**Bài 9: Cấu trúc bảng băm**

**Băm tuyến tính**

#include "stdio.h"

#include "stdlib.h"

#include "conio.h"

#include "time.h"

#define TRUE 1

#define FALSE 0

#define NULLKEY -1

#define M 10

//Khai bao cau truc mot nut cua bang bam

struct node

{

int key; //khoa cua nut tren bam

};

//Khai bao bang bam co M nut

struct node hashtable[M];

int N; //bien toan cuc chi so nut hien co tren bang bam

//ham bam

int hashfunc(int key)

{

return(key % M);

}

//Khoi dong bang bam

void initialize()

{

int i;

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

hashtable[i].key = NULLKEY;

N=0; // so nut hien co khoi dong bang 0

}

//Tac vu empty : kiem tra ca bang bam co rong hay khong

int empty()

{

return (N==0 ? TRUE : FALSE);

}

//Tac vu full : kiem tra bang bam co day chua

int full()

{

return (N==M-1 ? TRUE : FALSE);

}

//Tac vu search : tim kiem nut co khoa k tren bang bam

int search(int k)

{

int i;

i=hashfunc(k);

while(hashtable[i].key!=k && hashtable[i].key!=NULLKEY)

{

//bam lai(theo phuong phap do tuyen tinh): hi(key)=h(key)+i % M

i=i+1;

if(i>=M)

i=i-M;

}

if(hashtable[i].key==k) //tim thay

return(i);

else

return(M); //khong tim thay

}

//tac vu insert : them nut co khoa k vao bang bam

int insert(int k)

{

int i,j;

if(full())

{

printf("Bang bam bi day khong the them nut co khoa %d duoc",k);

return 0;

}

if(search(k)<M)

{

printf("So nay da co trong bang bam");

return 0;

}

i=hashfunc(k);

while(hashtable[i].key!=NULLKEY)

{

//bam lai theo phuong phap tuyen tinh

i++;

if(i>=M)

i=i-M;

}

hashtable[i].key=k;

N=N+1;

return(i);

}

//tac vu remove : xoa nut tai dia chi i tren bang bam

void remove(int i)

{

int j, r, cont, a;

cont= TRUE;

do

{

hashtable[i].key=NULLKEY;

j=i;

do

{

i=i+1;

if(i>=M)

i=i-M;

if(hashtable[i].key==NULLKEY)

cont=FALSE;

else

{

r=hashfunc(hashtable[i].key);

a=(j<r && r<=i) || (r<=i && i<j) || (i<j && j<r);

}

}while(cont && a);

if(cont)

hashtable[j].key=hashtable[i].key;

}while(cont);

}

//tac vu viewtable : xem chi tiet bang bam

void viewtable()

{

int i;

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

printf("\nTable[%2d] : %4d",i,hashtable[i].key);

}

//chuong trinh chinh

int main()

{

int i,n,p,q;

int b, key, chucnang;

char c;

//khoi tao bang bam

initialize();

do

{

//menu chinh cua chuong tinh

printf("\t\n\nCac chuc nang chinh cua chuong trinh : \n");

printf("\t1.Them nut moi vao bang bam\n");

printf("\t2.Them ngau nhien mot nut vao bang bam\n");

printf("\t3.Xoa nut tren bang bam\n");

printf("\t4.Xoa toan bo bang bam\n");

printf("\t5.Xem chi tiet bang bam\n");

printf("\t6.Tim kiem tren bang bam\n");

printf("\t0.Ket thuc chuong trinh\n");

printf("\tChuc nang ban chon : ");

scanf("%d",&chucnang);

switch(chucnang)

{

case 1:

{

printf("\nThem nut vao bang bam ");

printf("\nKhoa cua nut moi : ");

scanf("%d", &key);

insert(key);

break;

}

case 2:

{

srand(time(NULL));

printf("\nThem ngau nhien nhieu nut vao bang bam");

printf("\nBan muon them bao nhieu nut : ");

scanf("%d", &n);

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

{

key=rand()%(100);

insert(key);

}

break;

}

case 3:

{

printf("\nXoa nut tren bang bam");

printf("\nkhoa cua nut can xoa : ");

scanf("%d", &key);

i=search(key);

if(i==M)

printf("Khong co nut voi khoa can xoa");

else

{

remove(i);

N--;

}

break;

}

case 4:

{

printf("\nXoa toan bo bang bam");

printf("\nBan co chat khong (c/k) : ");

c=getch();

if(c=='c'||c=='C')

initialize();

break;

}

case 5:

{

printf("\nXem chi tiet bang bam");

viewtable();

break;

}

case 6:

{

printf("Tim kiem tren bang bam");

printf("Khoa can tim : ");

scanf("%d",&key);

if(search(key)==M)

printf("\nKhong tim thay");

else

{

printf("Tim thay tai dia chi %d trong bang bam",search(key));

break;

}

}

}

}while(chucnang!=0);

}

**Băm kép**

#include "stdio.h"

#include "stdlib.h"

#include "conio.h"

#include "time.h"

#define TRUE 1

#define FALSE 0

#define NULLKEY -1

#define M 10

//Khai bao cau truc mot nut cua bang bam

struct node

{

int key; //khoa cua nut tren bam

};

//Khai bao bang bam co M nut

struct node hashtable[M];

int N; //bien toan cuc chi so nut hien co tren bang bam

//ham bam

int hashfunc(int key)

{

return(key % M);

}

//ham bam thu hai

int hashfunc2(int key)

{

return (M-(key%M));

}

//Khoi dong bang bam

void initialize()

{

int i;

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

hashtable[i].key = NULLKEY;

N=0; // so nut hien co khoi dong bang 0

}

//Tac vu empty : kiem tra ca bang bam co rong hay khong

int empty()

{

return (N==0 ? TRUE : FALSE);

}

//Tac vu full : kiem tra bang bam co day chua

int full()

{

return (N==M-1 ? TRUE : FALSE);

}

//Tac vu search : tim kiem nut co khoa k tren bang bam

int search(int k)

{

int i,j;

i=hashfunc(k);

j=hashfunc2(k);

while(hashtable[i].key!=k && hashtable[i].key!=NULLKEY)

//bam lai(theo phuong phap bam kep

i=(i+j)%M;

if(hashtable[i].key==k) //tim thay

return(i);

else

return(M);

}

//tac vu insert : them nut co khoa k vao bang bam

int insert(int k)

{

int i,j;

if(full())

{

printf("Bang bam bi day khong the them nut co khoa %d duoc",k);

return(M);

}

if(search(k)<M)

{

printf("So nay da co trong bang bam");

return(M);

}

i=hashfunc(k);

j=hashfunc2(k);

while(hashtable[i].key!=NULLKEY)

//bam lai theo phuong phap tuyen tinh

i=(i+j)%M;

hashtable[i].key=k;

N=N+1;

return(i);

}

//tac vu remove : xoa nut tai dia chi i tren bang bam

void remove(int i)

{

int j, r, h, cont, a;

cont= TRUE;

do

{

h = hashfunc2(hashtable[i].key);

hashtable[i].key=NULLKEY;

j=i;

do

{

i=(i+h)%M;

if(hashtable[i].key==NULLKEY)

cont=FALSE;

else

{

r=hashfunc(hashtable[i].key);

a=(j<r && r<=i) || (r<=i && i<j) || (i<j && j<r);

}

}while (cont && a);

if(cont)

hashtable[j].key=hashtable[i].key;

}while(cont);

}

//tac vu viewtable : xem chi tiet bang bam

void viewtable()

{

int i;

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

printf("\nTable[%2d] : %4d\t",i,hashtable[i].key);

}

//chuong trinh chinh

int main()

{

int i,n,p,q;

int b, key, chucnang;

char c;

//khoi tao bang bam

initialize();

do

{

//menu chinh cua chuong tinh

printf("\t\n\nCac chuc nang chinh cua chuong trinh : \n");

printf("\t1.Them nut moi vao bang bam\n");

printf("\t2.Them ngau nhien mot nut vao bang bam\n");

printf("\t3.Xoa nut tren bang bam\n");

printf("\t4.Xoa toan bo bang bam\n");

printf("\t5.Xem chi tiet bang bam\n");

printf("\t6.Tim kiem tren bang bam\n");

printf("\t0.Ket thuc chuong trinh\n");

printf("\tChuc nang ban chon : ");

scanf("%d",&chucnang);

switch(chucnang)

{

case 1:

{

printf("\nThem nut vao bang bam ");

printf("\nKhoa cua nut moi : ");

scanf("%d", &key);

insert(key);

break;

}

case 2:

{

srand(time(NULL));

printf("\nThem ngau nhien nhieu nut vao bang bam");

printf("\nBan muon them bao nhieu nut : ");

scanf("%d", &n);

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

{

key=rand()%(100);

insert(key);

}

break;

}

case 3:

{

printf("\nXoa nut tren bang bam");

printf("\nkhoa cua nut can xoa : ");

scanf("%d", &key);

i=search(key);

if(i==M)

printf("Khong co nut voi khoa can xoa");

else

{

remove(i);

N--;

}

break;

}

case 4:

{

printf("\nXoa toan bo bang bam");

printf("\nBan co chat khong (c/k) : ");

c=getch();

if(c=='c'||c=='C')

initialize();

break;

}

case 5:

{

printf("\nXem chi tiet bang bam");

viewtable();

break;

}

case 6:

{

printf("Tim kiem tren bang bam");

printf("Khoa can tim : ");

scanf("%d", &key);

if(search(key)==M)

printf("\nKhong tim thay");

else

{

printf("Tim thay tai dia chi %d trong bang bam",search(key));

break;

}

}

}

}while(chucnang!=0);

}

**Băm nối kết**

#include<stdio.h>

#include<conio.h>

#include<string.h>

#include<ctype.h>

#include<stdlib.h>

#define M 26

typedef struct tudien

{

char tu[10];

char nghia[100];

}tudien;

typedef struct node

{

tudien data;

node \*link;

}node;

node bucket[M];

int hambam(char tu[])

{

char ch;

ch=toupper(tu[0]);

return ((ch-65)%M);

}

void khoitao(node bucket[])

{

int i;

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

bucket[i].link=NULL;

}

void themtu(tudien x)

{

node \*p;int i;

i=hambam(x.tu);

p=new (node);

p->data=x;

p->link=bucket[i].link;

bucket[i].link=p;

}

node \*timtu(char tu[])

{

int tim=1;

int i=hambam(tu);

node \*p=bucket[i].link;

while((tim==1)&&(p!=NULL))

{

if(strcmp(p->data.tu,tu)==0)

tim=0;

else

p=p->link;

}

if(tim==0)

return p;

else

return NULL;

}

int kiemtra(char tu[])

{

int tim=1;

int i=hambam(tu);

node \*p=bucket[i].link;

while((tim==1)&&(p!=NULL))

{

if(strcmp(p->data.tu,tu)==0)

tim=0;

else

p=p->link;

}

if(tim==0)

return 1;

else

return 0;

}

void khoi\_tao()

{

printf("\nCHUONG TRINH TU DIEN \n");

printf("\n1.Them mot tu moi");

printf("\n2.Tra tu ");

printf("\n3.In tu dien ");

printf("\n4.Xoa tu ");

printf("\n5.Ghi tu dien vao file");

printf("\n6.Doc file vao tu dien ");

printf("\n7.Thoat");

printf("\nChon chuc nang : ");

}

void intudien()

{

int i; node \*p;

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

{

p=bucket[i].link;

printf("\nDanh muc tu %c :",i+65);

while(p!=NULL)

{ printf("\n Tu : %s nghia : %s ",p->data.tu,p->data.nghia);

p=p->link;

}

}

}

void xoatu(char tu[])

{

int i;node \*p,\*q;

i=hambam(tu);

p=bucket[i].link;

while((p!=NULL)&&(strcmp(p->data.tu,tu)!=0))

{

q=p;

p=p->link;

}

if(p==NULL)

printf("\ntu tren khong co trong tu dien ");

else

if(p==bucket[i].link)

{

bucket[i].link=p->link;

delete(p);

}

else

{

q->link=p->link;

delete(p);

}

}

void ghifile(char \*filename)

{ FILE \*f;

int i; node \*p;

f=fopen(filename,"wb");

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

{

p=bucket[i].link;

while(p!=NULL)

{ fwrite(&p->data,sizeof(p->data),1,f);

p=p->link;

}

}

fclose(f);

}

void docfile(char \*filename)

{ FILE \*f;

tudien tam;

f=fopen(filename,"rb");

while(!feof(f))

{

fread(&tam,sizeof(tam),1,f);

if(kiemtra(tam.tu)==0) themtu(tam);

}

fclose(f);

}

int main()

{

int chon;tudien x;char ch[10];node \*p;int t;

docfile((char \*)"e:\\tudien.txt");

nhan:

khoi\_tao();

scanf("%d",&chon);

if(chon==7)

{

ghifile((char \*)"e:\\tudien.txt");

exit(1);

}

switch(chon)

{

case 1:

{

printf("\nBan muon them bao nhieu tu ?");

scanf("%d",&t);

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

{

printf("\nNhap tu moi thu %d : ",i+1);

fflush(stdin);gets(x.tu);

if(kiemtra(x.tu)==1)

printf("\n Tu: %s da co trong tu dien");

else

{

printf("\nNhap nghia cua tu: ");

fflush(stdin);gets(x.nghia);

themtu(x);

} }

printf("\n Nhan phim bat ky de tiep tuc!");

getch();

break;

}

case 2:

{

printf("\nNhap tu can tra ");

fflush(stdin);

gets(ch);

p=timtu(ch);

if(p!=NULL)

printf("\nTu : %s co nghia la :%s",p->data.tu,p->data.nghia);

else

printf("tu tren khong co trong tu dien");getch();

printf("\n Nhan phim bat ky de tiep tuc!");

getch();

break;

}

case 3:

intudien();

printf("\n Nhan phim bat ky de tiep tuc!");

getch();

break;

case 4:

{

printf("\nNhap tu can xoa : ");

fflush(stdin);

gets(ch);

xoatu(ch);

break;

}

case 5:

ghifile((char \*)"e:\\tudien.txt");

printf("\n Nhan phim bat ky de tiep tuc!");

getch();

break;

case 6:

docfile((char \*)"e:\\tudien.txt");

printf("\n Nhan phim bat ky de tiep tuc!");

getch();

break;

}

goto nhan;

}