**SOURCE CODE**

**PHÂN TÍCH VÀ THIẾT KẾ THUẬT TOÁN**

# I. Các thuật toán sắp xếp.

## I.1 Sắp xếp chọn (Selection Sort).

**//Thư viện khai báo**

#include<stdio.h>

**//Hàm khai báo**

typedef int keyType;

typedef float otherType;

typedef struct{

keyType key;

otherType otherFields;

}recordType;

**//Hàm đổi chỗ**

void swap (recordType \*a, recordType \*b){

recordType temp = \*a;

\*a = \*b;

\*b = temp;

}

**//Thuật toán Sắp xếp Chọn**

void SelectionSort(recordType a[], keyType n){

int i, j, lowIndex;

keyType lowKey;

for(i=0; i<=n-2; i++){

lowKey = a[i].key;

lowIndex = i;

for(j=i+1; j<=n-1; j++){

if(a[j].key < lowKey){

lowKey = a[j].key;

lowIndex = j;

}

}

swap(&a[i], &a[lowIndex]);

}

}

**//Hàm đọc dữ liệu**

void Read\_Data(recordtype a[], int \*n){

FILE \*f;

f=fopen("data.txt", "r");

int i=0;

if(f!=NULL)

while (!feof(f)){

fscanf(f,"%d%f",&a[i].key, &a[i].otherfields);

i++;

} else printf("Loi mo file\n");

fclose(f);

\*n=i;

}

**//Hàm in dữ liệu**

void Print\_Data(recordtype a[], int n){

int i;

for(i=0;i<n;i++)

printf("%3d%5d%8.2f\n",i+1,a[i].key,a[i].otherfields);

}

**//Chương trình**

int main(){

recordType a[100];

int n;

printf("Doc du lieu tu file\n");

readData(a,&n);

printf("\n==== Du lieu truoc khi Sort =====\n");

printData(a,n);

printf("\n==== Selection Sort =======");

SelectionSort(a,n);

printf("\n\n==== Du lieu sau khi sap xep =====\n");

printData(a,n);

}

## I.2 Sắp xếp chọn (Insertion Sort).

**//Thư viện khai báo**

#include<stdio.h>

**//Hàm khai báo**

typedef int keyType;

typedef float otherType;

typedef struct{

keyType key;

otherType otherFields;

}recordType;

**//Hàm đổi chỗ**

void swap (recordType \*a, recordType \*b){

recordType temp = \*a;

\*a = \*b;

\*b = temp;

}

**//Thuật toán Sắp xếp Xen**

void InsertionSort(recordType a[], keyType n){

int i, j;

for(i=1; i<n; i++){

j = i;

while(j>0 && a[j].key < a[j-1].key){

swap(&a[j], &a[j-1]);

j--;

}

}

}

**//Hàm đọc dữ liệu**

void Read\_Data(recordtype a[], int \*n){

FILE \*f;

f=fopen("data.txt", "r");

int i=0;

if(f!=NULL)

while (!feof(f)){

fscanf(f,"%d%f",&a[i].key, &a[i].otherfields);

i++;

} else printf("Loi mo file\n");

fclose(f);

\*n=i;

}

**//Hàm in dữ liệu**

void Print\_Data(recordtype a[], int n){

int i;

for(i=0;i<n;i++)

printf("%3d%5d%8.2f\n",i+1,a[i].key,a[i].otherfields);

}

**//Chương trình**

int main(){

recordType a[100];

int n;

printf("Doc du lieu tu file\n");

readData(a,&n);

printf("\n==== Du lieu truoc khi Sort =====\n");

printData(a,n);

printf("\n==== Insertion Sort =======");

InsertionSort(a,n);

printf("\n\n==== Du lieu sau khi sap xep =====\n");

printData(a,n);

}

## I.3 Sắp xếp Nổi bọt (Bubble Sort).

**//Thư viện khai báo**

#include<stdio.h>

**//Hàm khai báo**

typedef int keyType;

typedef float otherType;

typedef struct{

keyType key;

otherType otherFields;

}recordType;

**//Hàm đổi chỗ**

void swap (recordType \*a, recordType \*b){

recordType temp = \*a;

\*a = \*b;

\*b = temp;}

**//Thuật toán Sắp xếp Xen**

void BubbleSort(recordType a[], int n){

int i, j;

for(i=0; i<n-1; i++){

for(j=n-1; j>i; j--)

if(a[j].key < a[j-1].key)

swap(&a[j], &a[j-1]);

}

}

**//Hàm đọc dữ liệu**

void Read\_Data(recordtype a[], int \*n){

FILE \*f;

f=fopen("data.txt", "r");

int i=0;

if(f!=NULL)

while (!feof(f)){

fscanf(f,"%d%f",&a[i].key, &a[i].otherfields);

i++;

} else printf("Loi mo file\n");

fclose(f);

\*n=i;

}

**//Hàm in dữ liệu**

void Print\_Data(recordtype a[], int n){

int i;

for(i=0;i<n;i++)

printf("%3d%5d%8.2f\n",i+1,a[i].key,a[i].otherfields);

}

**//Chương trình**

int main(){

recordType a[100];

int n;

printf("Doc du lieu tu file\n");

readData(a,&n);

printf("\n==== Du lieu truoc khi Sort =====\n");

printData(a,n);

printf("\n==== Bubble Sort =======");

BubbleSort(a,n);

printf("\n\n==== Du lieu sau khi sap xep =====\n");

printData(a,n);

}

## I.4.1 Sắp xếp Nhanh(Quick Sort).

**//Thư viện khai báo**

#include<stdio.h>

**//Hàm khai báo**

typedef int keyType;

typedef float otherType;

typedef struct{

keyType key;

otherType otherFields;

}recordType;

**//Hàm đổi chỗ**

void swap (recordType \*a, recordType \*b){

recordType temp = \*a;

\*a = \*b;

\*b = temp;

}

**//Thuật toán Sắp xếp Xen**

**/Hàm tìm chốt**

int FindPivot(recordtype a[], int i, int j){

keytype firstkey;

int k;

k = i+1;

firstkey = a[i].key;

while ((k <= j) && (a[k].key == firstkey))

k++;

if (k >j)

return -1;

else {

if (a[k].key >firstkey)

return k;

else

return i;

}

}

**/Hàm phân hoạch**

int Partition(recordtype a[], int i, int j, keytype pivot){

int L,R;

L=i;

R=j;

while (L <= R){

while (a[L].key < pivot) L++;

while (a[R].key >= pivot) R--;

if (L<R)

Swap (&a[L],&a[R]);

}

return L; /\*Tra ve diem phan hoach\*/

}

**/Hàm sắp xếp**

void QuickSort(recordtype a[], int i, int j){

keytype pivot;

int pivotindex, k;

pivotindex = FindPivot(a,i,j);

if (pivotindex != -1){

pivot = a[pivotindex].key;

k = Partition(a,i,j,pivot);

QuickSort(a,i,k-1);

QuickSort(a,k,j);

}

}

**//Hàm đọc dữ liệu**

void Read\_Data(recordtype a[], int \*n){

FILE \*f;

f=fopen("data.txt", "r");

int i=0;

if(f!=NULL)

while (!feof(f)){

fscanf(f,"%d%f",&a[i].key, &a[i].otherfields);

i++;

} else printf("Loi mo file\n");

fclose(f);

\*n=i;

}

**//Hàm in dữ liệu**

void Print\_Data(recordtype a[], int n){

int i;

for(i=0;i<n;i++)

printf("%3d%5d%8.2f\n",i+1,a[i].key,a[i].otherfields);

}

**//Chương trình**

int main(){

recordType a[100];

int n;

printf("Doc du lieu tu file\n");

readData(a,&n);

printf("\n==== Du lieu truoc khi Sort =====\n");

printData(a,n);

printf("\n==== Quick Sort =======");

QuickSort(a,n);

printf("\n\n==== Du lieu sau khi sap xep =====\n");

printData(a,n);

}

## I.4.2 Sắp xếp Nhanh – Biến thể (Quick Sort - BT).

**//Thư viện khai báo**

#include<stdio.h>

**//Hàm khai báo**

typedef int keyType;

typedef float otherType;

typedef struct{

keyType key;

otherType otherFields;

}recordType;

**//Hàm đổi chỗ**

void swap (recordType \*a, recordType \*b){

recordType temp = \*a;

\*a = \*b;

\*b = temp;

}

**//Thuật toán Sắp xếp Xen**

**/Hàm tìm chốt**

int FindPivot(recordtype a[], int i, int j){

keytype firstkey;

int k;

k = i+1;

firstkey = a[i].key;

while ((k <= j) && (a[k].key == firstkey))

k++;

if (k >j)

return -1;

else {

if (a[k].key >firstkey)

return k;

else

return I;

}

}

**/Hàm phân hoạch**

int Partition(recordtype a[], int i, int j, keytype pivot){

int L,R;

L=i;

R=j;

while (L <= R){

while (a[L].key <= pivot) L++;

while (a[R].key > pivot) R--;

if (L<R)

Swap (&a[L],&a[R]);

}

return L; /\*Tra ve diem phan hoach\*/

}

**/Hàm sắp xếp**

void QuickSort(recordtype a[], int i, int j){

keytype pivot;

int pivotindex, k;

pivotindex = FindPivot(a,i,j);

if (pivotindex != -1){

pivot = a[pivotindex].key;

k = Partition(a,i,j,pivot);

QuickSort(a,i,k-1);

QuickSort(a,k,j);

}

}

**//Hàm đọc dữ liệu**

void Read\_Data(recordtype a[], int \*n){

FILE \*f;

f=fopen("data.txt", "r");

int i=0;

if(f!=NULL)

while (!feof(f)){

fscanf(f,"%d%f",&a[i].key, &a[i].otherfields);

i++;

} else printf("Loi mo file\n");

fclose(f);

\*n=i;

}

**//Hàm in dữ liệu**

void Print\_Data(recordtype a[], int n){

int i;

for(i=0;i<n;i++)

printf("%3d%5d%8.2f\n",i+1,a[i].key,a[i].otherfields);

}

**//Chương trình**

int main(){

recordType a[100];

int n;

printf("Doc du lieu tu file\n");

readData(a,&n);

printf("\n==== Du lieu truoc khi Sort =====\n");

printData(a,n);

printf("\n==== Quick Sort Bien The =======");

QuickSort(a,n);

printf("\n\n==== Du lieu sau khi sap xep =====\n");

printData(a,n);

}

## I.5 Sắp xếp Vun đống (Head Sort).

**//Thư viện khai báo**

#include<stdio.h>

**//Hàm khai báo**

typedef int keyType;

typedef float otherType;

typedef struct{

keyType key;

otherType otherFields;

}recordType;

**//Hàm đổi chỗ**

void swap (recordType \*a, recordType \*b){

recordType temp = \*a;

\*a = \*b;

\*b = temp;

}

**//Thuật toán Sắp xếp Xen**

**/Hàm PushDown**

void PushDown(recordtype a[], int first, int last){

int r=first;

while (r <= (last-1)/2)

if (last == 2\*r+1){

if(a[r].key > a[last].key)

Swap(&a[r],&a[last]);

r=last;

}

else{

if((a[r].key)>a[2\*r+1].key && (a[2\*r+1].key <= a[2\*r+2].key)){

Swap(&a[r],&a[2\*r+1]);

r=2\*r+1;

}

else

if ((a[r].key>a[2\*r+2].key) && (a[2\*r+2].key<a[2\*r+1].key)){

Swap(&a[r],&a[2\*r+2]);

r=2\*r+2;

}

else r = last;

}

}

**/Hàm sắp xếp**

void HeadSort(recordtype a[], int n){

int i;

for (i=(n-2)/2; i>=0; i--)

PushDown(a,i,n-1);

for (i=n-1; i>=2; i--){

Swap(&a[0],&a[i]);

PushDown(a,0,i-1);

}

Swap(&a[0],&a[1]);

}

**//Hàm đọc dữ liệu**

void Read\_Data(recordtype a[], int \*n){

FILE \*f;

f=fopen("data.txt", "r");

int i=0;

if(f!=NULL)

while (!feof(f)){

fscanf(f,"%d%f",&a[i].key, &a[i].otherfields);

i++;

} else printf("Loi mo file\n");

fclose(f);

\*n=i;

}

**//Hàm in dữ liệu**

void Print\_Data(recordtype a[], int n){

int i;

for(i=0;i<n;i++)

printf("%3d%5d%8.2f\n",i+1,a[i].key,a[i].otherfields);

}

**//Chương trình**

int main(){

recordType a[100];

int n;

printf("Doc du lieu tu file\n");

readData(a,&n);

printf("\n==== Du lieu truoc khi Sort =====\n");

printData(a,n);

printf("\n==== Head Sort =======");

HeadSort(a,n);

printf("\n\n==== Du lieu sau khi sap xep =====\n");

printData(a,n);

}

**Bổ sung - Thuật toán chia để trị.**

#include <stdio.h>

#include <string.h>

#include <malloc.h>

typedef char \* BigInteger;

void ReadFromFile(BigInteger x, BigInteger y){

FILE \*f;

f=fopen("BigInt.txt", "r");

fgets(x,255,f);

x[strlen(x)-1]='\0';

fgets(y,255,f);

y[strlen(y)-1]='\0';

fclose(f);

}

int Sign(BigInteger x){

return (x[0]=='-' ? -1 : 1);

}

BigInteger Right(BigInteger x, int n){

int i,l = strlen(x);

BigInteger ptr=x+l-1;

for (i=l-1; i>l-n ; i--) ptr--;

return ptr;

}

BigInteger Left(BigInteger x, int n){

int i;

BigInteger L;

L=(char\*) malloc(sizeof(char)\*256);

for(i=0;i<n;i++) L[i]=x[i];

L[n]='\0';

return L;

}

BigInteger ABS(BigInteger x){

if(Sign(x)==-1)

return(Right(x,strlen(x)-1));

else return x;

}

BigInteger Nhan10\_mu\_n (BigInteger x, int n){

int i;

BigInteger temp;

temp=(char\*)malloc(sizeof(char)\*256);

strcpy(temp,x);

int l=strlen(temp);

for(i=0;i<n;i++) temp[l+i]='0';

temp[l+n]='\0';

return temp;

}

BigInteger Reverse(BigInteger n){

BigInteger kq;

kq = (char\*) malloc(sizeof(char)\*256);

int L = strlen(n);

int i;

for(i=0; i<L; i++)

kq[i]=n[L-i-1];

kq[L]='\0';

return kq;

}

int Zero(BigInteger n){

return n[0]== '0';

}

int Positive(BigInteger n){

return n[0]>'0';

}

int Negative(BigInteger n){

return n[0]=='-' && !Zero(n);

}

int Not\_Negative(BigInteger n){

return Zero(n) || Positive(n);

}

int Not\_Positive(BigInteger n){

return Zero(n) || Negative(n);

}

// Ham xet xem 2 so co bang nhau hay kh

int Equal(BigInteger n, BigInteger m){

return !strcmp(n,m);

}

/\*

Ham xet xem so n co nho hon so m

Ta xet cac truong hop sau

0- neu n bang m => Khong nho hon

1- n am va m khong am => n<m

2- n bang khong va m duong => n<m

3- n khong am va m am => n>m

4- n duong va m khong duong => n>m

5- n va m cung duong va do dai cua n nho hon m => n<m

6- n va m cung khong am, cung do dai, xet tung ky tu cho den khi gap n[i]<m[i] thi n<m

7- n va m cung am, thi n<m khi abs(m)<abs(n)

\*/

int Less\_Than(BigInteger n, BigInteger m){

if (Equal(n,m))

return 0;

if (Negative(n)&& Not\_Negative(m))

return 1;

if (Zero(n)&& Positive(m))

return 1;

if (Not\_Negative(n)&& Negative(m))

return 0;

if (Positive(n)&& Not\_Positive(m))

return 0;

if (Not\_Negative(n)&& Not\_Negative(m))

if (strlen(n)!=strlen(m))

return strlen(n)<strlen(m);

else {

int i=0;

while (n[i]==m[i]) i++;

return (n[i]<m[i]);

}

if (Negative(n)&& Negative(m))

return Less\_Than(ABS(m),ABS(n));

}

// Xet xem so n co lon hon so m hay khong

int Greater\_Than(BigInteger n, BigInteger m){

return Less\_Than(m,n);

}

int Less\_Or\_Equal(BigInteger n, BigInteger m){

return Less\_Than(n,m) || Equal(n,m);

}

int Greater\_Or\_Equal(BigInteger n, BigInteger m){

return Greater\_Than(n,m) || Equal(n,m);

}

// Ham tru so nguyen n1 cho n2 voi gia thiet n1>=n2

BigInteger Subtract1(BigInteger x, BigInteger y){

BigInteger kq,n,m;

kq = (char\*) calloc(256,sizeof(char));

n = (char\*) calloc(256,sizeof(char));

m = (char\*) calloc(256,sizeof(char));

n = Reverse(x);

m = Reverse(y);

int L1=strlen(n);

int L2=strlen(m);

int i, nho=0;

for (i=0; i<L2; i++)

if (n[i] >= m[i] + nho) {

kq[i]=(n[i]-m[i]-nho)+48;

nho=0;

}else {

kq[i]=(n[i]+10-m[i]-nho)+48;

nho=1;

}

if (nho==0)

for (i=L2; i<L1; i++) kq[i]=n[i];

else

for (i=L2; i<L1; i++)

if (n[i]-48 >= nho) {

kq[i]=(n[i]-nho);

nho=0;}

else{

kq[i]=(n[i]+10-nho);

nho=1;

}

kq[strlen(kq)]='\0';

return Reverse(kq);

}

// Nhan mot so nguyen voi so 1 hoac -1

BigInteger MultS(BigInteger x, int s){

if(s==1) return x;

else {

int i,l=strlen(x);

BigInteger temp;

temp=(char\*)malloc(sizeof(char)\*256);

temp[0]='-';

for(i=1;i<=l;i++) temp[i]=x[i-1];

temp[l+1]='\0';

return temp;

}

}

BigInteger Subtract(BigInteger x, BigInteger y){

if (Greater\_Or\_Equal(x,y))

return Subtract1(x,y);

else

return MultS(Subtract1(y,x), -1);

}

// cong 2 so nguyen khong am

BigInteger Add1(BigInteger n1, BigInteger n2){

BigInteger kq,n,m;

kq = (char\*) calloc(256,sizeof(char));

n = (char\*) calloc(256,sizeof(char));

m = (char\*) calloc(256,sizeof(char));

strcpy(n,Reverse(n1));

strcpy(m, Reverse(n2));

int L1=strlen(n);

int L2=strlen(m);

int i, L, H, nho=0;

if (L1>=L2){

H=L1;

L=L2;

}else {

H=L2;

L=L1;

}

for (i=0; i<L; i++){

kq[i]=(n[i]+m[i]-96+nho)%10+48;

nho = (n[i]-48+m[i]-48+nho)/10;

}

if (L1>=L2)

for (i=L; i<H; i++){

kq[i]=(n[i]-48+nho)%10+48;

nho = (n[i]-48+nho)/10;

}

else

for (i=L; i<H; i++){

kq[i]=(m[i]-48+nho)%10+48;

nho = (m[i]-48+nho)/10;

}

if (nho>0) strcat(kq,"1");

kq[strlen(kq)]='\0';

return (Reverse(kq));

}

// Cong hai so bat ky

BigInteger Add(BigInteger n1, BigInteger n2){

if (Not\_Negative (n1))

if (Not\_Negative (n2)) return Add1(n1,n2);

else return Subtract(n1,ABS(n2));

else

if (Not\_Negative (n2))return Subtract(n2,ABS(n1));

else return MultS(Add1(ABS(n1),ABS(n2)),-1);

}

// Cong 3 so nguyen

BigInteger Add3(BigInteger n1, BigInteger n2, BigInteger n3){

return Add(Add(n1,n2),n3);

}

// Nhan 2 so nguyen co mot chu so

BigInteger Mult1(BigInteger x, BigInteger y){

BigInteger Temp;

Temp=(char\*)malloc(sizeof(char)\*3);

int nho;

Temp[0] = (x[0]-48)\*(y[0]-48)%10+48;

nho = (x[0]-48)\*(y[0]-48)/10;

if (nho>0){

Temp[1]=nho+48;

Temp[2]='\0';

}

else

Temp[1]='\0';

return Reverse(Temp);

}

BigInteger Mult(BigInteger X, BigInteger Y, int n){

BigInteger m1,m2,m3,A,B,C,D;

int s; // Luu tru dau cua tich XY

s = Sign(X)\*Sign(Y);

X = ABS(X); //Lay tri tuyet doi cua X

Y = ABS(Y);

if (n == 1) return MultS(Mult1(X,Y),s);

A = Left(X, n/2);

B = Right(X, n/2);

C = Left(Y, n/2);

D = Right(Y, n/2);

m1 = Mult(A,C, n/2);

m2 = Mult(Subtract(A,B),Subtract(D,C), n/2);

m3 = Mult(B,D, n/2);

return MultS(Add3(Nhan10\_mu\_n(m1,n),Nhan10\_mu\_n(Add3(m1,m2,m3),n/2), m3),s);

}

int main(){

BigInteger x, y;

x=(char\*)malloc(sizeof(char)\*256);

y=(char\*)malloc(sizeof(char)\*256);

ReadFromFile(x,y);

printf("\nSo nguyen X= %s\n\n",x);

printf("So nguyen Y= %s\n\n",y);

printf("Tich So XY= %s\n",Mult(x,y,strlen(ABS(x))));

free(x);

free(y);

return 0;

}

# II. Thuật toán tham ăn.

## II.1 Bài toán rút tiền ATM

// Bai toan tra tien cua may ATM

// Du lieu cho trong file ATM.TXT

// Giai bang phuong phap THAM AN

#include <stdio.h>

#include <malloc.h>

#include <string.h>

typedef struct {

char TenTien[25];

int MG, PA;

}Tien;

Tien \* ReadFromFile(int \*n){

FILE \*f;

f=fopen("ATM.TXT", "r");

Tien \*dslt;

dslt=(Tien\*)malloc(sizeof(Tien));

int i=0;

while (!feof(f)){

fscanf(f, "%d",&dslt[i].MG);

fgets(dslt[i].TenTien,25,f);

dslt[i].TenTien[strlen(dslt[i].TenTien)-1]='\0';

dslt[i].PA=0;

i++;

dslt=(Tien\*)realloc(dslt, sizeof(Tien)\*(i+1));

}

\*n=i;

fclose(f);

return dslt;

}

void Swap(Tien \*x, Tien \*y){

Tien Temp;

Temp = \*x;

\*x = \*y;

\*y = Temp;

}

// Sap xep theo thu tu tang cua Don gia

// Don gia = GiaTri/ Trongluong

void BubbleSort(Tien \*dslt, int n){

int i,j;

for(i=0; i<=n-2; i++)

for (j=n-1; j>=i+1; j--){

if (dslt[j].MG>dslt[j-1].MG)

Swap(&dslt[j],&dslt[j-1]);

}

}

void InDS(Tien \*dslt ,int n, int TienCanRut){

int i;

int TongTienTra=0;

printf("|---|-------------------------|---------|---------|----------|\n");

printf("|%-3s|%-25s|%-9s|%-9s|%-10s|\n", "STT", " Loai tien ","Menh Gia", "So to","Thanh tien");

printf("|---|-------------------------|---------|---------|----------|\n");

for(i=0;i<n;i++){

printf("|%-3d",i+1);

printf("|%-25s",dslt[i].TenTien);

printf("|%-9d",dslt[i].MG);

printf("|%-9d",dslt[i].PA);

printf("|%-10d|\n",dslt[i].MG\*dslt[i].PA);

TongTienTra=TongTienTra+dslt[i].PA \* dslt[i].MG;

}

printf("|---|-------------------------|---------|---------|----------|\n");

printf("So tien can rut= %9d\n",TienCanRut);

printf("So tien da tra= %9d\n", TongTienTra);

}

void Greedy(Tien \*dslt,int n, int TienCanRut){

int i=0;

while(i<n&&TienCanRut>0) {

dslt[i].PA= TienCanRut/dslt[i].MG;

TienCanRut = TienCanRut-dslt[i].PA \* dslt[i].MG;

i++;

}

}

int main(){

int n;

int TienCanRut;

printf("Nhap so tien can rut: "); scanf("%d",&TienCanRut);

Tien \*dslt;

dslt=ReadFromFile(&n);

BubbleSort(dslt,n);

Greedy(dslt,n,TienCanRut);

InDS(dslt,n,TienCanRut);

free(dslt);

return 0;

}

## II.2 Bài toán đường đi người giao hàng (TSP)

#include <stdio.h>

#define size 30

typedef struct {

float do\_dai;

int dau, cuoi;

} canh;

void read\_file(char file\_name[], canh a[], int \*n){

int i,j,t;

float temp;

FILE \*f;

f=fopen(file\_name, "r");

if (f==NULL){

printf("Loi mo file!!!\n");

return;

}

fscanf(f,"%d",n);

int k=0;

for(i=0; i<\*n; i++)

for(j=i; j<\*n; j++)

if(i==j) for(t=0; t<=j; t++) fscanf(f,"%f",&temp);

else {

fscanf(f,"%f",&a[k].do\_dai);

a[k].dau=i;

a[k].cuoi=j;

k++;

}

fclose(f);

}

void in\_ds\_canh(canh a[], int m, int la\_PA){

int i;

float tong=0.0;

for(i=0; i<m; i++){

printf("%3d %c%c=%8.2f\n", i+1, a[i].dau+97, a[i].cuoi+97, a[i].do\_dai);

if (la\_PA)

tong+= a[i].do\_dai;

}

if (la\_PA)

printf("Tong do dai cac canh = %5.2f\n", tong);

}

void swap(canh \*x, canh \*y){

canh temp= \*x;

\*x = \*y;

\*y = temp;

}

void bubble\_sort(canh a[], int n){

int i,j;

for(i=0; i<n-1; i++)

for(j=n-1; j>i; j--)

if(a[j].do\_dai<a[j-1].do\_dai)

swap(&a[j], &a[j-1]);

}

int dinh\_cap3(canh PA[], int k, canh moi){

int i,dem;

i=0;

dem=1;

while (i<k && dem <3){

if (moi.dau==PA[i].dau || moi.dau==PA[i].cuoi)

dem++;

i++;

}

if (dem==3) return 1;

i=0;

dem=1;

while (i<k && dem <3){

if (moi.cuoi==PA[i].dau || moi.cuoi==PA[i].cuoi)

dem++;

i++;

}

return dem==3;

}

void init\_forest(int parent[], int n){

int i;

for(i=0; i<n; i++)

parent[i]=i;

}

int find\_root(int parent[], int u){

while (u != parent[u])

u = parent[u];

return u;

}

int chu\_trinh(int r\_dau, int r\_cuoi){

return (r\_dau == r\_cuoi);

}

void update\_forest(int parent[], int r1, int r2){

parent[r2]= r1;

}

void greedy(canh ds\_canh[], int n, canh PA[]){

int i,j;

int parent[n];

init\_forest(parent,n);

int r\_dau, r\_cuoi;

j= 0;

for(i=0; i<n\*(n-1)/2 && j<n-1; i++){

r\_dau= find\_root(parent, ds\_canh[i].dau);

r\_cuoi= find\_root(parent, ds\_canh[i].cuoi);

if (!dinh\_cap3(PA,j, ds\_canh[i]) && !chu\_trinh(r\_dau, r\_cuoi)){

PA[j]= ds\_canh[i];

j++;

update\_forest(parent, r\_dau, r\_cuoi);

}

}

for(; i<n\*(n-1)/2; i++){

r\_dau= find\_root(parent, ds\_canh[i].dau);

r\_cuoi= find\_root(parent, ds\_canh[i].cuoi);

if ((!dinh\_cap3(PA, n-1, ds\_canh[i])) && (chu\_trinh(r\_dau, r\_cuoi))){

PA[n-1]= ds\_canh[i];

break;

}

}

}

int main(){

canh ds\_canh[size];

int n;

printf("Phuong an TSP dung thuat toan THAM AN:\n");

read\_file("TSP.txt", ds\_canh, &n);

printf("Danh sach cac canh cua do thi:\n");

in\_ds\_canh(ds\_canh, n\*(n-1)/2, 0);

bubble\_sort(ds\_canh, n\*(n-1)/2);

printf("\nDanh sach cac canh cua do thi da SAP XEP:\n");

in\_ds\_canh(ds\_canh, n\*(n-1)/2, 0);

canh PA[n];

greedy(ds\_canh, n, PA);

printf("\nPHUONG AN\n");

in\_ds\_canh(PA, n, 1);

return 0;

}

#include <stdio.h>

typedef struct{

float dodai;

int dau, cuoi;

}canh;

void Swap(canh \*a, canh \*b){

canh temp = \*a;

\*a = \*b;

\*b = temp;

}

void BubbleSort(canh a[], int n){

for(int i=0; i<n-1; i++){

for(int j=n-1; j>i; j--){

if(a[j].dodai < a[j-1].dodai)

Swap(&a[j], &a[j-1]);

}

}

}

void ReadData(char filename[], canh a[], int \*n){

FILE \*f = fopen(filename, "r");

if(f==NULL){

printf("Loi mo file!!!\n");

return;

}

fscanf(f, "%d", n);

float temp;

int k=0;

for(int i=0; i<\*n; i++){

for(int j=0; j<\*n; j++){

if(j<=i) fscanf(f, "%f", &temp);

else{

fscanf(f, "%f", &a[k].dodai);

a[k].dau = i;

a[k].cuoi = j;

k++;

}

}

}

fclose(f);

}

void init\_forest(int parent[], int n){

for(int i=0; i<n; i++)

parent[i] = i;

}

int find\_root(int parent[], int u){

while(u != parent[u])

u = parent[u];

return u;

}

void update\_forest(int parent[], int r1, int r2){

parent[r1] = r2;

}

int dinh\_cap\_3(canh PA[], int k, canh moi){

int i=0, dem=0;

while(i<k && dem<2){

if((moi.dau==PA[i].dau || moi.dau==PA[i].cuoi) && ++dem==2)

return 1;

i++;

}

i=0; dem=0;

while(i<k && dem<2){

if((moi.cuoi==PA[i].dau || moi.cuoi==PA[i].cuoi) && ++dem==2)

return 1;

i++;

}

return 0;

}

int chu\_trinh(int r\_dau, int r\_cuoi){

return r\_dau == r\_cuoi;

}

void Greedy(canh a[], int n, canh PA[]){

int i, j=0;

int r\_dau, r\_cuoi;

int parent[n];

init\_forest(parent, n);

for(i=0; i<n\*(n-1)/2 && j<n-1; i++){

r\_dau = find\_root(parent, a[i].dau);

r\_cuoi = find\_root(parent, a[i].cuoi);

if(!dinh\_cap\_3(PA, j, a[i]) && !chu\_trinh(r\_dau, r\_cuoi)){

PA[j] = a[i];

j++;

update\_forest(parent, r\_dau, r\_cuoi);

}

}

for(i=0; i<n\*(n-1)/2; i++){

r\_dau = find\_root(parent, a[i].dau);

r\_cuoi = find\_root(parent, a[i].cuoi);

if(!dinh\_cap\_3(PA, n-1, a[i]) && chu\_trinh(r\_dau, r\_cuoi)){

PA[n-1] = a[i];

break;

}

}

}

void InDS(canh a[], int m, int la\_PA){

float sum=0;

for(int i=0; i<m; i++){

printf("%2d %c%c = %2.2f\n", i+1, a[i].dau+97, a[i].cuoi+97, a[i].dodai);

sum += a[i].dodai;

}

if(la\_PA)

printf("Do dai cua chu trinh la: %.2f", sum);

}

int main(){

int n;

canh a[30];

ReadData("TSP.txt", a, &n);

printf("Bai toan TSP dung thuat toan THAM AN\n");

printf("Danh sach cac canh CHUA SAP XEP\n");

InDS(a, n\*(n-1)/2, 0);

BubbleSort(a, n\*(n-1)/2);

printf("Danh sach cac canh DA SAP XEP\n");

InDS(a, n\*(n-1)/2, 0);

canh PA[n];

Greedy(a, n, PA);

printf("PHUONG AN\n");

InDS(PA, n, 1);

return 0;

}

## II.3.1 Bài toán Cái ba lô (Balo1)

#include <stdio.h>

#include <malloc.h>

#include <string.h>

typedef struct {

char TenDV[20];

float TL, GT, DG;

int PA;

}DoVat;

DoVat \*ReadFromFile(float \*W, int \*n){

FILE \*f;

f = fopen("CaiBalo1.TXT", "r");

fscanf(f, "%f",W);

DoVat \*dsdv;

dsdv=(DoVat\*)malloc(sizeof(DoVat));

int i=0;

while (!feof(f)){

fscanf(f, "%f%f%[^\n]",&dsdv[i].TL,&dsdv[i].GT,&dsdv[i].TenDV);

dsdv[i].DG=dsdv[i].GT/dsdv[i].TL;

dsdv[i].PA=0;

i++;

dsdv=(DoVat\*)realloc(dsdv, sizeof(DoVat)\*(i+1));

}

\*n=i;

fclose(f);

return dsdv;

}

void swap(DoVat \*x, DoVat \*y){

DoVat Temp;

Temp = \*x;

\*x = \*y;

\*y = Temp;

}

void BubbleSort(DoVat \*dsdv, int n){

int i,j;

for(i=0; i<=n-2; i++)

for (j=n-1; j>=i+1; j--){

if (dsdv[j].DG>dsdv[j-1].DG)

swap(&dsdv[j],&dsdv[j-1]);

}

}

void InDSDV(DoVat \*dsdv, int n, float W){

int i;

float TongTL=0.0, TongGT=0.0;

printf("\nPhuong an Cai Ba lo 1 dung thuat toan THAM AN nhu sau:\n");

printf("\nTrong luong cua ba lo = %-9.2f\n",W);

printf("|---|------------------|---------|---------|---------|-----------|\n");

printf("|STT| Ten Do Vat | T Luong | Gia Tri | Don Gia | Phuong an |\n");

printf("|---|------------------|---------|---------|---------|-----------|\n");

for(i=0;i<n;i++){

printf("|%2d |%-18s|%9.2f|%9.2f|%9.2f|%6d |\n",

i+1,dsdv[i].TenDV,dsdv[i].TL,dsdv[i].GT,dsdv[i].DG,dsdv[i].PA);

TongTL=TongTL+dsdv[i].PA \* dsdv[i].TL;

TongGT=TongGT+dsdv[i].PA \* dsdv[i].GT;

}

printf("|---|------------------|---------|---------|---------|-----------|\n");

printf("Phuong an (theo thu tu DG giam dan): X(");

for(i=0; i<n-1; i++){

printf("%d,", dsdv[i].PA);

}

printf("%d)", dsdv[n-1].PA);

printf("\nTong trong luong = %-9.2f\n",TongTL);

printf("Tong gia tri = %-9.2f\n",TongGT);

}

void Greedy(DoVat \*dsdv,int n, float W){

int i;

for(i=0; i<n; i++) {

dsdv[i].PA = (W/dsdv[i].TL);

W = W-dsdv[i].PA \* dsdv[i].TL;

}

}

int main(){

int n;

float W;

DoVat \*dsdv;

dsdv=ReadFromFile(&W, &n);

BubbleSort(dsdv,n);

Greedy(dsdv,n,W);

InDSDV(dsdv,n,W);

free(dsdv);

return 0;

}

## II.3.2 Bài toán Cái ba lô (Balo2)

#include <stdio.h>

#include <malloc.h>

#include <string.h>

typedef struct {

char TenDV[20];

float TL, GT, DG;

int SL,PA;

}DoVat;

DoVat \*ReadFromFile(float \*W, int \*n){

FILE \*f;

f = fopen("CaiBalo2.txt", "r");

fscanf(f, "%f",W);

DoVat \*dsdv;

dsdv=(DoVat\*)malloc(sizeof(DoVat));

int i=0;

while (!feof(f)){

fscanf(f, "%f%f%d%[^\n]",&dsdv[i].TL,&dsdv[i].GT,&dsdv[i].SL,&dsdv[i].TenDV);

dsdv[i].DG=dsdv[i].GT/dsdv[i].TL;

dsdv[i].PA=0;

i++;

dsdv=(DoVat\*)realloc(dsdv, sizeof(DoVat)\*(i+1));

}

\*n=i;

fclose(f);

return dsdv;

}

void swap(DoVat \*x, DoVat \*y){

DoVat Temp;

Temp = \*x;

\*x = \*y;

\*y = Temp;

}

void BubbleSort(DoVat \*dsdv, int n){

int i,j;

for(i=0; i<=n-2; i++)

for (j=n-1; j>=i+1; j--){

if (dsdv[j].DG>dsdv[j-1].DG)

swap(&dsdv[j],&dsdv[j-1]);

}

}

void InDSDV(DoVat \*dsdv, int n, float W){

int i;

float TongTL=0.0, TongGT=0.0;

printf("\nPhuong an Cai Ba lo 2 dung thuat toan THAM AN nhu sau:\n");

printf("\nTrong luong cua ba lo = %-9.2f\n",W);

printf("|---|------------------|---------|----------|---------|---------|-----------|\n");

printf("|STT| Ten Do Vat | T Luong | So Luong | Gia Tri | Don Gia | Phuong an |\n");

printf("|---|------------------|---------|----------|---------|---------|-----------|\n");

for(i=0;i<n;i++){

printf("|%2d |%-18s|%9.2f|%5d |%9.2f|%9.2f|%6d |\n",

i+1,dsdv[i].TenDV,dsdv[i].TL,dsdv[i].SL,dsdv[i].GT,dsdv[i].DG,dsdv[i].PA);

TongTL=TongTL+dsdv[i].PA \* dsdv[i].TL;

TongGT=TongGT+dsdv[i].PA \* dsdv[i].GT;

}

printf("|---|------------------|---------|----------|---------|---------|-----------|\n");

printf("Phuong an (theo thu tu DG giam dan): X(");

for(i=0; i<n-1; i++){

printf("%d,", dsdv[i].PA);

}

printf("%d)", dsdv[n-1].PA);

printf("\nTong trong luong = %-9.2f\n",TongTL);

printf("Tong gia tri = %-9.2f\n",TongGT);

}

void Greedy(DoVat \*dsdv,int n, float W){

int i;

for(i=0; i<n; i++) {

dsdv[i].PA = (W/dsdv[i].TL);

if (dsdv[i].PA>dsdv[i].SL) dsdv[i].PA=dsdv[i].SL;

W = W-dsdv[i].PA \* dsdv[i].TL;

}

}

int main(){

int n;

float W;

DoVat \*dsdv;

dsdv=ReadFromFile(&W, &n);

BubbleSort(dsdv,n);

Greedy(dsdv,n,W);

InDSDV(dsdv,n,W);

free(dsdv);

return 0;

}

## II.3.3 Bài toán Cái ba lô (Balo3)

#include <stdio.h>

#include <malloc.h>

#include <string.h>

typedef struct {

char TenDV[20];

float TL, GT, DG;

int PA;

}DoVat;

DoVat \*ReadFromFile(float \*W, int \*n){

FILE \*f;

f = fopen("CaiBalo3.TXT", "r");

fscanf(f, "%f",W);

DoVat \*dsdv;

dsdv=(DoVat\*)malloc(sizeof(DoVat));

int i=0;

while (!feof(f)){

fscanf(f, "%f%f%[^\n]",&dsdv[i].TL,&dsdv[i].GT,&dsdv[i].TenDV);

dsdv[i].DG=dsdv[i].GT/dsdv[i].TL;

dsdv[i].PA=0;

i++;

dsdv=(DoVat\*)realloc(dsdv, sizeof(DoVat)\*(i+1));

}

\*n=i;

fclose(f);

return dsdv;

}

void swap(DoVat \*x, DoVat \*y){

DoVat Temp;

Temp = \*x;

\*x = \*y;

\*y = Temp;

}

void BubbleSort(DoVat \*dsdv, int n){

int i,j;

for(i=0; i<=n-2; i++)

for (j=n-1; j>=i+1; j--){

if (dsdv[j].DG>dsdv[j-1].DG)

swap(&dsdv[j],&dsdv[j-1]);

}

}

void InDSDV(DoVat \*dsdv, int n, float W){

int i;

float TongTL=0.0, TongGT=0.0;

printf("\nPhuong an Cai Ba lo 1 dung thuat toan THAM AN nhu sau:\n");

printf("\nTrong luong cua ba lo = %-9.2f\n",W);

printf("|---|------------------|---------|---------|---------|-----------|\n");

printf("|STT| Ten Do Vat | T Luong | Gia Tri | Don Gia | Phuong an |\n");

printf("|---|------------------|---------|---------|---------|-----------|\n");

for(i=0;i<n;i++){

printf("|%2d |%-18s|%9.2f|%9.2f|%9.2f|%6d |\n",

i+1,dsdv[i].TenDV,dsdv[i].TL,dsdv[i].GT,dsdv[i].DG,dsdv[i].PA);

TongTL=TongTL+dsdv[i].PA \* dsdv[i].TL;

TongGT=TongGT+dsdv[i].PA \* dsdv[i].GT;

}

printf("|---|------------------|---------|---------|---------|-----------|\n");

printf("Phuong an (theo thu tu DG giam dan): X(");

for(i=0; i<n-1; i++){

printf("%d,", dsdv[i].PA);

}

printf("%d)", dsdv[n-1].PA);

printf("\nTong trong luong = %-9.2f\n",TongTL);

printf("Tong gia tri = %-9.2f\n",TongGT);

}

void Greedy(DoVat \*dsdv,int n, float W){

int i;

for(i=0; i<n; i++) {

dsdv[i].PA = (W/dsdv[i].TL);

if (dsdv[i].PA>1) dsdv[i].PA=1;

W = W-dsdv[i].PA \* dsdv[i].TL;

}

}

int main(){

int n;

float W;

DoVat \*dsdv;

dsdv=ReadFromFile(&W, &n);

BubbleSort(dsdv,n);

Greedy(dsdv,n,W);

InDSDV(dsdv,n,W);

free(dsdv);

return 0;

}

# III. Thuật toán Nhánh cận.

## III.1 Bài toán đường đi người giao hàng (TSP nhánh cận)

#include <stdio.h>

#define size 30

typedef struct {

float do\_dai;

int dau, cuoi;

int da\_dung;

} canh;

void read\_file(char file\_name[], canh a[][size], int \*n){

int i,j;

FILE \*f;

f=fopen(file\_name, "r");

if (f==NULL){

printf("Loi mo file!!!\n");

return;

}

fscanf(f,"%d",n);

for(i=0; i<\*n; i++)

for(j=0; j<\*n; j++){

fscanf(f,"%f",&a[i][j].do\_dai);

a[i][j].dau=i;

a[i][j].cuoi=j;

a[i][j].da\_dung=0;;

}

fclose(f);

}

void in\_ma\_tran(canh a[][size], int n){

int i,j;

printf("\nMa tran TRONG SO cua do thi\n");

for(i=0; i<n; i++){

for(j=0; j<n; j++)

printf(" %c%c =%5.2f ",a[i][j].dau+97, a[i][j].cuoi+97, a[i][j].do\_dai);

printf("\n");

}

}

void in\_PA(canh PA[], int n){

int i;

float sum=0.0;

printf("\nPHUONG AN TIM DUOC:\n");

for(i=0; i<n; i++){

sum+= PA[i].do\_dai;

printf(" Canh %c%c = %5.2f\n", PA[i].dau+97, PA[i].cuoi+97, PA[i].do\_dai);

}

printf("CHU TRINH : ");

for(i=0; i<n; i++){

printf("%c",PA[i].dau+97);

printf("-> ");

}

printf("%c",PA[0].dau+97);

printf("\nTong do dai cac canh cua chu trinh = %5.2f\n", sum);

}

float canh\_NN(canh a[][size], int n){

float Cmin=3.40282e+38;

int i,j;

for(i=0; i<n; i++)

for(j=0; j<n; j++)

if(i!=j && !a[i][j].da\_dung && a[i][j].do\_dai<Cmin)

Cmin= a[i][j].do\_dai;

return Cmin;

}

float can\_duoi(canh a[][size], float TGT, int n, int i){

return TGT+ (n-i)\*canh\_NN(a,n);

}

void Cap\_Nhat\_PA\_TNTT(canh a[][size], int n, float TGT, float \*GNNTT, canh x[], canh PA[]){

int i;

x[n-1]=a[x[n-2].cuoi][x[0].dau];

TGT= TGT + x[n-1].do\_dai;

if(\*GNNTT > TGT){

\*GNNTT = TGT;

for(i=0; i<n; i++)

PA[i]=x[i];

}

}

int co\_chu\_trinh(canh x[], int k, int ke\_tiep){

int i=0, co\_CT=0;

while (i<k && !co\_CT)

if(ke\_tiep==x[i].dau) co\_CT=1;

else i++;

return co\_CT;

}

void Nhanh\_Can(canh a[][size], int n, int i, int dau, float \*TGT, float \*CD, float \*GNNTT, canh x[], canh PA[]){

int j;

for(j=0; j<n; j++)

if (dau!=j && !a[dau][j].da\_dung && !co\_chu\_trinh(x,i,j)){

\*TGT = \*TGT + a[dau][j].do\_dai;

\*CD = can\_duoi(a, \*TGT, n, i+1);

if(\*CD < \*GNNTT){

x[i] = a[dau][j];

a[dau][j].da\_dung=1;

a[j][dau].da\_dung=1;

if(i==n-2) {

Cap\_Nhat\_PA\_TNTT(a, n, \*TGT, GNNTT, x, PA);

}

else

Nhanh\_Can(a, n, i+1, j, TGT, CD, GNNTT, x, PA);

}

\*TGT = \*TGT - a[dau][j].do\_dai;

a[dau][j].da\_dung=0;

a[j][dau].da\_dung=0;

}

}

void reset(canh a[][size], int n){

int i,j;

for(i=0; i<n; i++)

for(j=0; j<n; j++)

a[i][j].da\_dung=0;

}

int main(){

canh a[size][size];

int n;

printf("\nPhuong an TSP dung thuat toan NHANH CAN:\n");

read\_file("TSP1.txt",a,&n);

canh PA[n];

canh x[n];

char tpxp, yn;

while (1){

fflush(stdin);

in\_ma\_tran(a,n);

float TGT=0.0, CD = 0.0, GNNTT = 3.40282e+38;

printf("\nXuat phat tu thanh pho nao? ");

printf("\n Nhap mot trong cac thanh pho tu a den %c: ", n-1+97);

scanf("%c", &tpxp);

Nhanh\_Can(a, n, 0, tpxp-97, &TGT, &CD, &GNNTT, x, PA);

in\_PA(PA,n);

fflush(stdin);

printf("\nTiep tuc Y/N? ");

scanf("%c", &yn);

if (yn == 'N' || yn == 'n')

break;

reset(a,n);

}

return 0;

}

#include <stdio.h>

typedef struct{

float dodai;

int dau, cuoi;

}canh;

void Swap(canh \*a, canh \*b){

canh temp = \*a;

\*a = \*b;

\*b = temp;

}

void BubbleSort(canh a[], int n){

for(int i=0; i<n-1; i++){

for(int j=n-1; j>i; j--){

if(a[j].dodai < a[j-1].dodai)

Swap(&a[j], &a[j-1]);

}

}

}

void ReadData(char filename[], canh a[], int \*n){

FILE \*f = fopen(filename, "r");

if(f==NULL){

printf("Loi mo file!!!\n");

return;

}

fscanf(f, "%d", n);

float temp;

int k=0;

for(int i=0; i<\*n; i++){

for(int j=0; j<\*n; j++){

if(j<=i) fscanf(f, "%f", &temp);

else{

fscanf(f, "%f", &a[k].dodai);

a[k].dau = i;

a[k].cuoi = j;

k++;

}

}

}

fclose(f);

}

void init\_forest(int parent[], int n){

for(int i=0; i<n; i++)

parent[i] = i;

}

int find\_root(int parent[], int u){

while(u != parent[u])

u = parent[u];

return u;

}

void update\_forest(int parent[], int r1, int r2){

parent[r1] = r2;

}

int dinh\_cap\_3(canh PA[], int k, canh moi){

int i=0, dem=0;

while(i<k && dem<2){

if((moi.dau==PA[i].dau || moi.dau==PA[i].cuoi) && ++dem==2)

return 1;

i++;

}

i=0; dem=0;

while(i<k && dem<2){

if((moi.cuoi==PA[i].dau || moi.cuoi==PA[i].cuoi) && ++dem==2)

return 1;

i++;

}

return 0;

}

int chu\_trinh(int r\_dau, int r\_cuoi){

return r\_dau == r\_cuoi;

}

void Greedy(canh a[], int n, canh PA[]){

int i, j=0;

int r\_dau, r\_cuoi;

int parent[n];

init\_forest(parent, n);

for(i=0; i<n\*(n-1)/2 && j<n-1; i++){

r\_dau = find\_root(parent, a[i].dau);

r\_cuoi = find\_root(parent, a[i].cuoi);

if(!dinh\_cap\_3(PA, j, a[i]) && !chu\_trinh(r\_dau, r\_cuoi)){

PA[j] = a[i];

j++;

update\_forest(parent, r\_dau, r\_cuoi);

}

}

for(i=0; i<n\*(n-1)/2; i++){

r\_dau = find\_root(parent, a[i].dau);

r\_cuoi = find\_root(parent, a[i].cuoi);

if(!dinh\_cap\_3(PA, n-1, a[i]) && chu\_trinh(r\_dau, r\_cuoi)){

PA[n-1] = a[i];

break;

}

}

}

void InDS(canh a[], int m, int la\_PA){

float sum=0;

for(int i=0; i<m; i++){

printf("%2d %c%c = %2.2f\n", i+1, a[i].dau+97, a[i].cuoi+97, a[i].dodai);

sum += a[i].dodai;

}

if(la\_PA)

printf("Do dai cua chu trinh la: %.2f", sum);

}

int main(){

int n;

canh a[30];

ReadData("TSP.txt", a, &n);

printf("Bai toan TSP dung thuat toan THAM AN\n");

printf("Danh sach cac canh CHUA SAP XEP\n");

InDS(a, n\*(n-1)/2, 0);

BubbleSort(a, n\*(n-1)/2);

printf("Danh sach cac canh DA SAP XEP\n");

InDS(a, n\*(n-1)/2, 0);

canh PA[n];

Greedy(a, n, PA);

printf("PHUONG AN\n");

InDS(PA, n, 1);

return 0;

}

## III.2.1 Bài toán Cái ba lô (Balo1 – Nhánh cận)

#include <stdio.h>

#include <malloc.h>

#include <string.h>

typedef struct {

char TenDV[20];

float TL, GT, DG;

int PA;

} DoVat;

DoVat \* ReadFromFile(float \*W, int \*n){

FILE \*f;

f = fopen("CaiBaLo1.txt", "r");

fscanf(f, "%f",W); // Xac dinh trong luong Ba lo

DoVat \*dsdv;

dsdv=(DoVat\*)malloc(sizeof(DoVat));

int i=0;

while (!feof(f)){

fscanf(f, "%f%f%[^\n]",&dsdv[i].TL,&dsdv[i].GT,&dsdv[i].TenDV);

dsdv[i].DG=dsdv[i].GT/dsdv[i].TL;

dsdv[i].PA=0;

i++;

dsdv=(DoVat\*)realloc(dsdv, sizeof(DoVat)\*(i+1));

}

\*n=i;

fclose(f);

return dsdv;

}

void swap(DoVat \*x, DoVat \*y){

DoVat Temp;

Temp = \*x;

\*x = \*y;

\*y = Temp;

}

void BubbleSort(DoVat \*dsdv, int n){

int i,j;

for(i=0; i<=n-2; i++)

for (j=n-1; j>=i+1; j--){

if (dsdv[j].DG>dsdv[j-1].DG)

swap(&dsdv[j],&dsdv[j-1]);

}

}

void InDSDV(DoVat \*dsdv ,int n, float W){

int i;

float TongTL=0.0, TongGT=0.0;

printf("\nPhuong an Cai Ba lo 1 dung thuat toan NHANH CAN nhu sau:\n");

printf("|---|--------------------|---------|---------|---------|-----------|\n");

printf("|STT| Ten Do Vat |T. Luong | Gia Tri | Don gia | Phuong an |\n");

printf("|---|--------------------|---------|---------|---------|-----------|\n");

for(i=0;i<n;i++){

printf("|%2d |%-20s|%9.2f|%9.2f|%9.2f|%6d |\n",

i+1,dsdv[i].TenDV,dsdv[i].TL,dsdv[i].GT,dsdv[i].DG, dsdv[i].PA);

TongTL=TongTL+dsdv[i].PA \* dsdv[i].TL;

TongGT=TongGT+dsdv[i].PA \* dsdv[i].GT;

}

printf("|---|--------------------|---------|---------|---------|-----------|\n");

printf("Trong luong cua ba lo = %-9.2f\n",W);

printf("Tong trong luong = %-9.2f\n",TongTL);

printf("Tong gia tri = %-9.2f\n",TongGT);

}

// Tinh cac dai luong tai nut goc

void Tao\_Nut\_Goc(float W, float \*V, float \*CT, float \*GLNTT, float \*TGT, float DG\_Max){

\*TGT = 0.0;

\*V = W;

\*CT = \*V \* DG\_Max; // Can tren cua nut goc

\*GLNTT = 0.0;

}

//Ghi nhan phuong an tot nhat tam thoi

void Cap\_Nhat\_GLNTT(float TGT, float \*GLNTT, int x[], DoVat \*dsdv, int n){

int i;

if(\*GLNTT < TGT){

\*GLNTT = TGT;

for(i=0;i<n;i++)

dsdv[i].PA=x[i];

}

}

void Nhanh\_Can(int i, float \*TGT, float \*CT, float \*V, float \*GLNTT, int x[], DoVat \*dsdv, int n){

int j; // j la so vat duoc chon

int yk; // So do vat lon nhat co the chon

yk = \*V/dsdv[i].TL;

for(j = yk; j>=0; j--){ // Xet tat ca cac kha nang co the phan nhanh theo so luong do vat

// Ung voi mot gia tri cua j la mot nut tren cay

// Tinh 3 dai luong cua mot nut trong

\*TGT = \*TGT + j\*dsdv[i].GT;

\*V = \*V - j\*dsdv[i].TL;

// dsdv[i+1].DG la DG vat ke tiep cua vat i (i + 1)

\*CT = \*TGT + \*V \* dsdv[i+1].DG;

// Truong hop Chua cat tia (Dieu kien Cat tia la khi CT <= GLNTT)

if(\*CT > \*GLNTT){

x[i] = j;

if((i==n-1)||(\*V==0)) // Da xet het tat ca cac do vat hoac ba lo da day

Cap\_Nhat\_GLNTT(\*TGT, GLNTT, x, dsdv, n);

else

Nhanh\_Can(i+1, TGT, CT, V, GLNTT, x, dsdv, n); //Xet nut con cua nut i

}

// Quay lui xet nut khac

x[i] = 0;

\*TGT = \*TGT - j\*dsdv[i].GT; // Tra lai Tong gia tri cua nut cha

\*V = \*V + j\*dsdv[i].TL; // Tra lai Trong luong con lai cua nut cha

}

}

int main(){

DoVat \* dsdv; // Danh sach cac do vat (mang dong cua cac do vat)

int n; // luu so luong do vat

float W; // Luu trong luong cua Ba lo

float CT; // Luu can tren

float TGT; // Luu Tong gia tri cua cac vat da duoc chon tai moi nut

float V; // Luu Trong luong con lai cua Ba lo tai moi nut

float GLNTT; // Luu Gia lon nhat tam thoi

dsdv = ReadFromFile(&W, &n);

int x[n]; // Luu phuong an tot nhat tam thoi

BubbleSort(dsdv,n);

Tao\_Nut\_Goc(W, &V, &CT, &GLNTT, &TGT, dsdv[0].DG);

Nhanh\_Can(0, &TGT, &CT, &V, &GLNTT, x, dsdv, n);

InDSDV(dsdv,n,W);

free(dsdv);

return 0;

}

## III.2.2 Bài toán Cái ba lô (Balo2 – Nhánh cận)

#include <stdio.h>

#include <malloc.h>

#include <string.h>

typedef struct {

char TenDV[20];

float TL, GT, DG;

int SL, PA;

} DoVat;

DoVat \* ReadFromFile(float \*W, int \*n){

FILE \*f;

f = fopen("caibalo2.txt", "r");

fscanf(f, "%f",W); // Xac dinh trong luong Ba lo

DoVat \*dsdv;

dsdv=(DoVat\*)malloc(sizeof(DoVat));

int i=0;

while (!feof(f)){

fscanf(f, "%f%f%d%[^\n]",&dsdv[i].TL,&dsdv[i].GT,&dsdv[i].SL,&dsdv[i].TenDV);

dsdv[i].DG=dsdv[i].GT/dsdv[i].TL;

dsdv[i].PA=0;

i++;

dsdv=(DoVat\*)realloc(dsdv, sizeof(DoVat)\*(i+1));

}

\*n=i;

fclose(f);

return dsdv;

}

void swap(DoVat \*x, DoVat \*y){

DoVat Temp;

Temp = \*x;

\*x = \*y;

\*y = Temp;

}

void BubbleSort(DoVat \*dsdv, int n){

int i,j;

for(i=0; i<=n-2; i++)

for (j=n-1; j>=i+1; j--){

if (dsdv[j].DG>dsdv[j-1].DG)

swap(&dsdv[j],&dsdv[j-1]);

}

}

void InDSDV(DoVat \*dsdv ,int n, float W){

int i;

float TongTL=0.0, TongGT=0.0;

printf("\nPhuong an Cai Ba lo 2 dung thuat toan NHANH CAN nhu sau:\n");

printf("|---|--------------------|---------|---------|---------|---------|-----------|\n");

printf("|STT| Ten Do Vat |T. Luong | Gia Tri |So luong | Don gia | Phuong an |\n");

printf("|---|--------------------|---------|---------|---------|---------|-----------|\n");

for(i=0;i<n;i++){

printf("|%2d |%-20s|%9.2f|%9.2f|%5d |%9.2f|%6d |\n",

i+1,dsdv[i].TenDV,dsdv[i].TL,dsdv[i].GT,dsdv[i].SL,dsdv[i].DG, dsdv[i].PA);

TongTL=TongTL+dsdv[i].PA \* dsdv[i].TL;

TongGT=TongGT+dsdv[i].PA \* dsdv[i].GT;

}

printf("|---|--------------------|---------|---------|---------|---------|-----------|\n");

printf("Trong luong cua ba lo = %-9.2f\n",W);

printf("Tong trong luong = %-9.2f\n",TongTL);

printf("Tong gia tri = %-9.2f\n",TongGT);

}

// Tinh cac dai luong tai nut goc

void Tao\_Nut\_Goc(float W, float \*V, float \*CT, float \*GLNTT, float \*TGT, float DG\_Max){

\*TGT = 0.0;

\*V = W;

\*CT = \*V \* DG\_Max; // Can tren cua nut goc

\*GLNTT = 0.0;

}

//Ghi nhan phuong an tot nhat tam thoi

void Cap\_Nhat\_GLNTT(float TGT, float \*GLNTT, int x[], DoVat \*dsdv, int n){

int i;

if(\*GLNTT < TGT){

\*GLNTT = TGT;

for(i=0;i<n;i++)

dsdv[i].PA=x[i];

}

}

int min(int a, int b){

return a<b? a:b;

}

void Nhanh\_Can(int i, float \*TGT, float \*CT, float \*V, float \*GLNTT, int x[], DoVat \*dsdv, int n){

int j; // j la so vat duoc chon

int yk; // So do vat lon nhat co the chon

yk = min(dsdv[i].SL, \*V/dsdv[i].TL);

for(j = yk; j>=0; j--){ // Xet tat ca cac kha nang co the phan nhanh theo so luong do vat

// Ung voi mot gia tri cua j la mot nut tren cay

// Tinh 3 dai luong cua mot nut trong

\*TGT = \*TGT + j\*dsdv[i].GT;

\*V = \*V - j\*dsdv[i].TL;

\*CT = \*TGT + \*V \* dsdv[i+1].DG; // dsdv[i+1].DG la DG vat ke tiep cua vat i (i + 1)

if(\*CT > \*GLNTT){ // Truong hop Chua cat tia (Dieu kien Cat tia la khi CT <= GLNTT)

x[i] = j;

if((i==n-1)||(\*V==0)) // Da xet het tat ca cac do vat hoac ba lo da day

Cap\_Nhat\_GLNTT(\*TGT, GLNTT, x, dsdv, n);

else

Nhanh\_Can(i+1, TGT, CT, V, GLNTT, x, dsdv, n); //Xet nut con cua nut i

}

// Quay lui xet nut khac

x[i] = 0;

\*TGT = \*TGT - j\*dsdv[i].GT; // Tra lai Tong gia tri cua nut cha

\*V = \*V + j\*dsdv[i].TL; // Tra lai Trong luong con lai cua nut cha

}

}

int main(){

DoVat \* dsdv; // Danh sach cac do vat (mang dong cua cac do vat)

int n; // luu so luong do vat

float W; // Luu trong luong cua Ba lo

float CT; // Luu can tren

float TGT; // Luu Tong gia tri cua cac vat da duoc chon tai moi nut

float V; // Luu Trong luong con lai cua Ba lo tai moi nut

float GLNTT; // Luu Gia lon nhat tam thoi

dsdv = ReadFromFile(&W, &n);

int x[n]; // Luu phuong an tot nhat tam thoi

BubbleSort(dsdv,n);

Tao\_Nut\_Goc(W, &V, &CT, &GLNTT, &TGT, dsdv[0].DG);

Nhanh\_Can(0, &TGT, &CT, &V, &GLNTT, x, dsdv, n);

InDSDV(dsdv,n,W);

free(dsdv);

return 0;

}

## III.2.3 Bài toán Cái ba lô (Balo3 – Nhánh cận)

#include <stdio.h>

#include <malloc.h>

#include <string.h>

typedef struct {

char TenDV[20];

float TL, GT, DG;

int PA;

} DoVat;

DoVat \* ReadFromFile(float \*W, int \*n){

FILE \*f;

f = fopen("CaiBaLo1.txt", "r");

fscanf(f, "%f",W); // Xac dinh trong luong Ba lo

DoVat \*dsdv;

dsdv=(DoVat\*)malloc(sizeof(DoVat));

int i=0;

while (!feof(f)){

fscanf(f, "%f%f%[^\n]",&dsdv[i].TL,&dsdv[i].GT,&dsdv[i].TenDV);

dsdv[i].DG=dsdv[i].GT/dsdv[i].TL;

dsdv[i].PA=0;

i++;

dsdv=(DoVat\*)realloc(dsdv, sizeof(DoVat)\*(i+1));

}

\*n=i;

fclose(f);

return dsdv;

}

void swap(DoVat \*x, DoVat \*y){

DoVat Temp;

Temp = \*x;

\*x = \*y;

\*y = Temp;

}

void BubbleSort(DoVat \*dsdv, int n){

int i,j;

for(i=0; i<=n-2; i++)

for (j=n-1; j>=i+1; j--){

if (dsdv[j].DG>dsdv[j-1].DG)

swap(&dsdv[j],&dsdv[j-1]);

}

}

void InDSDV(DoVat \*dsdv ,int n, float W){

int i;

float TongTL=0.0, TongGT=0.0;

printf("\nPhuong an Cai Ba lo 3 dung thuat toan NHANH CAN nhu sau:\n");

printf("|---|--------------------|---------|---------|---------|-----------|\n");

printf("|STT| Ten Do Vat |T. Luong | Gia Tri | Don gia | Phuong an |\n");

printf("|---|--------------------|---------|---------|---------|-----------|\n");

for(i=0;i<n;i++){

printf("|%2d |%-20s|%9.2f|%9.2f|%9.2f|%6d |\n",

i+1,dsdv[i].TenDV,dsdv[i].TL,dsdv[i].GT,dsdv[i].DG, dsdv[i].PA);

TongTL=TongTL+dsdv[i].PA \* dsdv[i].TL;

TongGT=TongGT+dsdv[i].PA \* dsdv[i].GT;

}

printf("|---|--------------------|---------|---------|---------|-----------|\n");

printf("Trong luong cua ba lo = %-9.2f\n",W);

printf("Tong trong luong = %-9.2f\n",TongTL);

printf("Tong gia tri = %-9.2f\n",TongGT);

}

// Tinh cac dai luong tai nut goc

void Tao\_Nut\_Goc(float W, float \*V, float \*CT, float \*GLNTT, float \*TGT, float DG\_Max){

\*TGT = 0.0;

\*V = W;

\*CT = \*V \* DG\_Max; // Can tren cua nut goc

\*GLNTT = 0.0;

}

//Ghi nhan phuong an tot nhat tam thoi

void Cap\_Nhat\_GLNTT(float TGT, float \*GLNTT, int x[], DoVat \*dsdv, int n){

int i;

if(\*GLNTT < TGT){

\*GLNTT = TGT;

for(i=0;i<n;i++)

dsdv[i].PA=x[i];

}

}

void Nhanh\_Can(int i, float \*TGT, float \*CT, float \*V, float \*GLNTT, int x[], DoVat \*dsdv, int n){

int j; // j la so vat duoc chon

int yk; // So do vat lon nhat co the chon

yk = \*V/dsdv[i].TL;

if(yk>1) yk=1;

for(j = yk; j>=0; j--){ // Xet tat ca cac kha nang co the phan nhanh theo so luong do vat

// Ung voi mot gia tri cua j la mot nut tren cay

// Tinh 3 dai luong cua mot nut trong

\*TGT = \*TGT + j\*dsdv[i].GT;

\*V = \*V - j\*dsdv[i].TL;

\*CT = \*TGT + \*V \* dsdv[i+1].DG; // dsdv[i+1].DG la DG vat ke tiep cua vat i (i + 1)

if(\*CT > \*GLNTT){ // Truong hop Chua cat tia (Dieu kien Cat tia la khi CT <= GLNTT)

x[i] = j;

if((i==n-1)||(\*V==0)) // Da xet het tat ca cac do vat hoac ba lo da day

Cap\_Nhat\_GLNTT(\*TGT, GLNTT, x, dsdv, n);

else

Nhanh\_Can(i+1, TGT, CT, V, GLNTT, x, dsdv, n); //Xet nut con cua nut i

}

// Quay lui xet nut khac

x[i] = 0;

\*TGT = \*TGT - j\*dsdv[i].GT; // Tra lai Tong gia tri cua nut cha

\*V = \*V + j\*dsdv[i].TL; // Tra lai Trong luong con lai cua nut cha

}

}

int main(){

DoVat \* dsdv; // Danh sach cac do vat (mang dong cua cac do vat)

int n; // luu so luong do vat

float W; // Luu trong luong cua Ba lo

float CT; // Luu can tren

float TGT; // Luu Tong gia tri cua cac vat da duoc chon tai moi nut

float V; // Luu Trong luong con lai cua Ba lo tai moi nut

float GLNTT; // Luu Gia lon nhat tam thoi

dsdv = ReadFromFile(&W, &n);

int x[n]; // Luu phuong an tot nhat tam thoi

BubbleSort(dsdv,n);

Tao\_Nut\_Goc(W, &V, &CT, &GLNTT, &TGT, dsdv[0].DG);

Nhanh\_Can(0, &TGT, &CT, &V, &GLNTT, x, dsdv, n);

InDSDV(dsdv,n,W);

free(dsdv);

return 0;

}

#include <stdio.h>

typedef struct{

float dodai;

int dau, cuoi;

int dadung;

}canh;

void ReadData(char filename[], canh ds\_canh[][30], int \*n){

FILE \*f = fopen(filename, "r");

fscanf(f, "%d", n);

for(int i=0; i<\*n; i++){

for(int j=0; j<\*n; j++){

fscanf(f, "%f", &ds\_canh[i][j].dodai);

ds\_canh[i][j].dau = i;

ds\_canh[i][j].cuoi = j;

ds\_canh[i][j].dadung = 0;

}

}

fclose(f);

}

void InMaTran(canh ds\_canh[][30], int n){

for(int i=0; i<n; i++){

for(int j=0; j<n; j++){

printf("%c%c = %5.2f ", ds\_canh[i][j].dau+97, ds\_canh[i][j].cuoi+97, ds\_canh[i][j].dodai);

}

printf("\n");

}

}

void InPA(canh PA[], int n){

float sum=0.0;

printf("PHUONG AN TIM DUOC: \n");

for(int i=0; i<n; i++){

printf("Canh %c%c = %5.2f\n", PA[i].dau+97, PA[i].cuoi+97, PA[i].dodai);

sum += PA[i].dodai;

}

printf("CHU TRINH: ");

for(int i=0; i<n; i++){

printf("%c -> ", PA[i].dau+97);

}

printf("%c\n", PA[0].dau+97);

printf("Tong do dai cua chu trinh la: %5.2f", sum);

}

float canhNN(canh ds\_canh[][30], int n){

float Cmin = 3.40282e+38;

for(int i=0; i<n; i++){

for(int j=0; j<n; j++){

if(i!=j && !ds\_canh[i][j].dadung && ds\_canh[i][j].dodai<Cmin)

Cmin = ds\_canh[i][j].dodai;

}

}

return Cmin;

}

float can\_duoi(canh ds\_canh[][30], float TGT, int n, int i){

return TGT + (n-i)\*canhNN(ds\_canh, n);

}

void CapNhatPA(canh ds\_canh[][30], int n, float TGT, float \*GNNTT, canh x[], canh PA[]){

x[n-1] = ds\_canh[x[n-2].cuoi][x[0].dau];

TGT = TGT + x[n-1].dodai;

if(TGT < \*GNNTT){

\*GNNTT = TGT;

for(int i=0; i<n; i++){

PA[i] = x[i];

}

}

}

int chu\_trinh(canh x[], int k, int ketiep){

int i=0;

while(i<k){

if(x[i].dau == ketiep)

return 1;

i++;

}

return 0;

}

void NhanhCan(canh a[][30], int n, int i, int dau, float \*TGT, float \*CD, float \*GNNTT, canh x[], canh PA[]){

int j;

for(j=0; j<n; j++){

if(dau!=j && !a[dau][j].dadung && !chu\_trinh(x, i, j)){

\*TGT += a[dau][j].dodai;

\*CD = can\_duoi(a, \*TGT, n, i+1);

if(\*CD < \*GNNTT){

x[i] = a[dau][j];

a[dau][j].dadung=1;

a[j][dau].dadung=1;

if(i==n-2){

CapNhatPA(a, n, \*TGT, GNNTT, x, PA);

}

else NhanhCan(a, n, i+1, j, TGT, CD, GNNTT, x, PA);

}

\*TGT -= a[dau][j].dodai;

a[dau][j].dadung=0;

a[j][dau].dadung=0;

}

}

}

void resest(canh a[][30], int n){

for(int i=0; i<n; i++){

for(int j=0; j<n; j++){

a[i][j].dadung=0;

}

}

}

int main(){

canh a[30][30];

int n;

ReadData("TSP1.txt", a, &n);

canh PA[n], x[n];

char tpxp, yn;

while(1){

fflush(stdin);

InMaTran(a, n);

float TGT=0, CD=0, GNNTT=3.40282e+38;

printf("Ban muon xuat phat tu thanh pho nao? \n");

printf("Nhap 1 thanh pho tu a den %c: ", n-1+97);

scanf("%c", &tpxp);

NhanhCan(a, n, 0, tpxp-97, &TGT, &CD, &GNNTT, x, PA);

InPA(PA, n);

fflush(stdin);

printf("\nBan co muon tiep tuc khong Y/N? ");

scanf("%c", &yn);

if(yn == 'N' || yn == 'n')

break;

resest(a, n);

}

return 0;

}

# IV. Thuật toán Quy hoạch động.

## IV.1 Bài toán Tam giác số

// Bai toan Tam giac so

// Du lieu cho trong file tam\_giac\_so.txt

// Giai bai toan bang thuat toan QUY HOACH DONG

#include <stdio.h>

#define size 50

void ReadData(int a[][size], int \*n){

FILE \*f;

f=fopen("tam\_giac\_so1.txt", "r");

if(f==NULL){

printf("Loi mo file!!!\n");

return;

}

int i=0, j;

while (!feof(f)){

for(j=0; j<=i; j++)

fscanf(f, "%d", &a[i][j]);

i++;

}

\*n=i;

fclose(f);

}

void PrintData(int a[][size], int n){

int i,j;

printf("\nTAM GIAC SO da cho\n");

for(i=0; i<n; i++){

for(j=0; j<=i; j++)

printf("%5d", a[i][j]);

printf("\n");

}

}

int CS\_max(int F[][size], int i, int j){

if (j==0)

return (F[i-1][0]>F[i-1][1])? 0:1;

if (j==i)

return i-1;

if (j==i-1)

return (F[i-1][i-2]>F[i-1][i-1])? i-2:i-1;

if (F[i-1][j-1]>F[i-1][j]&&F[i-1][j-1]>F[i-1][j+1])

return j-1;

if (F[i-1][j]>F[i-1][j-1]&&F[i-1][j]>F[i-1][j+1])

return j;

if (F[i-1][j+1]>F[i-1][j]&&F[i-1][j+1]>F[i-1][j-1])

return j+1;

}

// Dung cong thuc truy hoi de tao bang F

void Tao\_Bang(int a[][size], int n, int F[][size]){

int i, j;

// 2 dong dau tien cua bang F xac dinh cu the

F[0][0]= a[0][0];

F[1][0]= F[0][0] + a[1][0];

F[1][1]= F[0][0] + a[1][1];

// Tu dong thu 3 (i=2) tro ve sau

// Moi phan tu cua bang F duoc xac dinh nho vao dong truoc do (truy hoi)

for(i=2; i<n; i++)

for(j=0; j<=i; j++){

int k=CS\_max(F,i,j);

F[i][j] = F[i-1][k] + a[i][j];

}

}

void In\_Bang(int n, int F[][size]){

int i, j;

printf("\nBang F\n");

for(i=0; i<n; i++){

for(j=0; j<=i; j++)

printf("%5d", F[i][j]);

printf("\n");

}

}

int CS\_max\_dong\_cuoi(int F[], int j){

int somax=F[0];

int maxindex=0;

int k;

for(k=1; k<=j; k++)

if (F[k]>somax){

somax=F[k];

maxindex=k;

}

return maxindex;

}

// Tra bang F, nhung xac dinh phuong an tu trong tam giac so (bang a)

void Tra\_Bang(int a[][size], int n, int F[][size], int PA[]){

int i,j;

// Xac dinh chi so j cua phan tu lon nhat o dong cuoi trong bang F

j=CS\_max\_dong\_cuoi(F[n-1],n-1);

// Phan tu cuoi cung cua duong di tuc la PA[n-1]

// la phan tu cua dong cuoi cung bang a, ung voi cot j vua tim thay o tren

PA[n-1]=a[n-1][j];

// Xet cac dong cua bang F, tu dong n-1 den dong 1

// De xac dinh cac phan tu cua PA tu PA[n-2] den PA[0]

for(i=n-1; i>=1; i--){

// Can cu vao chi so cot j cua dong cuoi (dong i) cua bang F

// ma xac dinh chi so cot j cua dong tren (dong i-1) cua bang F

j=CS\_max(F,i,j);

// PA[i-1] la phan tu cua dong i-1 cua tam giac so a,

// ung voi cot j vua tim thay o tren

PA[i-1]=a[i-1][j];

}

}

int GiaPA(int PA[], int n){

int i;

int sum=0;

for(i=0; i<n; i++) sum+=PA[i];

return sum;

}

void PrintPA(int PA[], int n){

int i;

printf("\nPhuong an la duong di qua cac so : ");

printf("\%d", PA[0]);

for(i=1; i<n; i++) printf(" => %d", PA[i]);

printf("\n\nTong cac so tren duong di la %d\n", GiaPA(PA,n));

}

int main(){

int a[size][size]; //Luu tam giac so

int n;

printf("\nBai toan TAM GIAC SO dung thuat toan QUY HOACH DONG\n");

ReadData(a,&n);

PrintData(a,n);

int PA[n]; //Phuong an toi uu: mang co n phan tu

int F[n][size]; //Bang F: mang 2 chieu co n dong, n cot

Tao\_Bang(a,n,F);

In\_Bang(n,F);

Tra\_Bang(a,n,F,PA);

PrintPA(PA,n);

return 0;

}

## IV.2.1 Bài toán Cái ba lô (Balo1,3 – Quy hoạch động)

#include <stdio.h>

#include <malloc.h>

#include <string.h>

typedef struct {

char TenDV[20];

int TL, GT, PA;

} DoVat;

typedef int bang[50][100];// Ba lo co trong luong toi da 99 va co toi da 50 do vat

DoVat \*ReadFromFile(int \*W, int \*n){

FILE \*f;

f = fopen("QHD\_CaiBalo1.txt", "r");

fscanf(f, "%d",W); // Xac dinh trong luong Ba lo

DoVat \*dsdv;

dsdv=(DoVat\*)malloc(sizeof(DoVat));

int i=0;

while (!feof(f)){

fscanf(f, "%d%d%[^\n]",&dsdv[i].TL,&dsdv[i].GT,&dsdv[i].TenDV);

dsdv[i].PA=0;

i++;

dsdv=(DoVat\*)realloc(dsdv,sizeof(DoVat)\*(i+1));

}

\*n=i;

fclose(f);

return dsdv;

}

void InDSDV(DoVat \*dsdv ,int n, int W){

int i, TongTL=0, TongGT=0;

printf("\nPhuong an Cai Ba lo 1 dung thuat toan QUY HOACH DONG nhu sau:\n");

printf("|---|------------------|----------|---------|-----------|\n");

printf("|STT| Ten Do Vat | T Luong | Gia Tri | Phuong an |\n");

printf("|---|------------------|----------|---------|-----------|\n");

for(i=0;i<n;i++){

printf("|%2d |%-18s|%5d |%5d |%6d |\n",

i+1,dsdv[i].TenDV,dsdv[i].TL,dsdv[i].GT,dsdv[i].PA);

TongTL=TongTL+dsdv[i].PA \* dsdv[i].TL;

TongGT=TongGT+dsdv[i].PA \* dsdv[i].GT;

}

printf("|---|------------------|----------|---------|-----------|\n");

printf("Trong luong cua ba lo = %-9d\n",W);

printf("Tong trong luong = %-9d\n",TongTL);

printf("Tong gia tri = %-9d\n",TongGT);

}

void TaoBang(DoVat \*dsdv,int n,int W, bang F,bang X){

int xk, yk, k;

int FMax, XMax, V;

// Dien dong dau tien cua hai bang

for(V= 0; V<=W; V++) {

X[0][V] = V/dsdv[0].TL;

F[0][V] = X[0][V] \* dsdv[0].GT;

}

// ?ien c?c d?ng c?n lai

for(k= 1; k<n; k++)

for(V=0; V<=W; V++) {

FMax = F[k-1][V] ;

XMax = 0;

yk = V/dsdv[k].TL;

for(xk = 1; xk<=yk; xk++)

if(F[k-1][V-xk\*dsdv[k].TL]+xk\*dsdv[k].GT>FMax){

FMax=F[k-1][V-xk\*dsdv[k].TL]+xk\*dsdv[k].GT;

XMax= xk;

}

F[k][V] = FMax;

X[k][V] = XMax;

}

}

void InBang(int n, int W, bang F, bang X){

int V, k;

for(k=0; k<n; k++){

for(V=0; V<=W; V++)

printf("|%4d%2d",F[k][V], X[k][V]);

printf("\n");

}

}

void TraBang(DoVat \*dsdv, int n, int W, bang X) {

int k, V;

V = W;

for(k= n-1; k>=0; k--) {

dsdv[k].PA = X[k][V];

V = V - X[k][V] \* dsdv[k].TL;

}

}

int main(){

int n, W;

bang X,F;

DoVat \*dsdv;

dsdv=ReadFromFile(&W, &n);

TaoBang(dsdv,n,W,F,X);

InBang(n,W,F,X);

printf("\n");

TraBang(dsdv,n,W,X);

InDSDV(dsdv,n,W);

free(dsdv);

return 0;

}

## IV.2.2 Bài toán Cái ba lô (Balo2 – Quy hoạch động)

#include <stdio.h>

#include <malloc.h>

#include <string.h>

typedef struct {

char TenDV[20];

int TL, GT, SL, PA;

} DoVat;

typedef int bang[50][100];

DoVat \*ReadFromFile(int \*W, int \*n){

FILE \*f;

f = fopen("QHD\_caibalo2.txt", "r");

fscanf(f, "%d",W);

DoVat \*dsdv;

dsdv=(DoVat\*)malloc(sizeof(DoVat));

int i=0;

while (!feof(f)){

fscanf(f, "%d%d%d%[^\n]",&dsdv[i].TL,&dsdv[i].GT,&dsdv[i].SL,&dsdv[i].TenDV);

dsdv[i].PA=0;

i++;

dsdv=(DoVat\*)realloc(dsdv,sizeof(DoVat)\*(i+1));

}

\*n=i;

fclose(f);

return dsdv;

}

void InDSDV(DoVat \*dsdv ,int n, int W){

int i, TongTL=0, TongGT=0;

printf("\nPhuong an Cai Ba lo 2 dung thuat toan QUY HOACH DONG nhu sau:\n");

printf("|---|------------------|----------|---------|---------|-----------|\n");

printf("|STT| Ten Do Vat | T Luong | Gia Tri | So Luong| Phuong an |\n");

printf("|---|------------------|----------|---------|---------|-----------|\n");

for(i=0;i<n;i++){

printf("|%2d |%-18s|%5d |%5d |%5d |%6d |\n",

i+1,dsdv[i].TenDV,dsdv[i].TL,dsdv[i].GT,dsdv[i].SL,dsdv[i].PA);

TongTL=TongTL+dsdv[i].PA \* dsdv[i].TL;

TongGT=TongGT+dsdv[i].PA \* dsdv[i].GT;

}

printf("|---|------------------|----------|---------|---------|-----------|\n");

printf("Trong luong cua ba lo = %-9d\n",W);

printf("Tong trong luong = %-9d\n",TongTL);

printf("Tong gia tri = %-9d\n",TongGT);

}

void TaoBang(DoVat \*dsdv,int n,int W, bang F,bang X){

int xk, yk, k;

int FMax, XMax, V;

for(V= 0; V<=W; V++) {

X[0][V] = V/dsdv[0].TL;

F[0][V] = X[0][V] \* dsdv[0].GT;

}

for(k= 1; k<n; k++)

for(V=0; V<=W; V++) {

FMax = F[k-1][V] ;

XMax = 0;

yk = V/dsdv[k].TL;

for(xk = 1; xk<=yk; xk++)

if(F[k-1][V-xk\*dsdv[k].TL]+xk\*dsdv[k].GT>FMax){

FMax=F[k-1][V-xk\*dsdv[k].TL]+xk\*dsdv[k].GT;

XMax= xk;

}

F[k][V] = FMax;

X[k][V] = XMax;

}

}

void InBang(int n, int W, bang F, bang X){

int V, k;

for(k=0; k<n; k++){

for(V=0; V<=W; V++)

printf("|%4d%2d",F[k][V], X[k][V]);

printf("\n");

}

}

void TraBang(DoVat \*dsdv, int n, int W, bang X) {

int k, V;

V = W;

for(k= n-1; k>=0; k--) {

dsdv[k].PA = X[k][V];

V = V - X[k][V] \* dsdv[k].TL;

}

}

int main(){

int n, W;

bang X,F;

DoVat \*dsdv;

dsdv=ReadFromFile(&W, &n);

TaoBang(dsdv,n,W,F,X);

InBang(n,W,F,X);

printf("\n");

TraBang(dsdv,n,W,X);

InDSDV(dsdv,n,W);

free(dsdv);

return 0;

}