單元1

遞迴：可由大問題分解為小問題去解
程式碼較簡單
重複呼叫同一個函式解決一樣問題

Factorial 階乘

Fibonacci series 費氏數列

Combinatorial numbers 組合數

遞迴的思維

1. 遞迴定義
2. 問題簡化
3. 終止條件!!
4. 保證終止

Greatest common Divisor

① gcd1 (x,y) = x   if y=0
= gcd1 (x, y mod x)   y>x
= gcd1 (x, x mod y)   otherwise

② gcd2 (x,y) = y   if x mod y=0
= gcd (y, x mod y)   otherwise

bases cases

gcd2 saves one recursive call

when x divides y

Special case

gcd2 spends one extra call

if initially x≤y

overall

gcd2 is more efficient

whenever x≥y

單元2

Data Abstraction 資料抽象化

Principles of object-oriented Programming

object-oriented languages enable us to build

classes of objects called instances)

A class combines

Attributes (characteristics) of objects of a single type

Typically data

called data members

Behaviors (operations)

Typically operate on the data

Called methods or member functions

Three characteristics

Encapsulation 封裝

object combine data and operations

Hides inner details

Inheritance 繼承

classes can inherit properties from other classes

Existing classes can be reused.

Polymorphism 多型

object can determine appropriate operations at execution time.

operation contracts 運算合約

Documents the use and limitations of a method

specify data flow

Do not specify how module will perform its task

Specify pre-and-post conditions

Unusual conditions 例外狀況

- Assume they never happen
- Ignore invalid situations
- return a value that signals a problem
- Throw an exception

A modules operation contract specifies its

Purpose

Assumptions

Input

output

Begin the contract during analysis, finish during design

use to document code, particularly in header files

單元3

[head] → □ → □ → □ → [tail]

Link list 鏈結串列

array ↔ Link List

preliminaries

□ → □ → □ → □

動態陣列

int arraysize = 50;

AnArray = new double [arraysize];

delete [] AnArray (釋放)

Pointer

p = &x

p = new Int

delete p

p = NULL

Array vs. Pointer

size: Linked List grow and and shrink as necessary

storage: array requires less memory

retieval: Array 存取時間快 Link List 取決於節點位置

Insert/delete: 若要移動, Array 会比較慢

Restoring Listed List by using file

ofstream outFile

outFile << item 寫檔

outFile close; 關閉

ifstream inFile

inFile >> nextitem 讀檔

inFile close;

struct

| item | item |

struct Node {
int item;
Node *next;
}

描述了一個字母所組成的字串
(第1个字母須是大寫, 其餘是小寫)

Algebraic Expression

infix 中序表達式 a+b

prefix ex +ab 前序

postfix ex ab+ 後序

Advantages 優點

No precedence rules

No association 結合律

No parentheses 括號

Prefix

grammer
<Prefix> = <identifier> | <operator> <prefix> <prefix>

recursive recognition

Base case the lowercase letter is a prefix exp

recursive: <operator> <prefix> <prefix>

一个前序式後面接著非空字串, 一定是前序式

The basic of grammer → recognition algorithm 辨識演算法

單元4

終止條件: 字一致 / 遞迴呼叫: 排除最後一个字元

isId 遞迴

isId suffix

Palindroms 回文

ex 38+83 = 121

<pal> = empty string <ch> | a<pal>a | b<pal>b | … | z<pal>z (base)

<ch> = a|b|c…|z