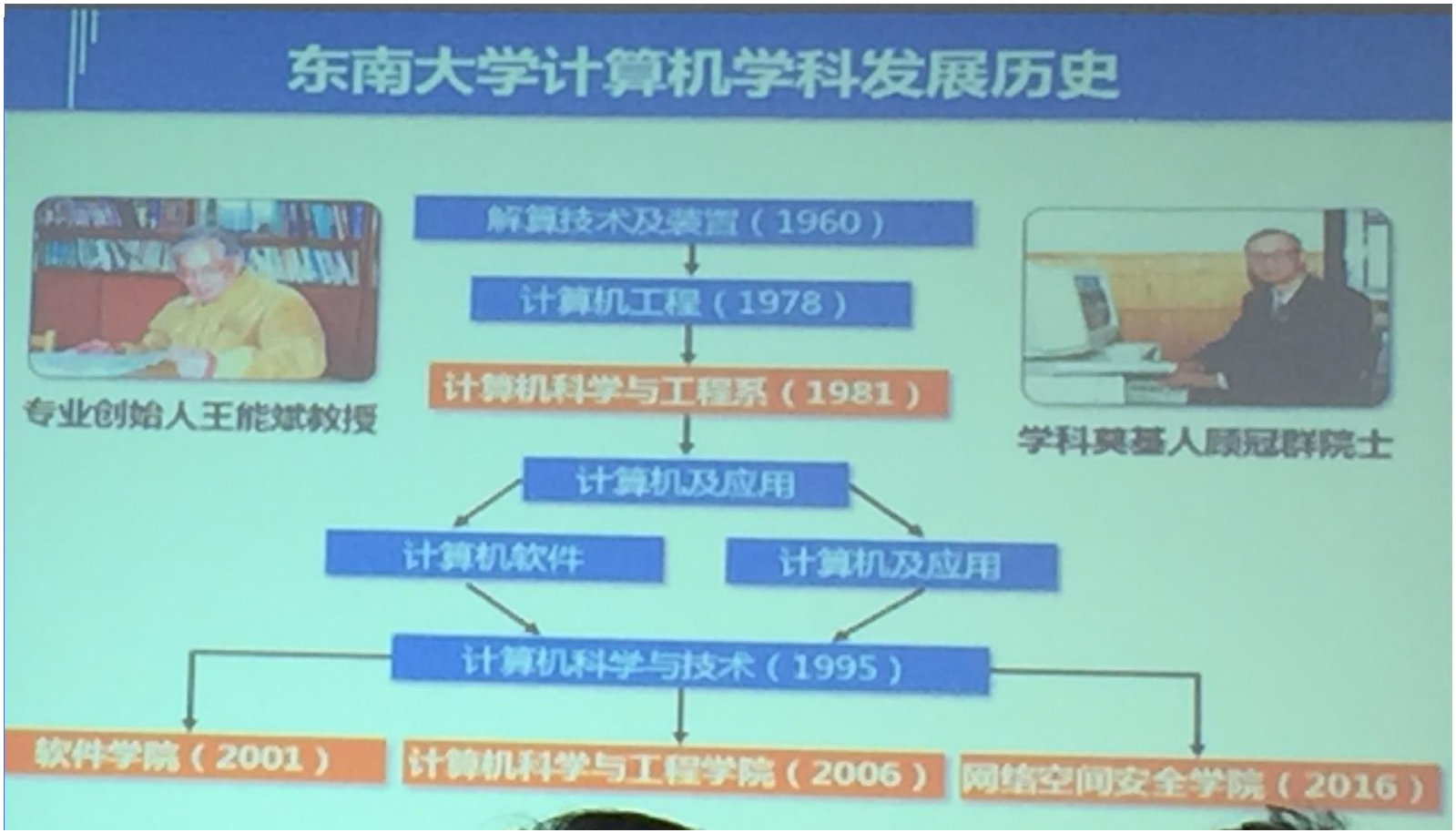
课前简介

- 1960-1978-1981-2006



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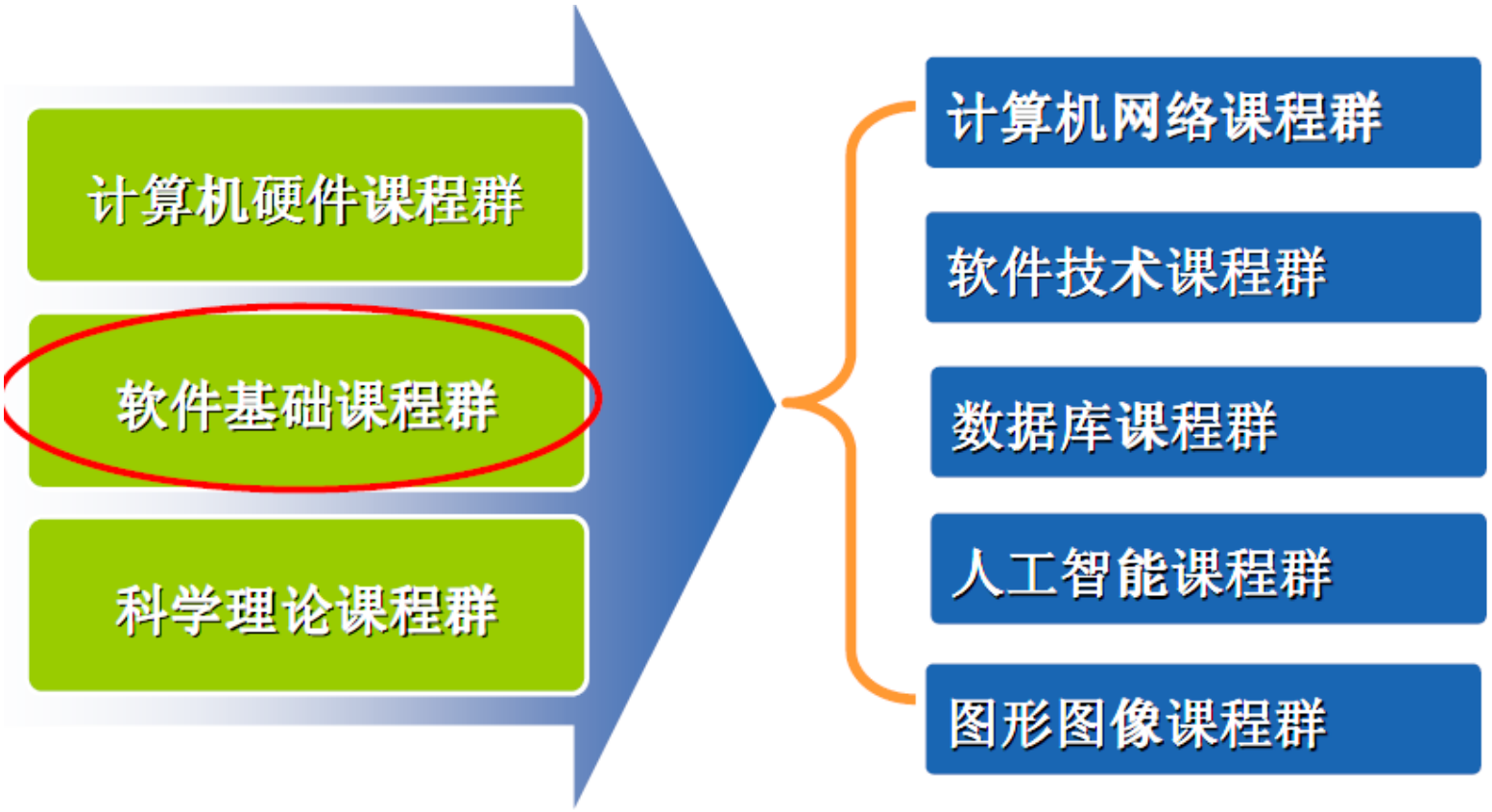
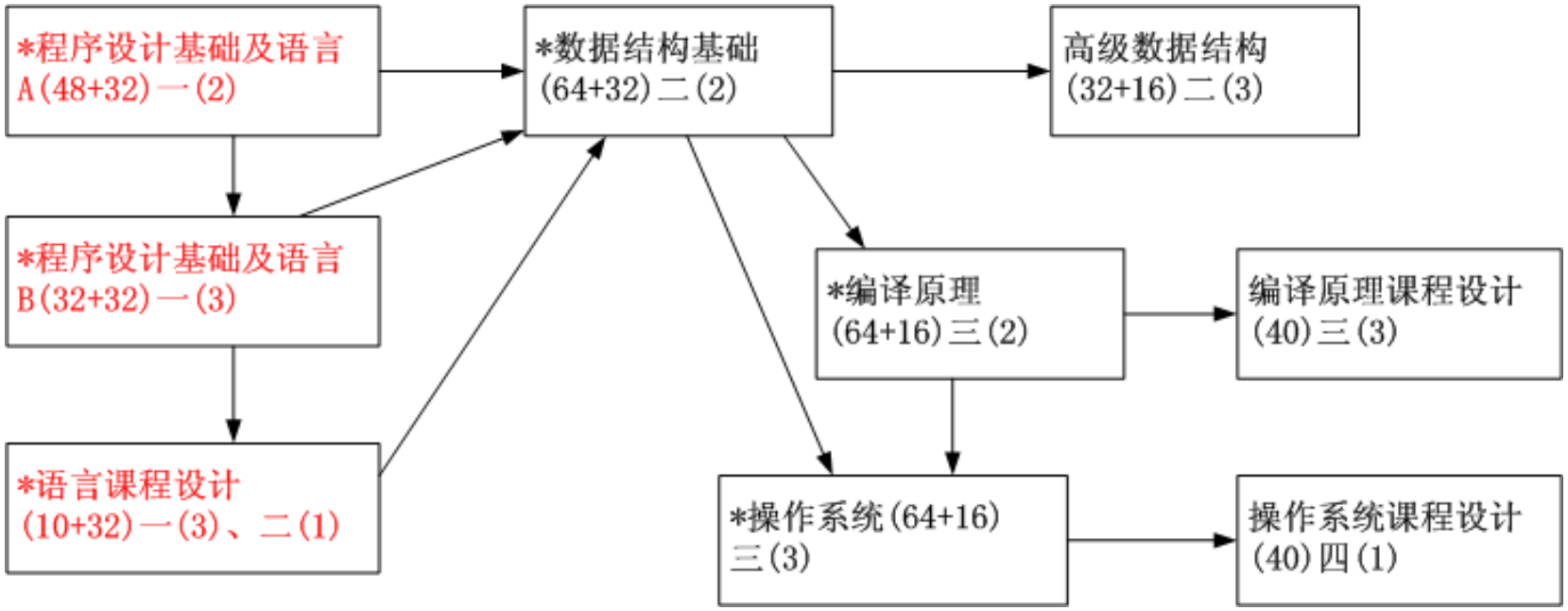

计算机硬件课程群
软件基础课程群
科学理论课程群
计算机网络课程群
软件技术课程群
数据库课程群
人工智能课程群
图形图像课程群

课前简介

- “软件基础”课程群
- 课程目标
- 支持数据结构、算法、软件工程等课程



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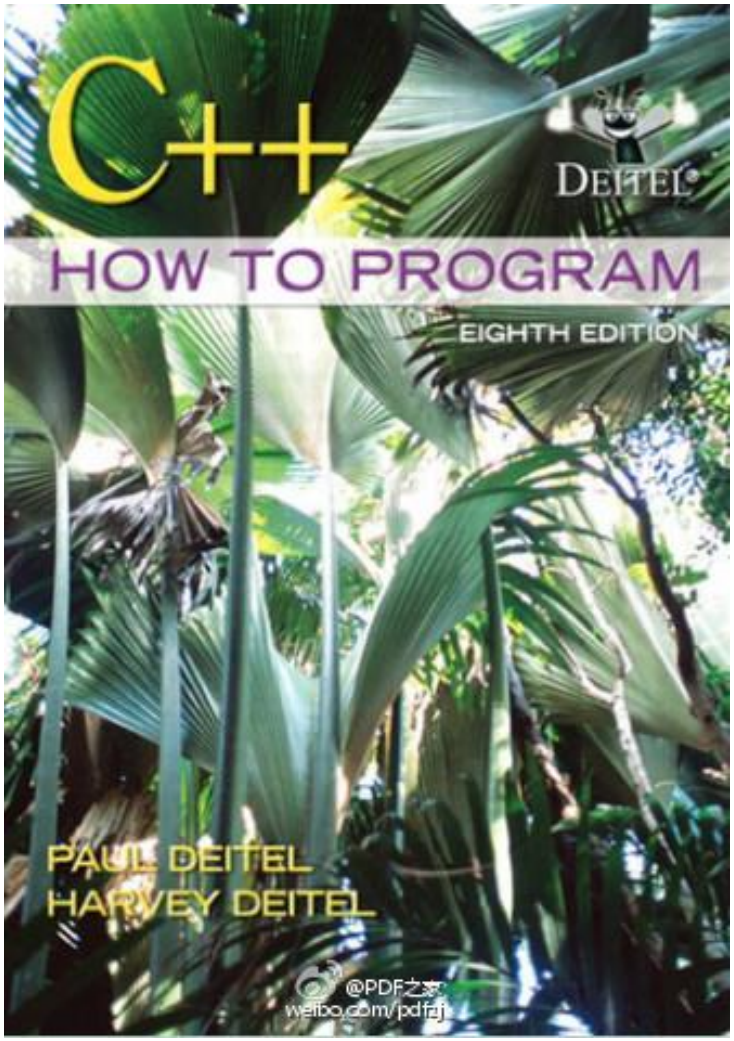


C++ 大学英语教程

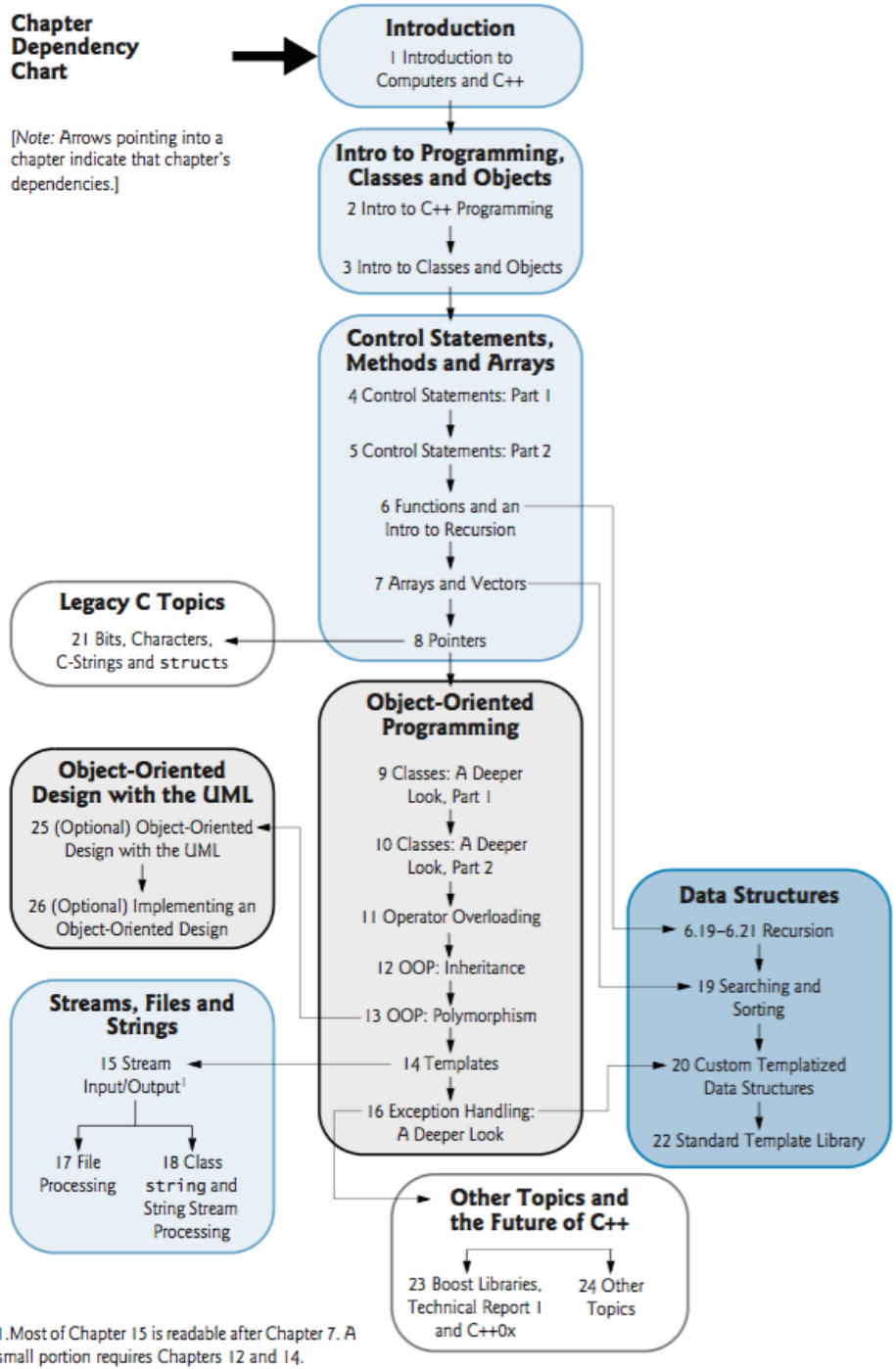
(第八版) (英文版)

(美) H.M.Deitel, P.J.Deitel

电子工业出版社

Chapter Dependency Chart

[*Note:* Arrows pointing into a chapter indicate that chapter's dependencies.]



1.Most of Chapter 15 is readable after Chapter 7. A small portion requires Chapters 12 and 14.

课前简介

- 程序设计基础与语言：2学期
- 本学期学时：80学时（48+32）

- 平时成绩：作业+上机实验+到课率
- 期末考试（英文）成绩：
  - 笔试部分（代码阅读+代码填空+编程）
  - 机考部分（编程）
- 总成绩：30%*平时成绩+70%*期末考试成绩

课前简介

- 课程主要参考书
  - 《C++程序设计教程》, 钱能, 清华大学出版社
  - 《C++编程思想》/《Thinking in C++》, Bruce Eckel, 机械工业出版社

网络资源

- http://www.deitel.com/Books/C/CHowtoProgram6e/tabid/2046/Default.aspx
- http://msdn.microsoft.com/zh-cn/default.aspx

Chapter 1
Introduction to Computers, and C++

OBJECTIVES

- Basic hardware(硬件) and software(软件) concepts.
- Basic object-technology(对象技术) concepts: classes(类), objects(对象), attributes(属性), behaviors(行为), encapsulation(封装) and inheritance(继承).
- Different types of programming languages.
- Typical C++ development environment
- Internet (互联网) and the World Wide Web(万维网)
- UML, Unified Modeling Language(统一建模语言)

Topics

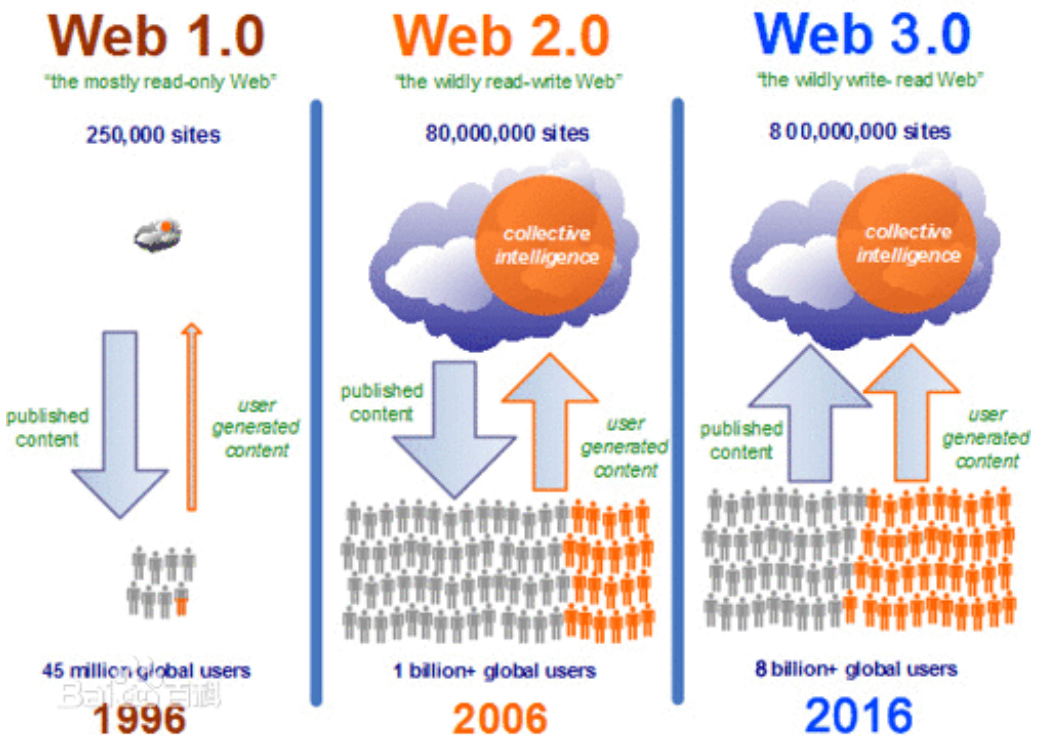
- **1.1 Internet, WWW and Computer**
- 1.2 Information representation(机内信息表示)
- 1.3 Machine languages, Assembly Languages and High-level Languages
- 1.4 C, C++, Java and other High-level languages
- 1.5 Object Technology
- 1.6 Typical C++ Development Environment
- 1.7 Test-Driving a C++ Application
- 1.8 UML

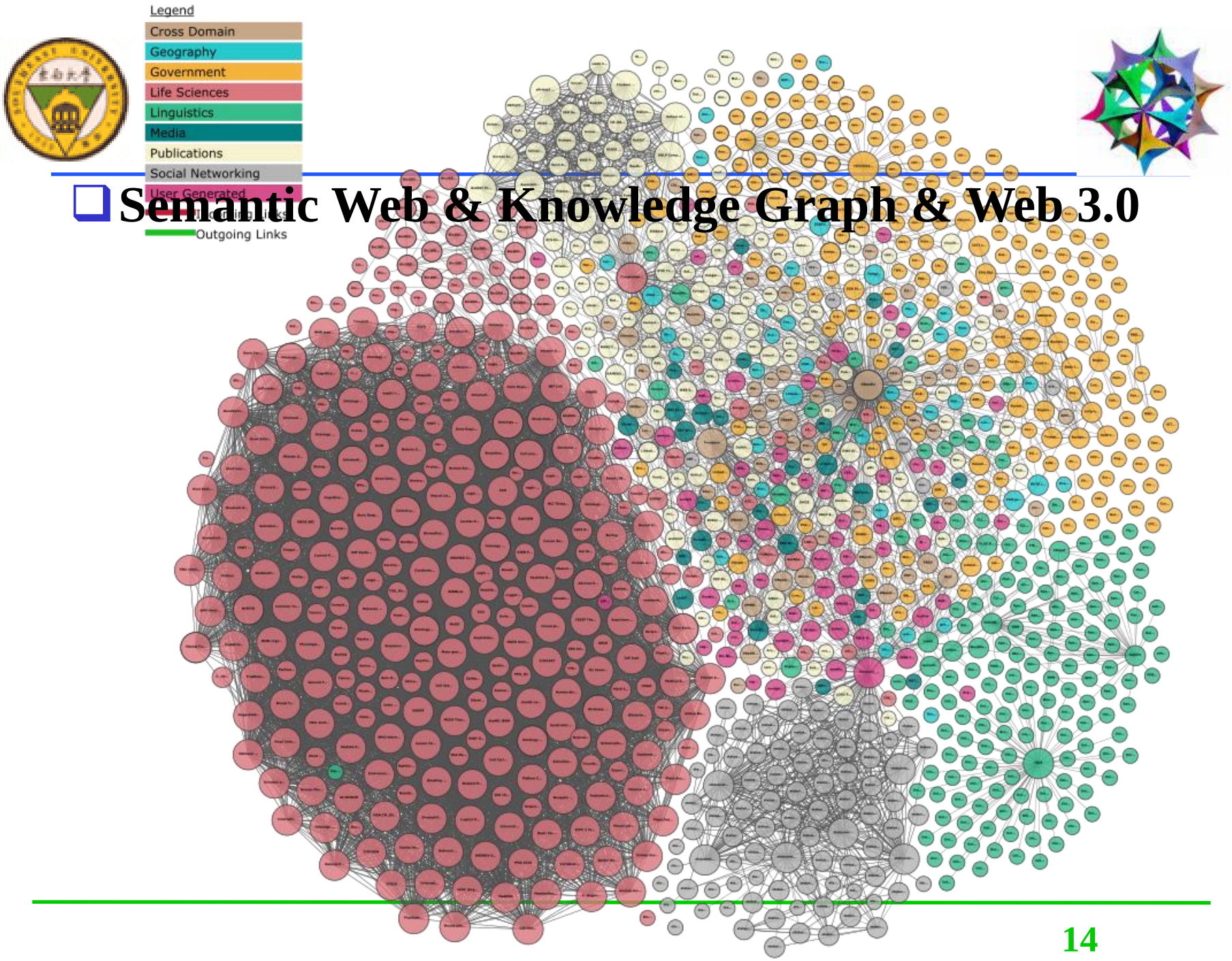
1.1 Internet, WWW and Computer

- U.S.DoD ARPANet (1960s)
- Internet (互联网, 1973)
  - 工作更方便
  - 信息获取更容易
- WWW (万维网, 1991)
  - 发明人 Tim Berners-Lee
    - 2017年获得图灵奖
  - HTML (超文本标记语言)
  - HTTP (超文本传输协议)

1.1 Internet, WWW and Computer

- Web 2.0
  - Social Networking
  - Blogs
  - Facebook
  - YouTube
  - 微信
  - 优酷





Semantic Web & Knowledge Graph & Web 3.0

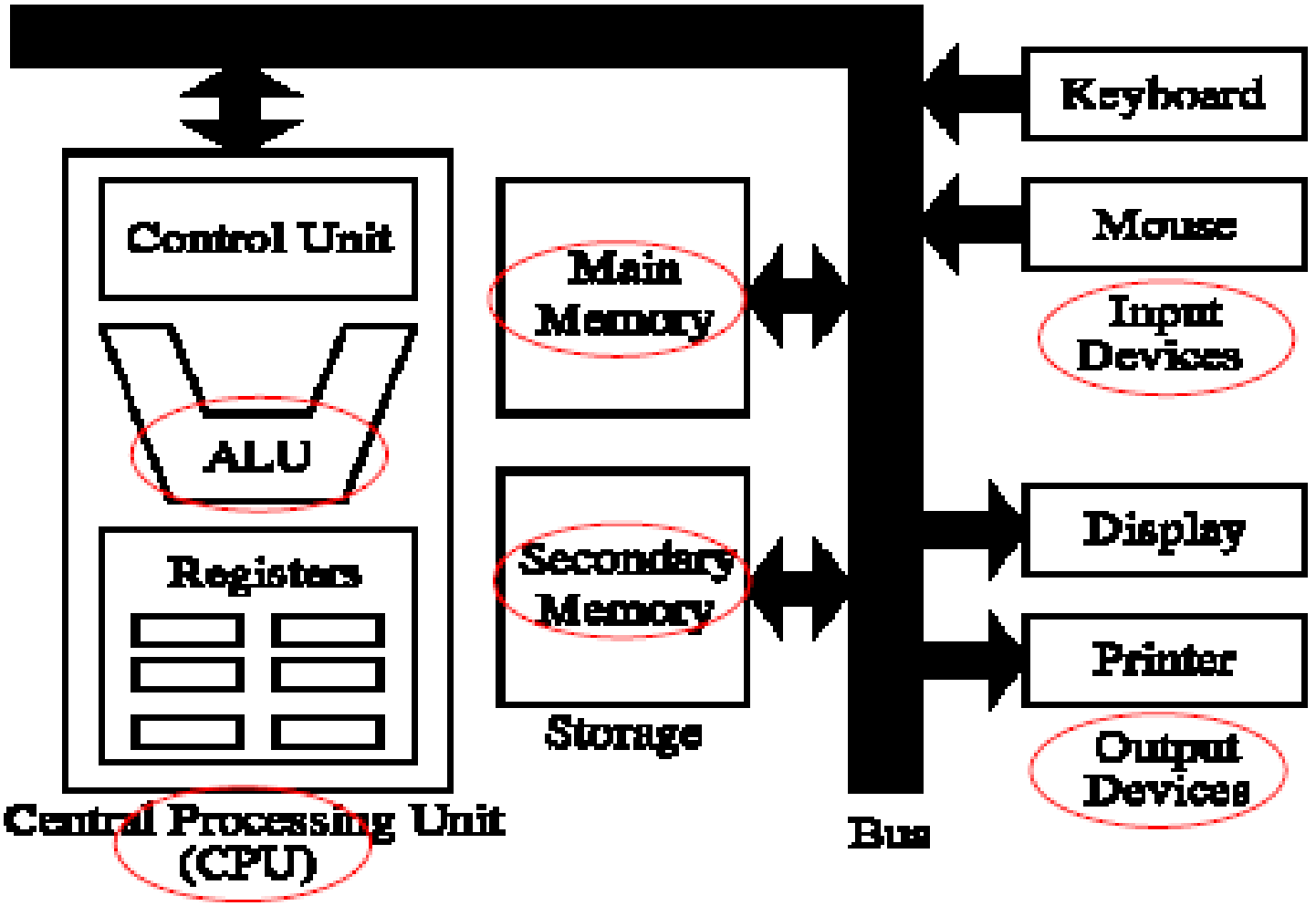
1.1 Internet, WWW and Computer

算盘 → 电子管计算机 → 晶体管计算机 → 集成电路计算机

1946年，美国物理学家莫奇利任总设计师，研制成功世界上第一台电子管计算机ENIAC(图中左为莫奇利)

1964年，美国IBM公司研制成功一个采用集成电路的电子 计算机

1.1 Internet, WWW and Computer

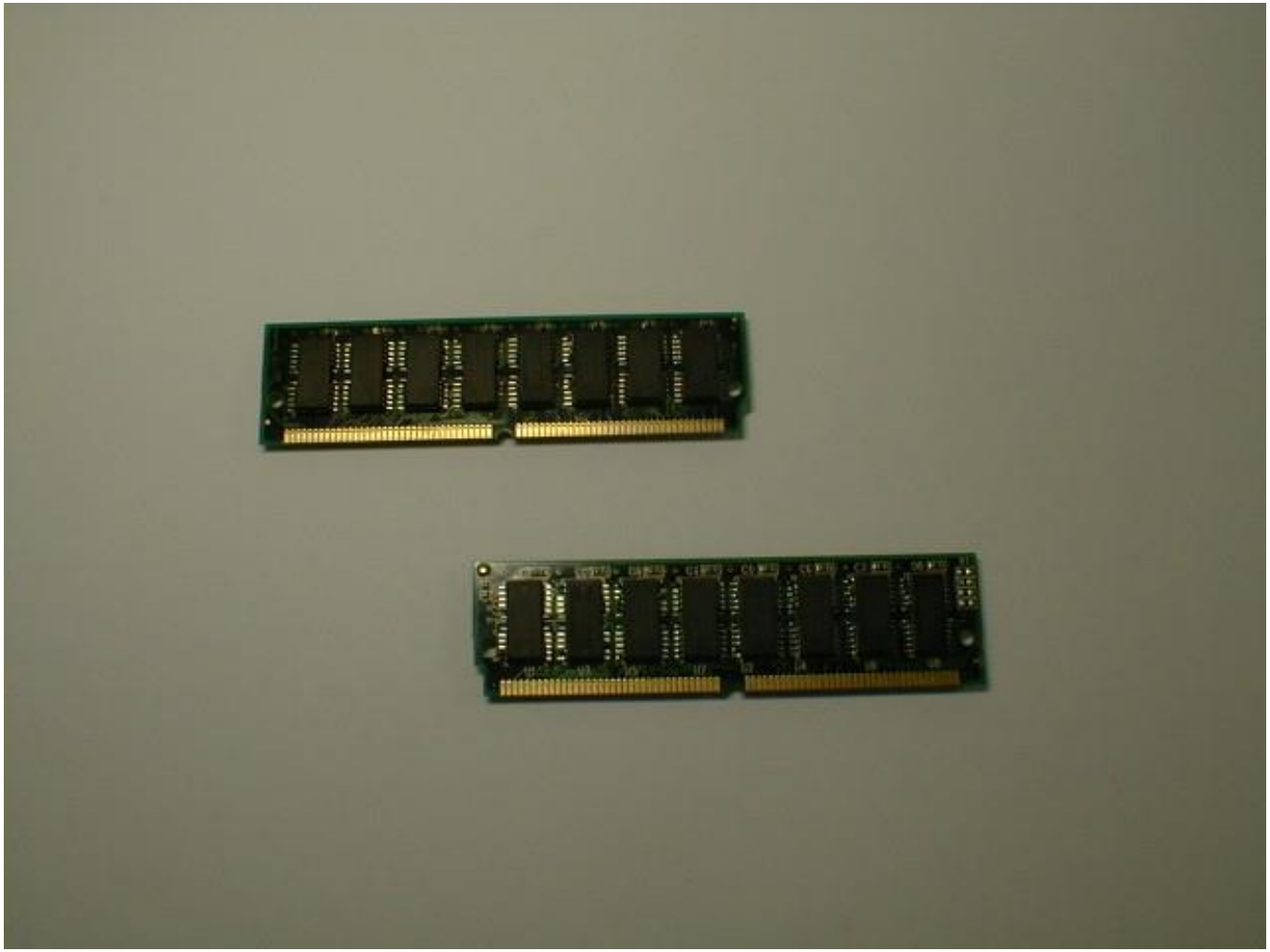


IU (Input Unit)

IU (Input Unit)

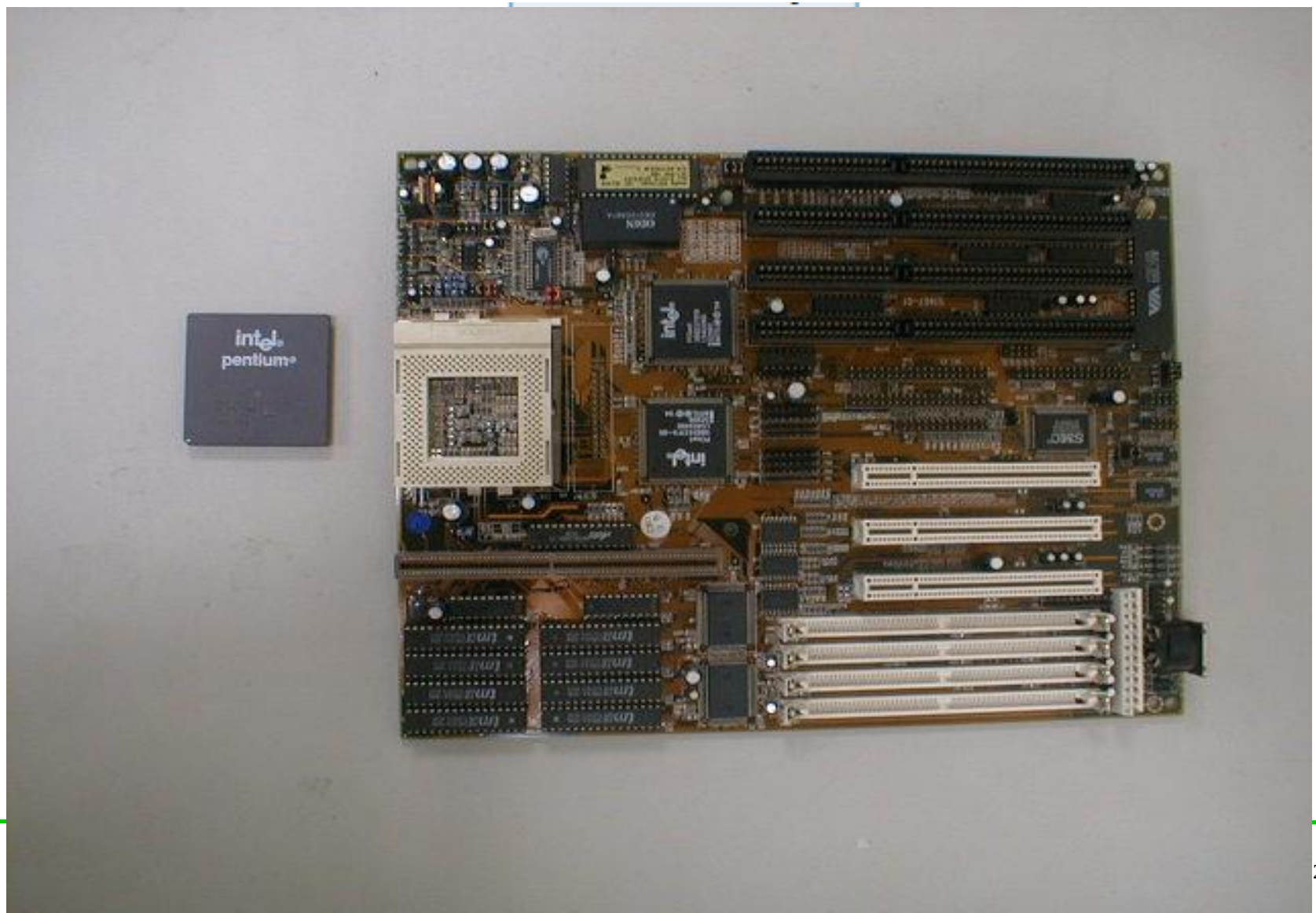
OU (Output Unit)

MU (Memory Unit)

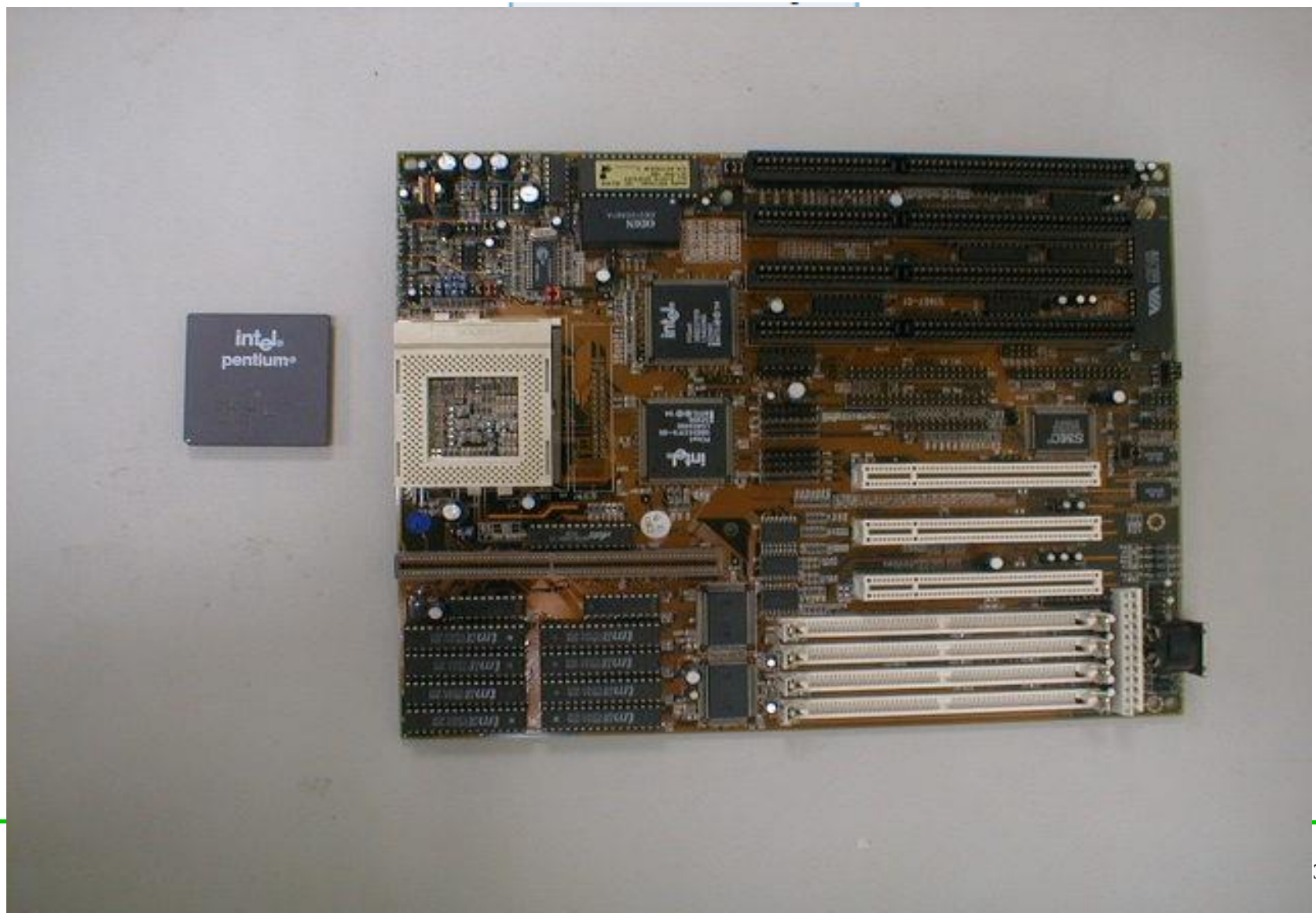


Secondary Storage Unit)

ALU (Arithmetic and Logic Unit)



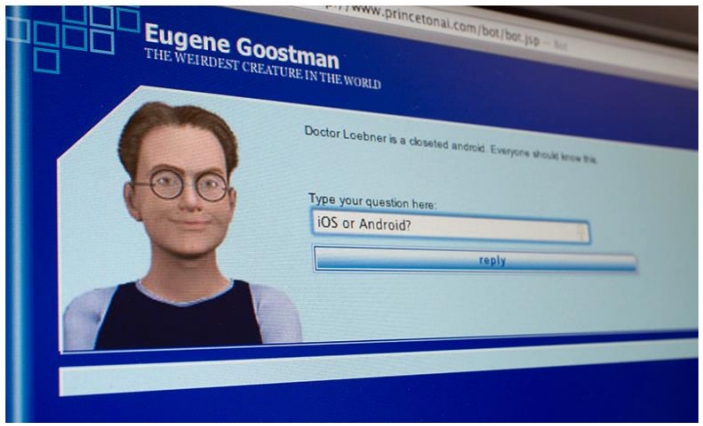
CPU (Central Processing Unit)



1.1 Internet, WWW and Computer

冯·诺伊曼

计算机首次通过图灵测试



冯·诺伊曼: 计算机之父

- 二进制
- 存储程序

艾伦·图灵: 计算机科学之父

- 图灵机
- **1966, Turing Award (ACM, Association for Computing Machinery), 图灵奖**
- 姚期智, 2000年

  2017年放弃美国国籍，中科院
- 谷歌 AlphaGo (2016李世石 2017 柯洁)

1.1 Internet, WWW and Computer

- **Computer – programmable machine designed to follow instructions**
- **Program– instructions tell computer to do something**
- **Programmer – person who writes instructions (program) to make computer perform a task**

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- **1.2 Information representation(机内信息表示)**
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- 1.6 Typical C++ Development Environment
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1.2 Information representation

- 1.2.1 数制的基本概念
- 1.2.2 常用的数制
- 1.2.3 不同数制间的转换
- 1.2.4 二进制编码
- 1.2.5 计算机中信息的存储

1.2 Information representation

- 基数：数制中数字的个数
- 数位：每个数字在数中的位置
- 数位值（权）：每个数位对应的单位值

1.2 Information representation

- 十进制数：

  组成：由0 - 9 十个数字组成

  基数： 10　　逢十进一

  表示方法：（15）$_{10}$

  多项式表示：

  $(115)_{10} = 1\times10^2 + 1\times10^1 + 5\times10^0$

1.2 Information representation

- 二进制数：

  组成：由0 – 1两个数字组成

  基数： 2 逢二进一

  表示方法：（101）$_2$

  多项式表示：

  $(111)_2 = 1\times2^2 + 1\times2^1 + 1\times2^0$

1.2 Information representation

- 二进制数转换为十进制数
- 方法：先将被转换的数用多项式表示法表示出，再求出对应的和

举例：$(101)_2$

$= 1x2^2 + 0x2^1 + 1x2^0$

$= 4 + 0 + 1$

$= 5$

1.2 Information representation

- 十进制整数转为二进制数

  方法：求余法，即“除以2，取余数，将所得余数倒读”

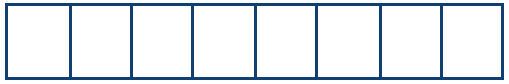
- 举例：13

除以2	余数	余数排列
2 | 13	……1	↑
2 | 6	……0	
2 | 3	……1	
2 | 1	……1	
0		

$13 = (1101)_2$

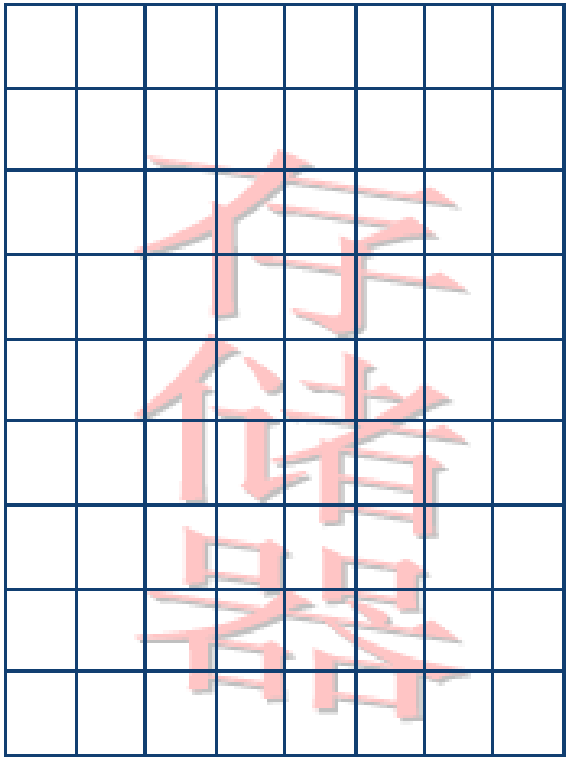
1.2 Information representation

- 位(bit)



- 字节(Byte)

  基本存储单元

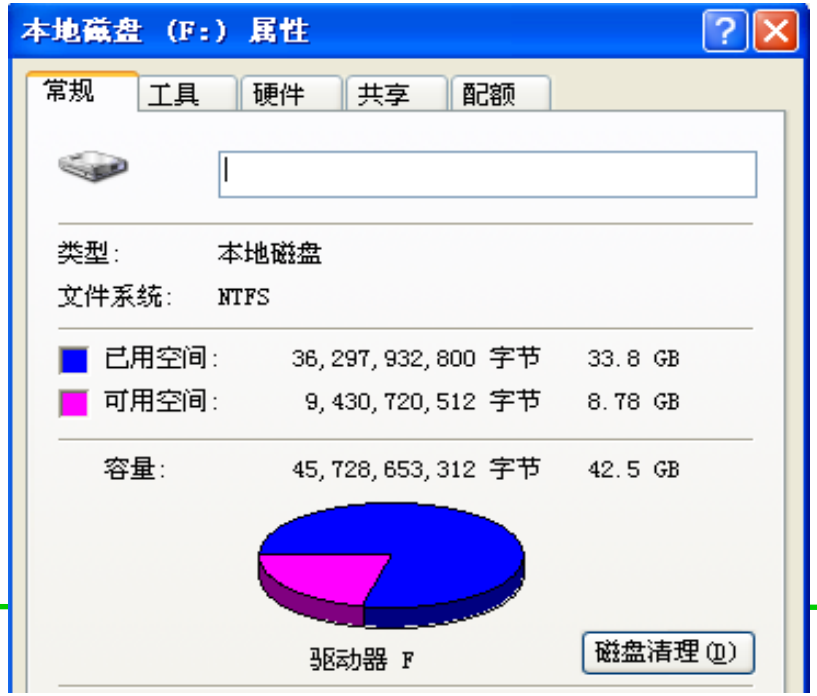


1.2 Information representation

- 位(bit)：是计算机存储信息的最小单位, 指二进制数中的一个数位, 其值为“0”或“1”
- 字节(Byte)：8个二进制位称一个字节, 即一个存储单元
- 存储容量：存储器中包含存储单元的数量

1.2 Information representation

- KB：1KB=1024B
- MB：1MB=1024KB
- GB：1GB=1024MB
- TB：1TB=1024GB



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1.3 Machine, Assembly and High-level Languages

- **Three types of programming languages**
  - **Machine Language（机器语言）**
  - **Assembly Language（汇编语言）**
  - **High-Level Language（高级语言）**

1.3 Machine, Assembly and High-level Languages

- **Machine languages（机器语言）**
  - ***Strings of numbers giving machine specific instructions***
- **machine dependent**
- **Object Code（目标代码）**
- **Example:**
  - **+1300042774**
  - **+1400593419**
  - **+1200274027**

1.3 Machine, Assembly and High-level Languages

- **Assembly languages（汇编语言）**
  - ***English-like abbreviations representing elementary computer operations***
- **Translated via Assemblers 汇编器**
- **Example:**
  - **LOAD BASEPAY**
  - **ADD OVERPAY**
  - **STORE GROSSPAY**

1.3 Machine, Assembly and High-level Languages

- **High-level languages（高级语言）**
  - ***Codes similar to everyday English, Use mathematical notations***

- **Translated via Compilers 编译器，△Interpreter解释器**
- **Example:**
  - **grossPay = basePay + overTimePay**

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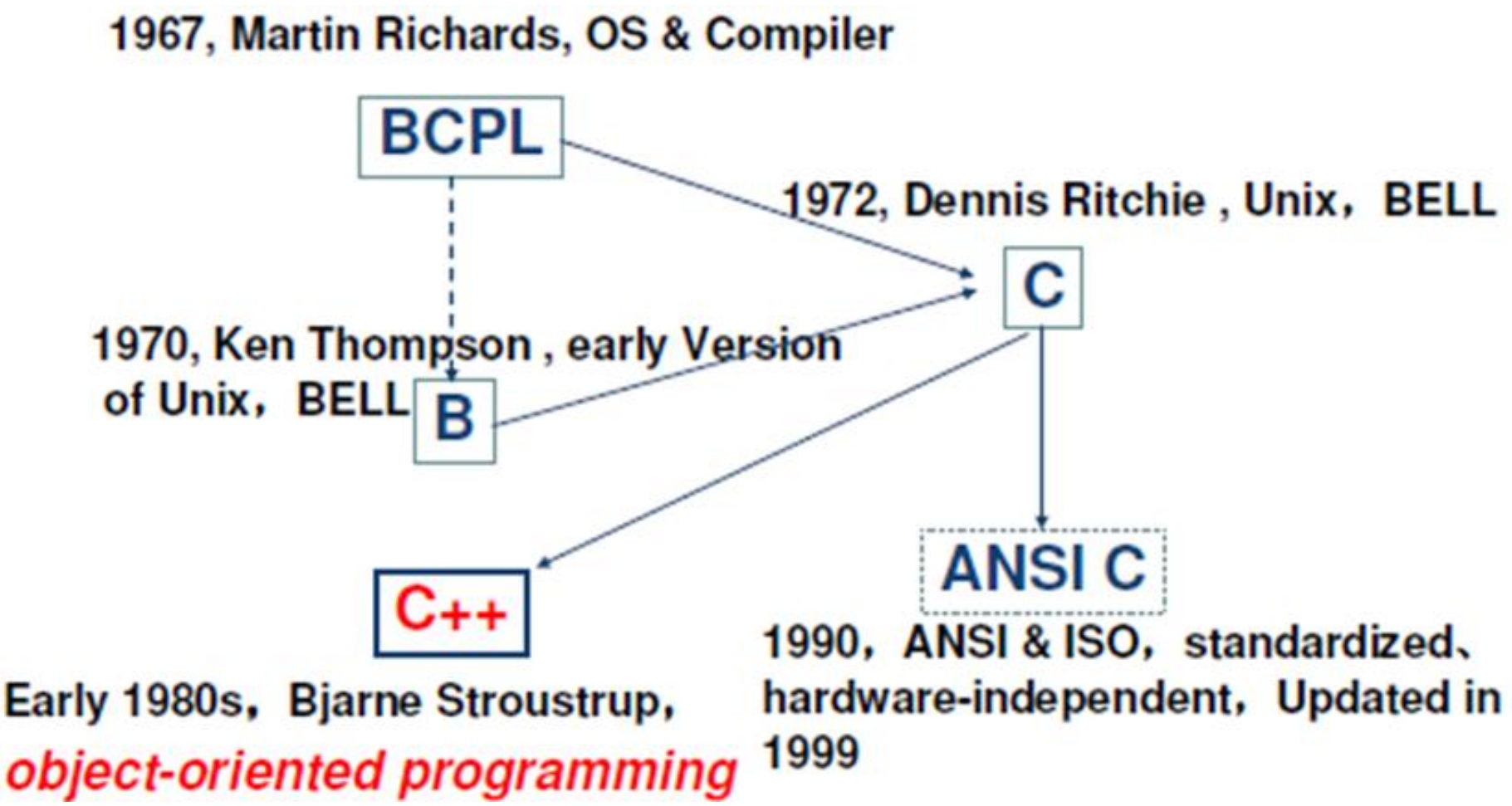
1.4 C, C++, Java and other High-level languages

- 1.4.1 History of C and C++
- 1.4.2 C++ Standard Library
- 1.4.3 History of Java
- 1.4.4 FORTRAN,COBOL,Pascal and Ada

1.4.1 History of C and C++



1.4.2 C++ Standard Library

- C++ programs consist of pieces called Functions(函数) & Classes(类)
  - A programmer can all create his own

    Advantage: the programmer knows exactly how it works

    Disadvantage: time consuming
  - Otherwise he can use
    - C++ Standard Library (C++标准库)
    - C Standard Library

1.4.2 C++ Standard Library

- 学习
  - **C++ Language itself**
  - **Functions and Classes in C++ Standard Library**
- 项目开发
  - 自己的函数和类
  - 合作者开发的函数和类
  - 标准库

1.4.3 History of Java

- Sun Microsystems
  - A C++ based Language – OAK, 1991
  - JAVA, 1995 formally announced
- Java is used to
  - Intelligent consumer electronic devices
  - WWW - Create Web pages with dynamic and interactive content (Applet)
  - Develop large-scale enterprise applications
  - Enhance the functionality of Web servers
  - Provide applications for consumer devices (such as Cell phones, PDA)

1.4.4 FORTRAN,COBOL,Pascal and Ada

- FORTRAN
  - IBM, Used for scientific and engineering applications
- COBOL
  - Used to manipulate large amounts of data
- Pascal
  - designed for teaching structured programming
  - DELPHI (Object Pascal, MIS,管理信息系统)
- Ada
  - DoD's massive command-and-control software systems, multitasking

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1.5 Object Technology

- 1.5.1 Why Object?
- 1.5.2 What is Object?

1.5.1 Why Object?

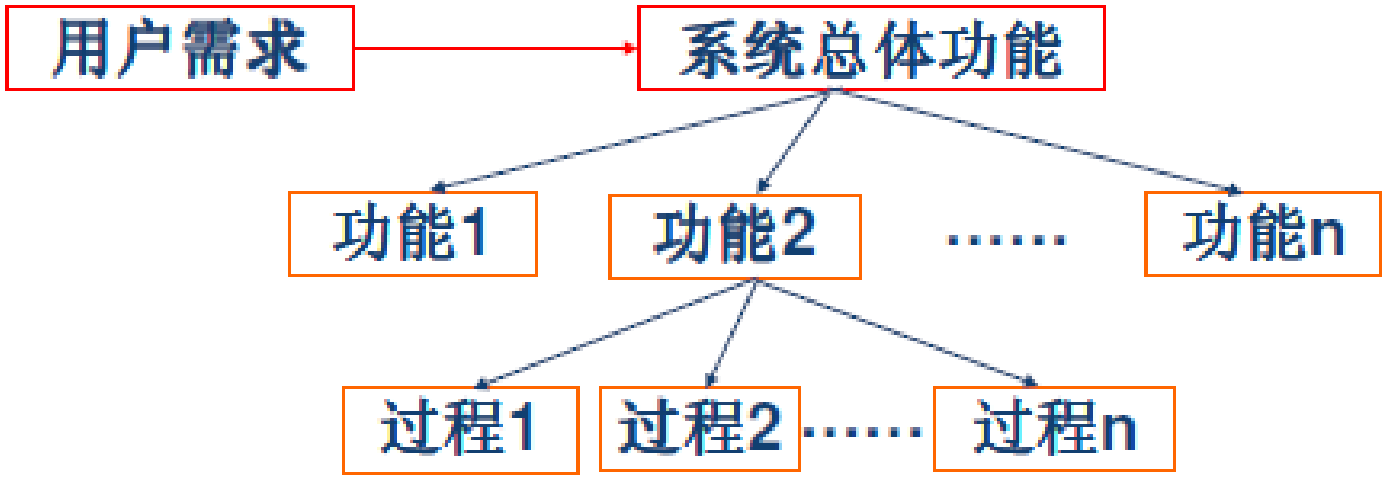
- Procedure Oriented（面向过程）
  - ORTRAN, COBOL, Pascal, Basic and C
  - 将复杂的过程按功能分层分解, 以解决问题
- Structured Programming（结构化编程, 1970s）
  - 描述任何实体的操作序列只需要三种基本控制结构

    Sequence (顺序结构)

    Selection (选择结构)*3

    Repetition (循环结构)*3
- 消除以往编程过程中无限制使用转移语句的情况：goto

1.5.1 Why Object?



- 主要问题
  - 软件重用性差
  - 软件可维护性差
  - 开发出的软件不能很好地满足用户需要

1.5.1 Why Object?

Humans learn about existing objects by studying their Attributes and observing their behaviors.

1.5.1 Why Object?

- **Conclusion: Structured Programming + Object oriented Programming (面向对象编程)**
  - **Their internal structure is often built using structured-programming techniques.**
  - **Also, the logic of manipulating objects is occasionally expressed with structured programming.**

1.5.2 What is Object?

- **Object oriented** (面向对象)
  - Reusable software components (可重用的软件组件)
  - model items in the real world (现实事物的建模)
  - Any noun can be represented as an object
  - Object = Attribute + Behavior
- **Class**(类): 对同一类Objects的共同描述和抽象
  - C++中的一种用户定义的数据类型
  - Attribute: member data
  - Behavior: method / Member Functions

1.5.2 What is Object?

- **Encapsulates(封装) attributes(属性) and operations (操作, behaviors) into objects**
- **Inheritance(继承) : 人/猩猩- 生物**
- **Information hiding**
  - **Communicating with one another across well-defined interfaces using Message**
  - **Without knowing how it is implemented**

1.5.2 What is Object?

Procedure oriented vs Object oriented

- focused on actions (verbs) rather than on things or objects (nouns)
- break down a programming task into
  - variables, data structures, and subroutines
  - Objects, encapsulating its own data and methods
- procedural programming uses procedures to operate on data structures
- object-oriented programming bundles the two together so an "object" operates on its "own" data structure

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1.6 Ty
Developme

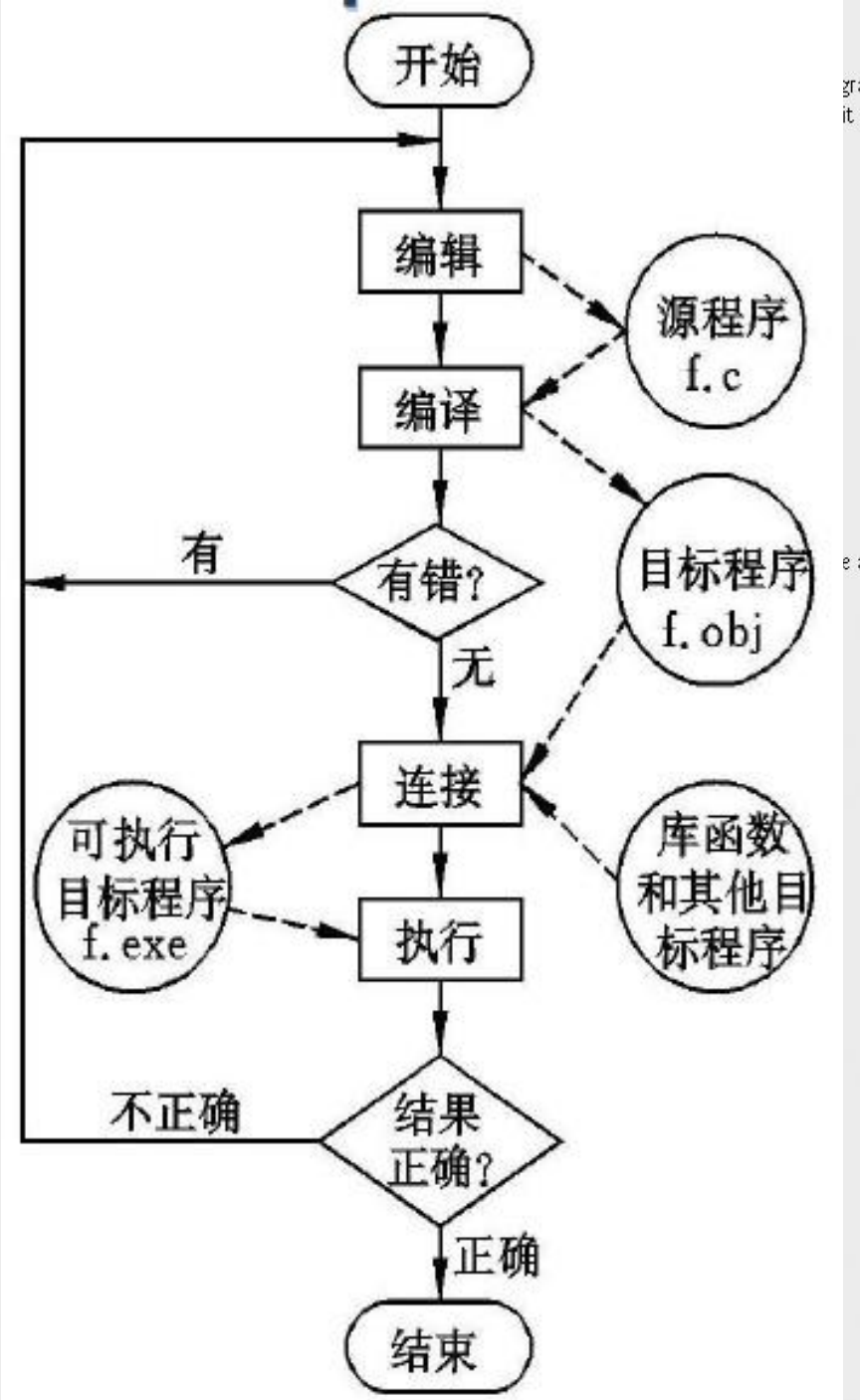
- *1. Edit*
- *2. Preprocess*

宏、文件包含、条件编译

- *3. Compile*

编译错误(语法等)

- *4. Link*
- *5. Load*
- *6. Execute*



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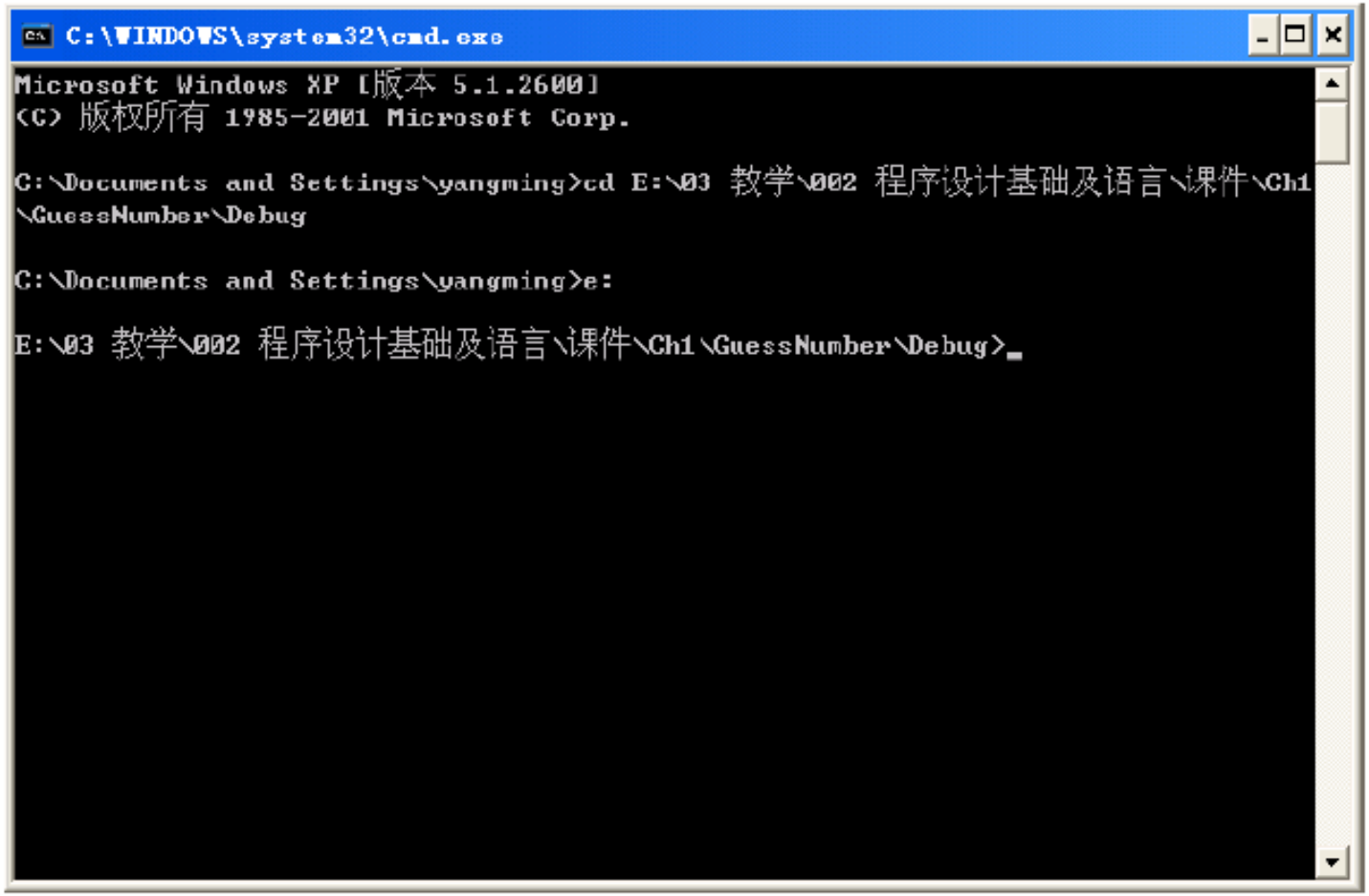
1.7 Test-Driving a C++ Application

- Open the Command Prompt window
  - 开始-所有程序-附件-命令提示符
  - 开始-运行-输入“cmd”
- Locating the completed application
- Running the GuessNumber application
  - Entering your first guess
  - Entering another guess
  - Entering additional guesses
  - Playing the game again or exiting the application
- Close the Command Prompt window

1.7 Test-Driving a C++ Application



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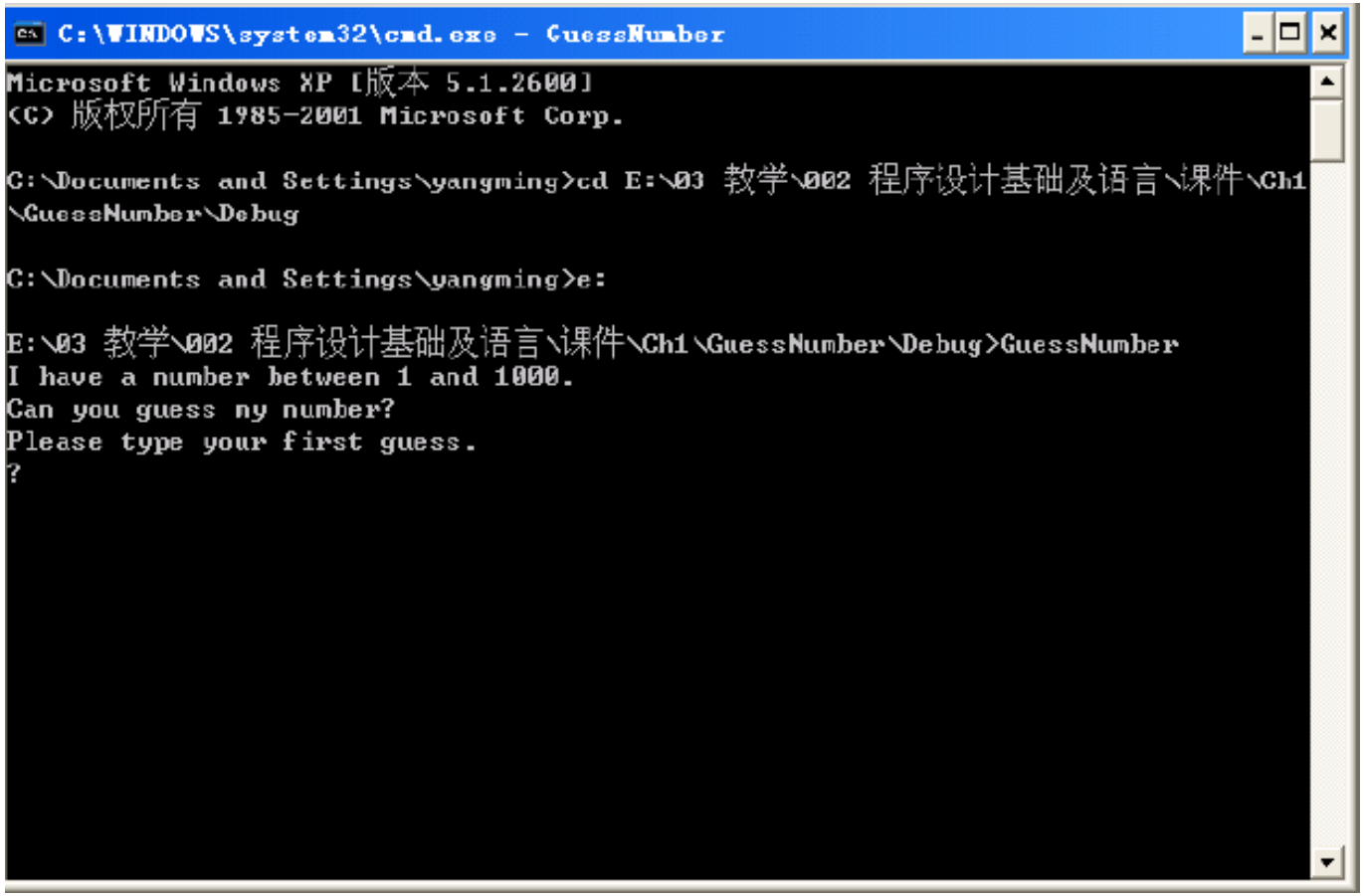

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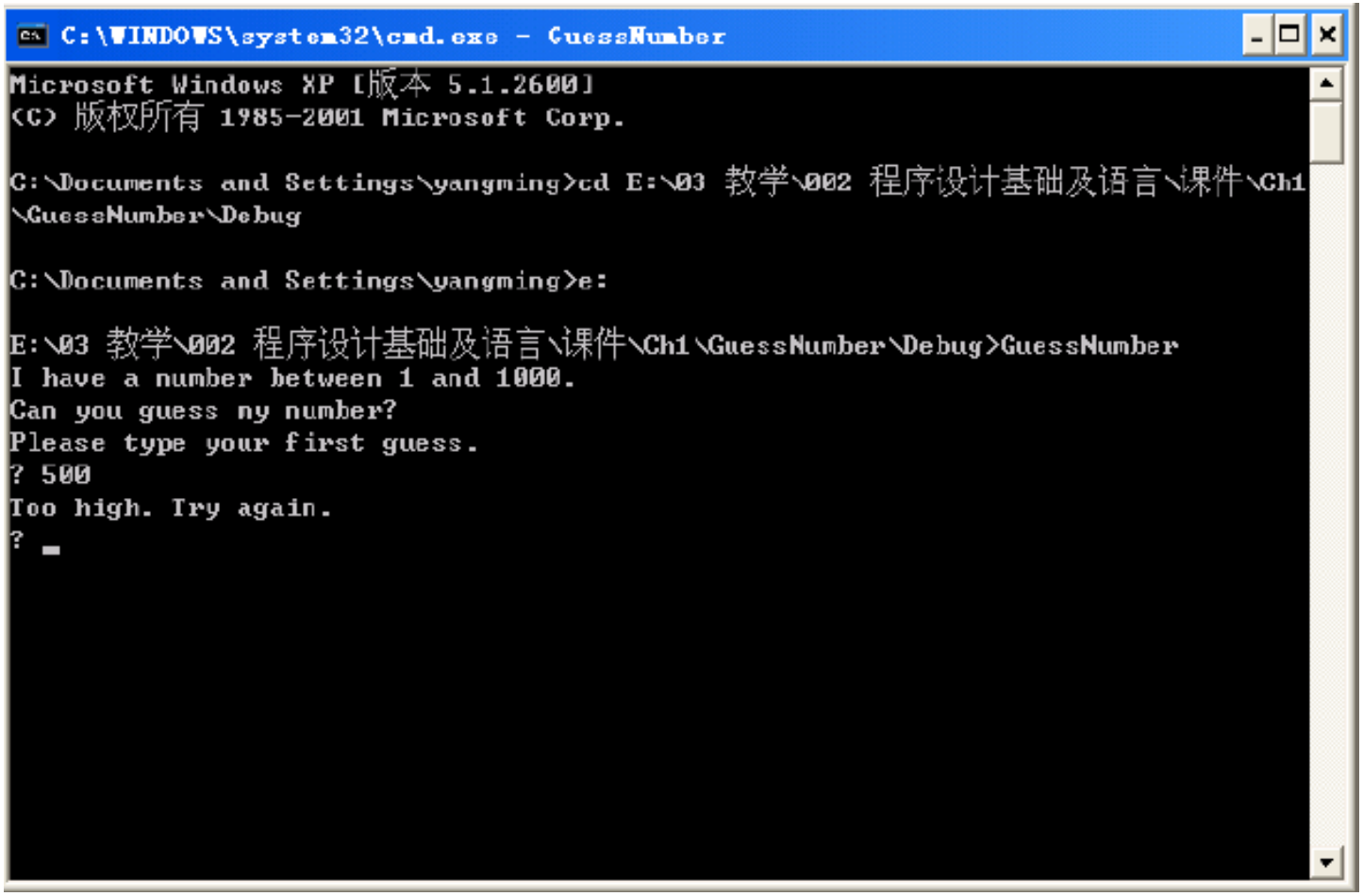

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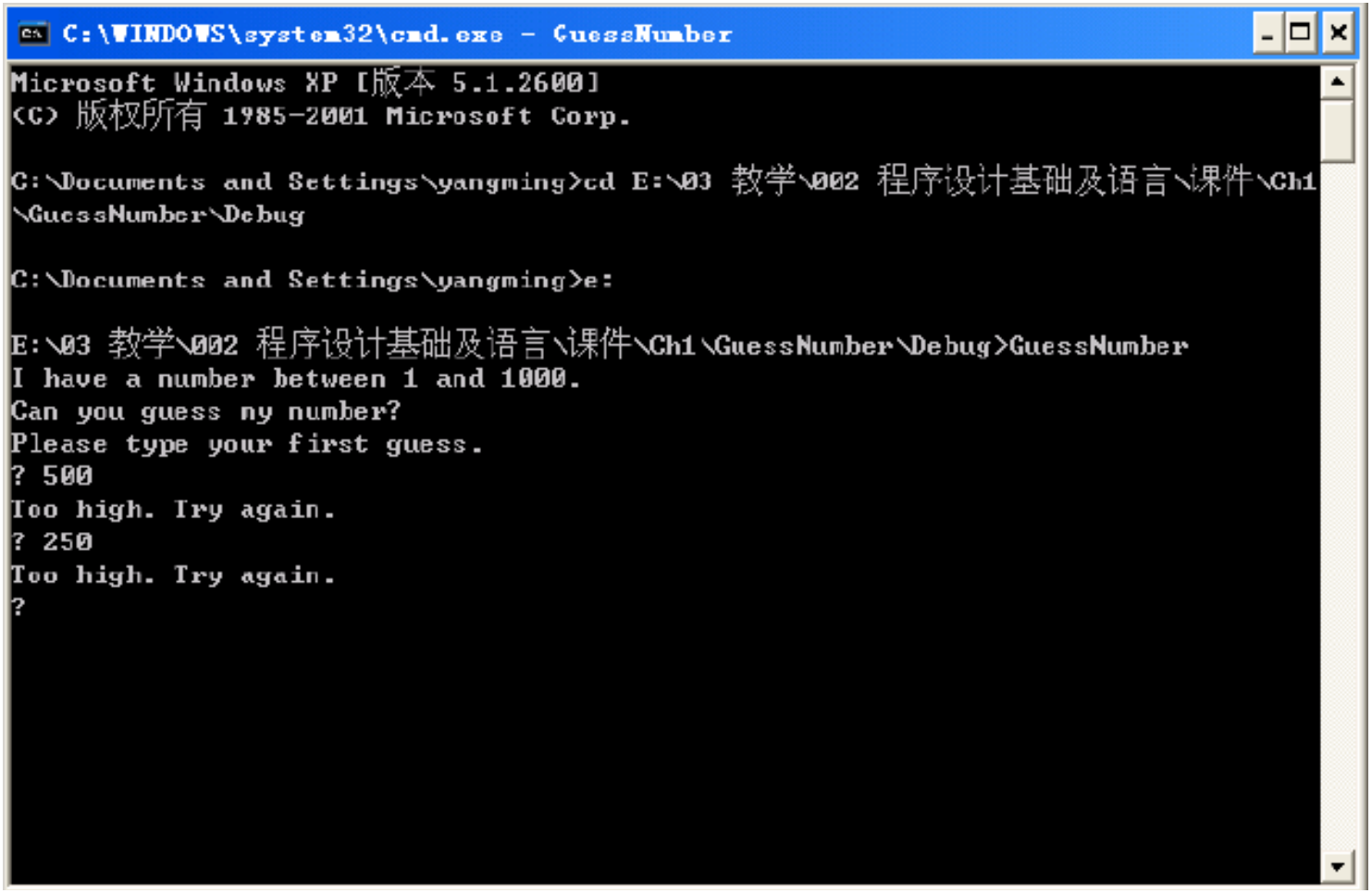

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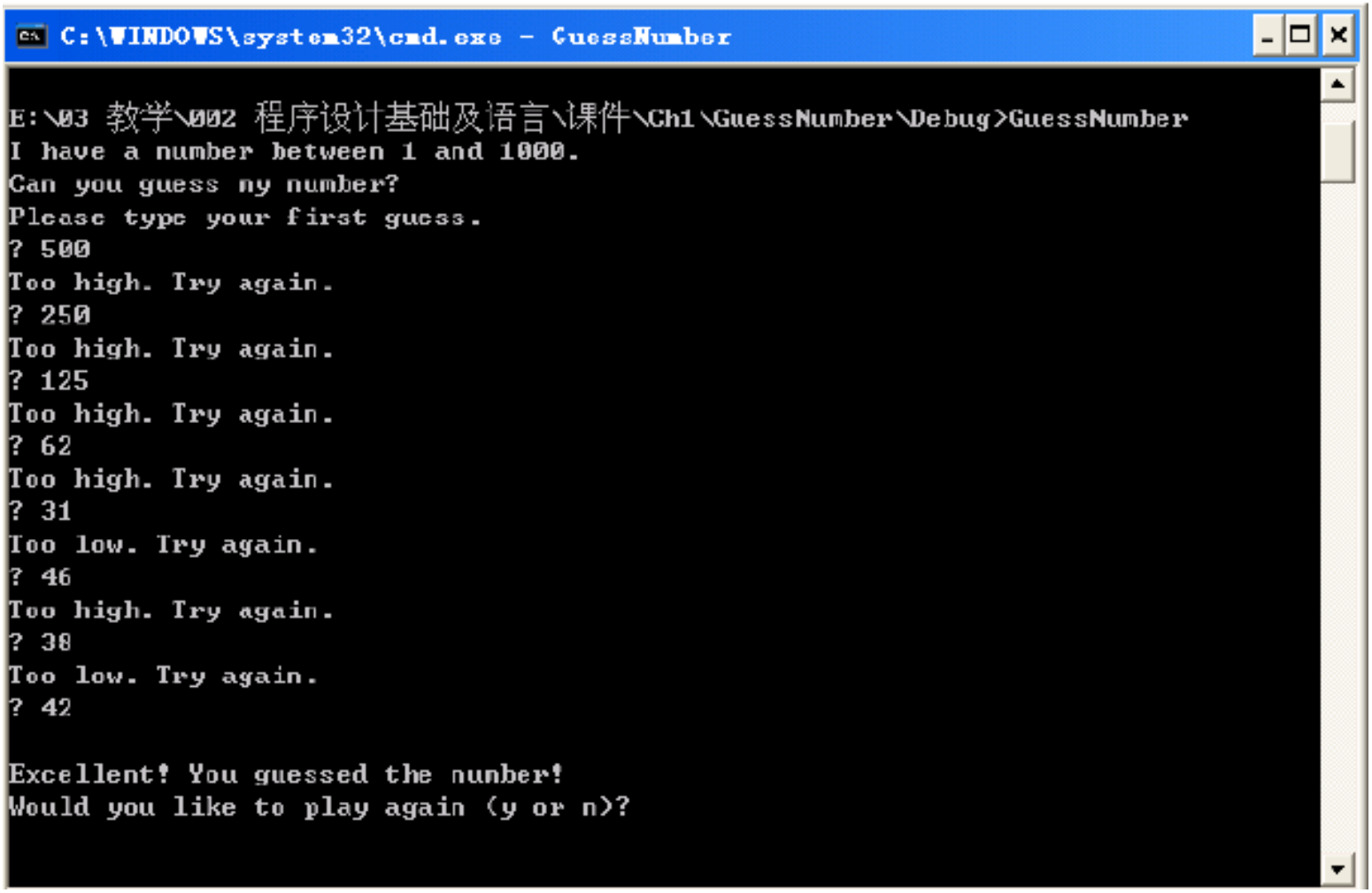

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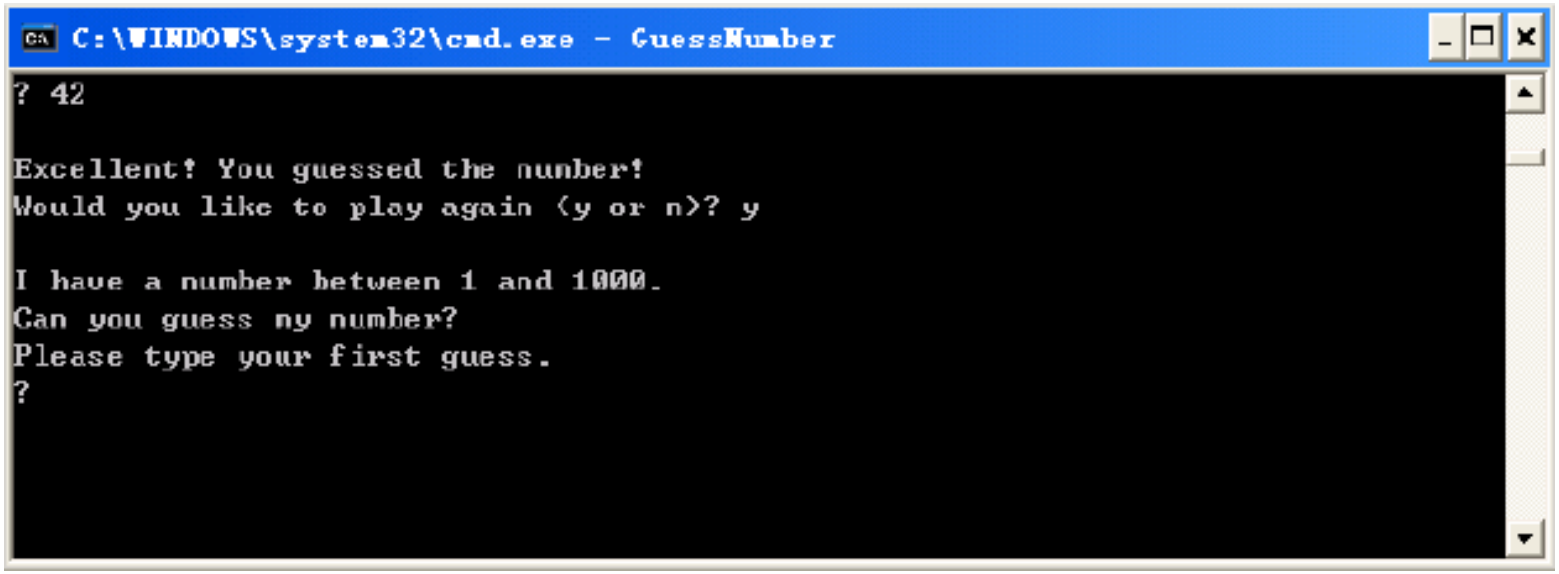
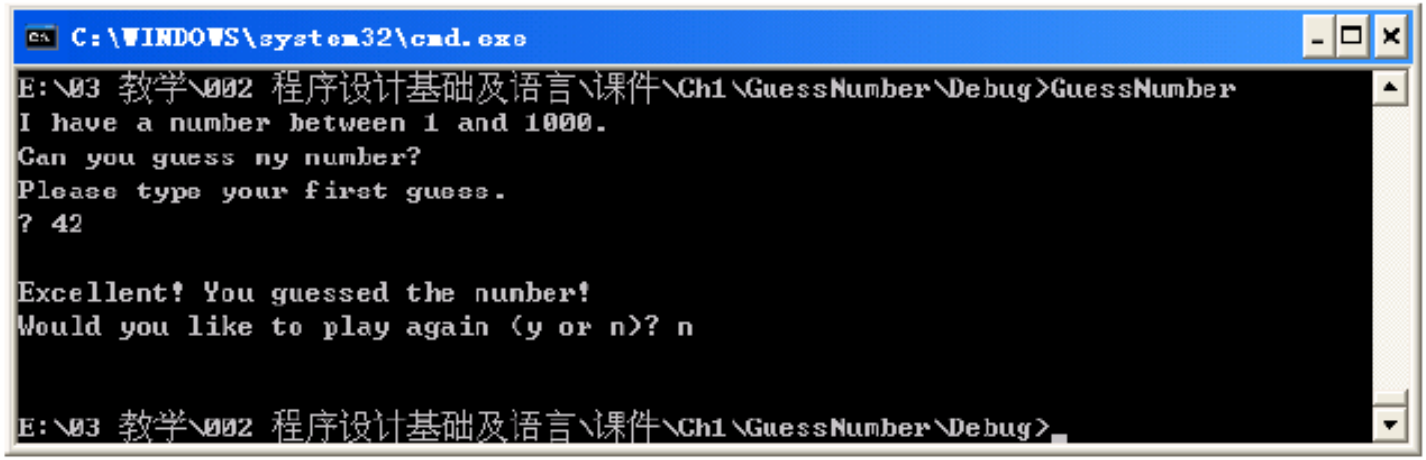


1.7 Test-Driving a C++ Application



- 输入数据的特点？（500、250、125、62、31、46、38、42）
- 为何每次执行该程序让猜的第一个数都是42？

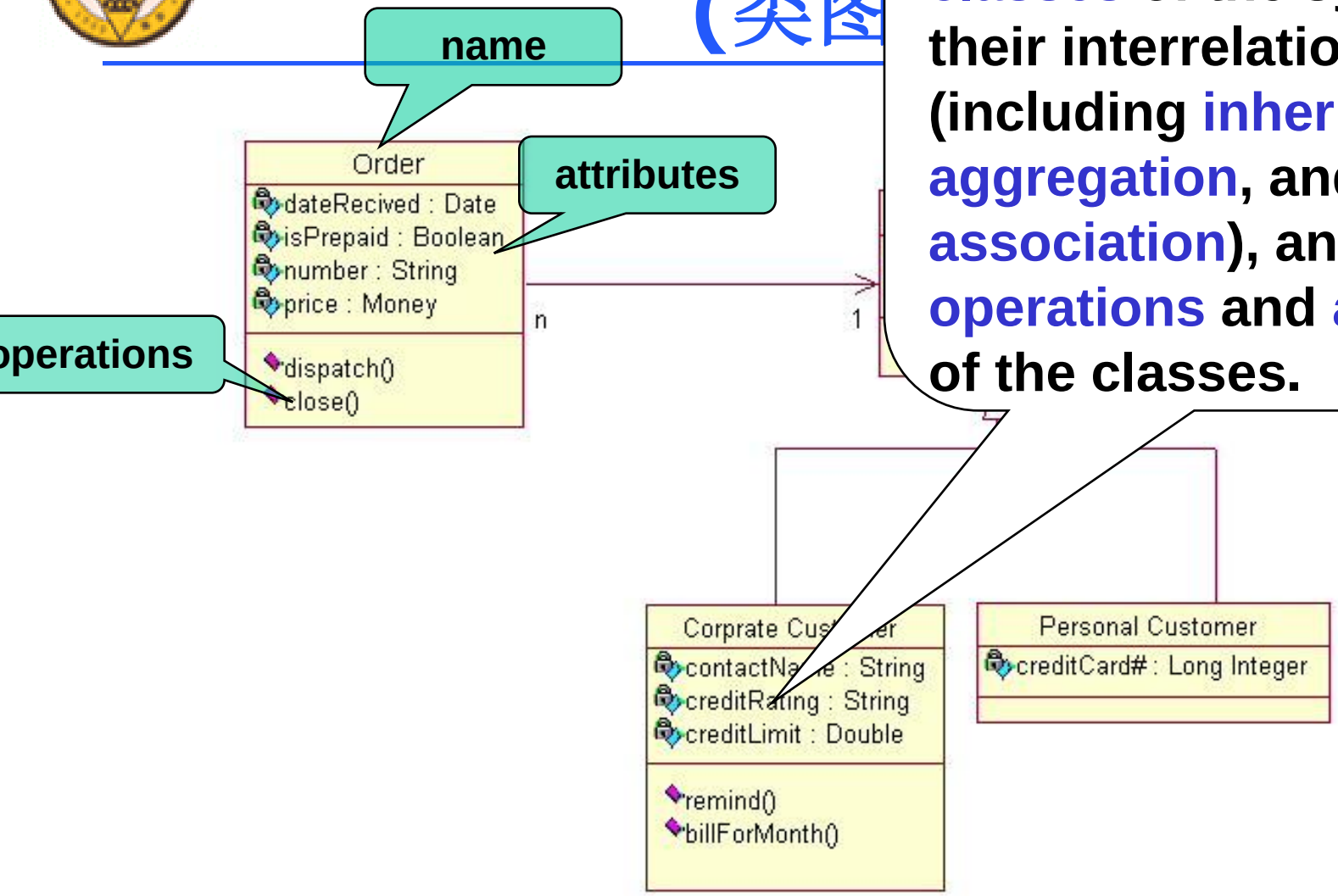
Topics

- 1.1 Internet, WWW and Computer
- 1.2 Information representation(机内信息表示)
- 1.3 Machine languages, Assembly Languages and High-level Languages
- 1.4 C, C++, Java and other High-level languages
- 1.5 Object Technology
- 1.6 Typical C++ Development Environment
- 1.7 Test-Driving a C++ Application
- **1.8 UML**

1.8 UML

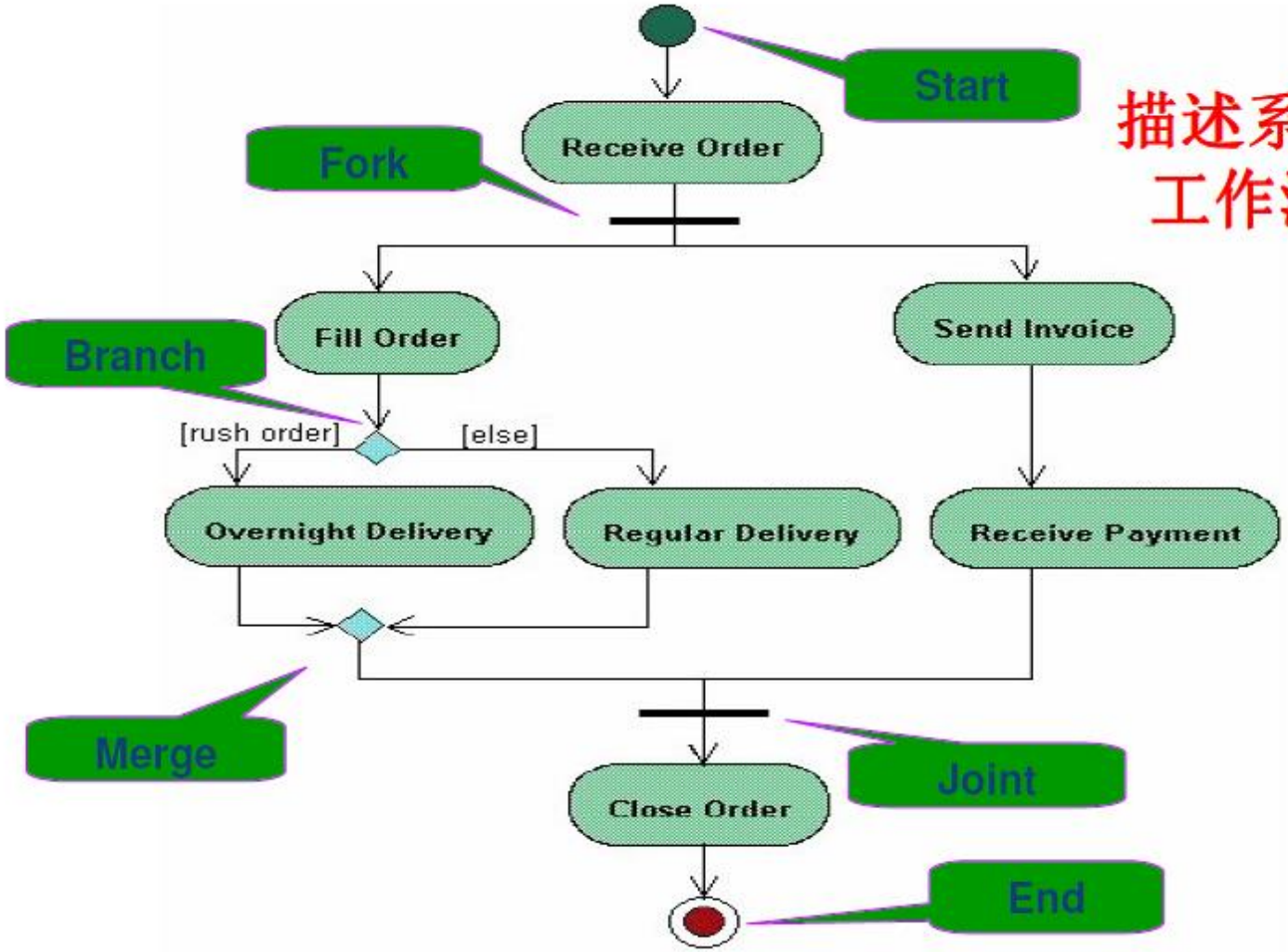
- UML (Unified Modeling Language, 统一建模语言). 1997年, OMG组织(Object Management Group对象管理组织)发布.
- 目标: 为开发团队提供标准通用的图形化设计语言来开发和构建计算机应用. 通过使用UML, 开发人员能够阅读和交流系统架构和设计规划.

UML ---- Clas
(类图



Class diagrams show the classes of the system, their interrelationships (including inheritance, aggregation, and association), and the operations and attributes of the classes.

UML ---- Action Diagram (活动图)



本章小结

- 计算机科学的基本概念
  - What is Computer?
  - Computer Organization
  - 数制
- 熟悉面向对象的一些基本概念：类、对象、属性、行为和继承
- 熟悉不同类型的编程语言
  - 机器语言
  - 汇编语言
  - 高级语言
- 初步了解UML

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上机时间

- 第4, 6, 10, 12, 14, 16周周二上午3,4节
- 第7, 9, 11, 13, 15周周四晚上6:30-9:30

- 计算机实验中心3楼（金智楼）

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