

单元1

递归: 可由大问题分解为小问题去解
有递归 递归函数
递归与树 同一个函数树状图 一棵树

Fibonacci 递归

Fibonacci series 斐波那契
combinatorial numbers 组合数

递归的图形

1. 递归定义
2. 问题简化
3. 终止条件!!
4. 保证终止

Greatest common Divisor

$$\text{gcd}(x, y) = x \quad \text{if } y = 0$$

$$= \text{gcd}(x, y \bmod x) \quad y > x$$

$$= \text{gcd}(x, x \bmod y) \quad \text{otherwise}$$

$$\text{gcd}(x, y) = y \quad \text{if } x \bmod y = 0$$

$$= \text{gcd}(y, x \bmod y) \quad \text{otherwise}$$

base cases

gcd saves one recursive call
when x divides y

Special case

gcd spends one extra call
if initially $x \leq y$

overall
gcd is more efficient
however $x \leq y$

单元2

Data Abstraction 资料抽象化

Principles of object-oriented programming

object-oriented languages enables us to build
data + objects called instances

A class combines

Attributes (characteristics) of objects of a single type

Typically data
called data members

Behavior (operations)

Typically operate on the data

Called methods or member functions

Three characteristics

Encapsulation of the
object unites data and operations

Hides inner details

Inheritance

classes can inherit properties
from other classes

Existing classes can be reused.

Polymorphism 多态

object can determine appropriate
operation at execution time.

operation contexts 操作上下文

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 异常情况

Assure the user knows
(some invalid) strategy
have a value the
signals a problem
Throw an exception

A module's operation contract specifies its

Purpose

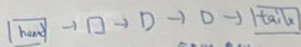
Assumptions

Input

Output

Begin the contract during analysis, finish during design
use to document code, particularly in header files

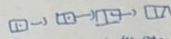
单元)



Link list 链式存储

array \leftrightarrow Link List

eliminates



数组

Pointer

$p = \&x$

$p = \text{new Int}$

delete p

$p = \text{NULL}$

int arraySize = 50;

Array = new double [arraySize];

delete [] Array (释放)

struct



struct Node {

int item;

Node *next;

}

指针 \rightarrow 一个变量所指向的变量
(一个变量指向另一个变量, 地址)

A) general Expression

infix 中序表达式

Postfix 后序表达式

Prefix 前序表达式

Advantages

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Array vs. Pointer

Size: linked list grows and shrinks as necessary

Storage: array requires less memory

Retrieval: array faster than linked list

Insert/delete: array requires shifting

Processing linked list by using file

ofstream outfile

outfile << item

outfile << endl

ifstream infile

infile >> nextitem

infile >> endl

单元 4

The basic of grammar

\rightarrow the cognition algorithm

isid 识别

isid suffix

Palindrome 回文

ex 38+83=121

$\langle pa \rangle = \text{empty string } \langle ch \rangle | a \langle pa \rangle a | b \langle pa \rangle b | \dots | a \langle pa \rangle a$

$\langle ch \rangle = a b c a \sim 12$