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#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
#include<time.h>

//=====
typedef struct node{
    int info;
    node* pNext;
}Node;
//=====
typedef struct list{
    Node* pHead;
    Node* pTail;
}List;
//=====
void Init(List &l)
{
    l.pHead=l.pTail = NULL;
}
//=====
int IsEmpty(List l)
{
    return (l.pHead==NULL) ;
}
//=====
Node* CreateNode (int x)
{
    node* p;
    p = new Node;
    if(p == NULL)
    {
        printf("Loi cap phat vung nho!");
        getch();
        exit(0);
    }
    p->info = x;
    p->pNext = NULL;
    return p;
}
//=====
void AddHead(List &l, Node* p)
{
    if(IsEmpty(l))
    {
        l.pHead=l.pTail=p;
    }
    else
    {
        p->pNext=l.pHead;
        l.pHead=p;
    }
}
//=====
void AddTail(List &l, Node* p)
{
    if(IsEmpty(l))
    {
        l.pHead=l.pTail=p;
    }
    else
    {
        l.pTail->pNext = p;
        l.pTail= p;
    }
}
//=====
void InputList(List &l)
{
    int n;
    int x;

    printf("Nhap so phan tu can nhap: ");
    scanf("%d", &n);
    for(int i=0; i<n; i++)
    {

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        printf("Nhap songuyen thu %d: ", i+1);
        scanf("%d", &x);
        Node* p=CreateNode(x);
        AddTail(l, p); // them node vao cuoi DS
    }
}
//=====
void InputList_OStop(List &l)
{
    int x;
    do{
        printf("Nhap songuyen 0_Stop: ");
        scanf("%d", &x);
        if(x!=0)
        {
            Node* p=CreateNode(x);
            if(p!=NULL) AddTail(l, p); // them node vao cuoi DS
        }
    }while(x!=0);
}
//=====
int Rand_Int(int a,int b)
{
    return a + rand()%(b - a + 1);
}
//=====
void InputList_Rand(List &l, int a, int b)
{
    int n, x;
    printf("Nhap so phan tu : ");
    scanf("%d", &n);

    srand(time(NULL));
    for(int i=0; i<n; i++)
    {
        x = Rand_Int(a, b);
        Node* p=CreateNode(x);
        if(p) AddTail(l, p); // them node vao dau DS
    }
}
//=====
void ReadFile(const char* filename, List &l)
{
    FILE *f= fopen(filename, "rt");
    if (f==NULL)
    {
        printf("\nKhong mo duoc file\n");
        getch();
        exit(0);
    }

    int x;
    while(!feof(f))
    {
        fscanf(f,"%d",&x);
        Node* p=CreateNode(x);
        if(p) AddTail(l, p);
    }
    fclose(f);
}
//=====
void OutputList(List l)
{
    for (Node* i = l.pHead; i!=NULL; i=i->pNext)
        printf("%d ", i->info);
}
//=====
void swap(int &x,int &y)
{
    int t = x; x = y; y = t;
}
//=====

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void InterchangeSort_Giam(List &l)
{
    for (Node* i = l.pHead; i->pNext!=NULL; i = i->pNext)
        for (Node* j = i->pNext; j!=NULL; j = j->pNext)
            if(i->info < j->info)
                swap(i->info,j->info);
}
//=====================================================
void SelectionSort_Tang(int a[],int n)
{
    for (int i=0; i<n-1; i++)
    {
        int vtmin = i;
        for (int j=i+1; j<n; j++)
            if(a[vtmin] > a[j])
                vtmin = j;
        swap(a[vtmin], a[i]);
    }
}
//=====================================================
void SelectionSort_Tang(List &l)
{
    for (Node* i = l.pHead; i->pNext!=NULL; i = i->pNext)
    {
        Node* vtmin = i;
        for (Node* j = i->pNext; j!=NULL; j = j->pNext)
            if(vtmin->info > j->info)
                vtmin = j;
        swap(vtmin->info, i->info);
    }
}
//=====================================================
int TimX(List l, int X)
{
    int vt=0;
    for(Node* i=l.pHead; i!=NULL; i=i->pNext,vt++)
        if(i->info == X )
            return vt;

    return -1;
}
//=====================================================
void menu(int &chon)
{
    printf("\n\n=====MENU=====");
    printf("\n 1. InterchangeSort GIAM");
    printf("\n 2. SelectionSort TANG");
    printf("\n 3. Tim gia tri X");

    printf("\n\n 0. Thoat");
    printf("\n=====");
    printf("\n\n Ban chon cong viec: "); scanf("%d", &chon);
}
//=====================================================
int main()
{
    List l;

    Init(l);
    // InputList(l);
    // printf("\nDanh sach lien ket vua nhap: \n");
    // OutputList(l);

    // InputList_0Stop(l);
    // printf("\nDanh sach lien ket vua nhap: \n");
    // OutputList(l);

    InputList_Rand(l, -20, 20);
    printf("\nDanh sach lien ket phat sinh ngau nhien: \n");
    OutputList(l);

    // ReadFile("int.txt", l);
    // printf("\nDanh sach lien ket doc tu file: \n");
    // OutputList(l);
}

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int X;
int vt;
int chon;
do{
    menu(chon);
    switch(chon)
    {
        case 1:
            InterchangeSort_Giam(l);
            printf("\n\n\t\t=====LIST Interchange Sort GIAM =====\n\n");
            OutputList(l);
            break;

        case 2:
            SelectionSort_Tang(l);
            printf("\n\n\t\t=====LIST Selection Sort TANG =====\n\n");
            OutputList(l);
            break;

        case 3:
            printf("\n\n Nhap gia tri X can tim: ");
            scanf("%d", &X);
            vt = TimX(l, X);
            if(vt== -1) printf("\n Khong tim thay X: %d", X);
            else printf("\n Tim thay X: %d tai vi tri: %d\n", X, vt);

            break;

        default: chon=0;
    }
}while(chon!=0);

return 0;
}

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