ព្រះរាជាណាចក្រកម្ពុជា

ជាតិ សាសនា ព្រះមហាក្សត្រ

Institute of technology of Cambodia

Department of Information and communication Engineering

The lesson taking about Linked list function in c++

TP16: Linked list (part 2)

TP: Algorithm and Programming ll

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Contents

Problem1:

Create an element structure and a list structure that can store a list of integer numbers. Create 4 functions to

a. Create an empty list,
b. Add a number to begin of list,
c. Add a number to end of list,
d. Add a number to specific position in the list, and
e.Display list.

art here | Problem1 Venthon,e20191250.cpp

```cpp
#include<iostream>
using namespace std;
struct Element{
    int num;
    Element*next;
};
struct list{
    int n;
    Element*head;
    Element*tail;
};
list*createEmptyList()
{
    list*ls;
    ls=new list;
    ls->n=0;
    ls->head=NULL;
    ls->tail=NULL;
    return ls;
}
void addToEnd(list*ls, int numData)
{
    Element*ele;
    ele=new Element;
    ele->num=numData;
    ele->next=NULL;
    if(ls->n==0)
    {
        ls->head=ele;
        ls->tail=ele;
    }else{
        ls->tail->next=ele;
        ls->tail=ele;
    }
    ls->n=ls->n+1;
}
```

here X Problem1 Venthon,e20191250.cpp X

```
37  void addToBegin(list*ls,int numData)
38  {
39      Element*tmp;
40      tmp=new Element;
41      tmp->num=numData;
42      if(ls->n==0)
43      {
44          tmp->next=NULL;
45          ls->head=tmp;
46          ls->tail=tmp;
47      }else{
48          tmp->next=ls->head;
49          ls->head=tmp;
50      }
51      ls->n=ls->n+1;
52  }
```

Start here X Problem1 Venthon,e20191250.cpp X

```
52  }
53  void addSpecificPositionList(list*ls, int numData, int pos)
54  {
55      int n;
56      if(n<=1)
57      {
58          addToBegin(ls,numData);
59      }else  if(n>=ls->n)
60      {
61          addToEnd(ls,numData);
62      }else{
63          Element*ne;
64          ne=new Element();
65          ne->num=numData;
66          Element*tmp;
67          tmp=ls->head;
68          for(int i=1; i<=n; i++)
69          {
70              tmp=tmp->next;
71          }
72          ne->next=tmp->next;
73          tmp->next=ne;
74          ls->n=ls->n+1;
75      }
76  }
77  void displayList(list*ls)
78  {
79      Element*tmp;
80      tmp=ls->head;
81      while(tmp!=NULL)
82      {
83          cout<<tmp->num<<" ";
84          tmp=tmp->next;
85      }
86  }
87  main()
88  {
89
```

Problem2:

Get a number n from a user. Include the user-defined header, yourName-SingleLinkList.h, created from problem #1. Build a singly linked list to store all numbers from 1 to n. Display all data in the list.

tart here | Problem1 Venthon,e20191250.cpp | *Problem2 Venthon,e20191250.cpp

```cpp
#include<iostream>
using namespace std;
struct Element{
    int num;
    Element*next;
};
struct list{
    int n;
    Element*head;
    Element*tail;
};
list*createEmptyList()
{
    list*ls;
    ls=new list;
    ls->n=0;
    ls->head=NULL;
    ls->tail=NULL;
    return ls;
}
void addToEnd(list*ls, int numData)
{
    Element*ele;
    ele=new Element;
    ele->num=numData;
    ele->next=NULL;
    if(ls->n==0)
    {
        ls->head=ele;
        ls->tail=ele;
    }else{
        ls->tail->next=ele;
        ls->tail=ele;
    }
    ls->n=ls->n+1;
}
```

rt here | Problem1 Venthon,e20191250.cpp | *Problem2 Venthon,e20191250.cpp

```cpp
void addToBegin(list*ls,int numData)
{
    Element*tmp;
    tmp=new Element;
    tmp->num=numData;
    if(ls->n==0)
    {
        tmp->next=NULL;
        ls->head=tmp;
        ls->tail=tmp;
    }else{
        tmp->next=ls->head;
        ls->head=tmp;
    }
    ls->n=ls->n+1;
}
```

```
53  void addSpecificPositionList(list*ls, int numData, int pos)
54  {
55      int n;
56      if(n<=1)
57      {
58          addToBegin(ls,numData);
59      }else  if(n>=ls->n)
60      {
61          addToEnd(ls,numData);
62      }else{
63          Element*ne;
64          ne=new Element();
65          ne->num=numData;
66          Element*tmp;
67          tmp=ls->head;
68          for(int i=1; i<=n; i++)
69          {
70              tmp=tmp->next;
71          }
72          ne->next=tmp->next;
73          tmp->next=ne;
74          ls->n=ls->n+1;
75      }
76  }
77  void displayList(list*ls)
78  {
79      Element*tmp;
80      tmp=ls->head;
81      while(tmp!=NULL)
82      {
83          cout<<tmp->num<<" "<<endl;
84          tmp=tmp->next;
85      }
86  }
```

```
87  main()
88  {
89      list*ls;
90      ls=createEmptyList();
91      int n;
92      cout<<"\n\tEnter number you want to display: ";cin>>n;
93      cout<<endl;
94      for(int k=0; k<n; k++)
95      {
96          int number;
97          cout<<"Enter number "<<k+1<<": ";cin>>number;
98          addToEnd(ls,number);
99      }
100     cout<<"\n*****Display all number from n.****"<<endl;
101     displayList(ls);
102 }
103
```

```
"C:\Users\Admin\Desktop\code c++\TP16 linked list\Problem2 Ventho

       Enter number you want to display: 5

Enter number 1: 20
Enter number 2: 40
Enter number 3: 60
Enter number 4: 80
Enter number 5: 100

*****Display all number from n.****
20
40
60
80
100

Process returned 0 (0x0)   execution time : 24.147 s
Press any key to continue.
```

gs & others

Search results | Cccc | Build log | Build messages

File | Line | Message

Problem3:

Get a number n from a user. Generate n random numbers and store in the list.

a.Display the list.

b.Compute summation and average of all numbers in the list then display the result on screen.

c.Find the minimum and maximum numbers inthe list.

here | Problem1 Venthon,e20191250.cpp | Problem2 Venthon,e20191250.cpp | Problem3 Venthon,e20191250.cpp

```cpp
#include<iostream>
using namespace std;
struct element
{
    int data;;
    element*next;
};
struct list
{
    int n;
    element*head;
    element*tail;
};
list *createEmptyList()
{
    list*ls;
    ls=new list;
    ls->n=0;
    ls->head=NULL;
    ls->tail=NULL;
    return ls;
}
```

```cpp
void insertToEnd(list*ls, int newData)
{
    element*ele;
    ele=new element;
    ele->data=newData;
    ele->next=NULL;
    if(ls->n==0)
    {
        ls->head=ele;
        ls->tail=ele;
    }else{
        ls->tail->next=ele;
        ls->tail=ele;
    }
    ls->n=ls->n+1;
}
void displayList(list*ls)
{
    element*tmp;
    tmp=ls->head;
    while(tmp!=NULL)
    {
        cout<<tmp->data<<" ";
        tmp=tmp->next;
    }
}
```

```cpp
int sumList(list*ls)
{
    element*tmp;
    tmp=ls->head;
    float sum=0;
    while(tmp!=NULL)
    {
        sum=sum+tmp->data;
        tmp=tmp->next;
    }
    return sum;
}
int maxList(list*ls)
{
    float max;
    element*tmp;
    tmp=ls->head;
    while(tmp!=NULL)
    {
        if(max<tmp->data)
        {
            max=tmp->data;
        }
        tmp=tmp->next;
    }
    return max;
}
```

art here | Problem1 Venthon,e20191250.cpp | Problem2 Venthon,e20191250.cpp | Problem3 Venthon,e20191250.cpp

```cpp
int minList(list*ls)
{
    float min;
    element*tmp;
    tmp=ls->head;
    while(tmp!=NULL)
    {
        if(min>tmp->data)
        {
            min=tmp->data;
        }
        tmp=tmp->next;
    }
    return min;
}

main()
{
    list*ls;
    ls=createEmptyList();
    int n;
    cout<<"\n\tEnter number you want: "; cin>>n;
    for(int k=0; k<n; k++)
    {
        float num;
        cout<<"Enter number "<<k+1<<": ";
        cin>>num;
        insertToEnd(ls,num);
    }
    float avg;
    avg=sumList(ls)/n;
    cout<<"\n=====display All number======"<<endl;
    displayList(ls);
    cout<<"\n Sum of number is: "<<sumList(ls)<<endl;
    cout<<"\n Avg of number is: "<<avg<<endl;
    cout<<"\n max of number is: "<<maxList(ls)<<endl;
    cout<<"\n min of number is: "<<minList(ls)<<endl;
}
```

```
Select "C:\Users\Admin\Desktop\code c++\TP16 linked list\Problem3 Venthon,e20191250.exe"

       Enter number you want: 5
Enter number 1: -2
Enter number 2: 2
Enter number 3: -9
Enter number 4: 9
Enter number 5: 5

=====display All number======
-2 2 -9 9 5
 Sum of number is: 5

 Avg of number is: 1

 max of number is: 9

 min of number is: -9

Process returned 0 (0x0)   execution time : 29.055 s
Press any key to continue.
```

Problem4:

Build a double linked list that is able to store a list of scores for I3 class. Data in the list includesstudent information such asname, ID, sex, score.Create some functions below:

a.Create structure element and list
b.Create a function to createan empty list
c.Insert data to begin of the list
d.Insert data to end of the list
e.Display data from beginof the list
f.Display data from end of the list
g.What is the average of the score?
h.Display list of students who got score more than the average.

art here | Problem4 Venthon,e20191250.cpp

```cpp
#include<iostream>
using namespace std;
struct Element{
    string name;
    string id;
    string sex;
    float score;
    Element*next;
    Element*previous;
};
struct list{
    int n;
    Element*head;
    Element*tail;
};
list*createEmptyList()
{
    list*ls;
    ls=new list;
    ls->n=0;
    ls->head=NULL;
    ls->tail=NULL;
    return ls;
}
void insertDataToBigin(list*ls,string nameData,string idData,string sexData, float scoreData)
{
    Element*e;
    e=new Element;
    e->name=nameData;
    e->id=idData;
    e->sex=sexData;
    e->score=scoreData;
    e->previous=NULL;
    if(ls->n==0)
    {
        e->next=NULL;
        ls->head=e;
        ls->tail=e;
    }
    else{
        e->next=ls->head;
        ls->head->previous;
        ls->head=e;
    }
    ls->n=ls->n+1;
}
```

```
47  void insertDataToEnd(list*ls,string nameData,string idData,string sexData, float scoreData)
48  {
49      Element*e;
50      e=new Element;
51      e->name=nameData;
52      e->id=idData;
53      e->sex=sexData;
54      e->score=scoreData;
55      if(ls->n==0)
56      {
57          e->next=NULL;
58          ls->head=e;
59          ls->tail=e;
60      }else{
61          e->next=ls->head;
62          ls->head->previous=e;
63          ls->head=e;
64      }
65      ls->n=ls->n+1;
66  }
67  int sumOfscore(list*ls)
68  {
69      Element*tmp;
70      tmp=ls->head;
71      float sum=0;
72      while(tmp!=NULL)
73      {
74          sum=sum+tmp->score;
75          tmp=tmp->next;
76      }
77      return sum;
78  }
79  void displayList(list*ls)
80  {
81      Element*tmp;
82      tmp=ls->head;
83      cout<<"\tName"<<"\tId"<<"\tSex"<<"\tsocre"<<endl;
84      while(tmp!=NULL)
85      {
86          cout<<"\t"<<tmp->name<<"\t"<<tmp->id<<"\t"<<tmp->sex<<"\t"<<tmp->score<<endl;
87          tmp=tmp->next;
88      }
89  }
```

```
90  main()
91  {
92      list*ls;
93      ls=createEmptyList();
94      int n;
95      cout<<"\nEnter of number student you want: ";cin>>n;
96      cout<<endl;
97      for(int k=0; k<n; k++)
98      {
99          string name,id,sex;
100         float score;
101         cout<<"***Information of student"<<k+1<<" :"<<endl;
102         cout<<"Enter your name: ";cin>>name;
103         cout<<"Enter your id: ";cin>>id;
104         cout<<"Enter your sex: ";cin>>sex;
105         cout<<"Enter your score: ";cin>>score;
106         cout<<endl;
107         insertDataToEnd(ls,name,id,sex,score);
108     }
109     cout<<"\n*****Display all information of student*****"<<endl;
110     displayList(ls);
111     float avg;
112     avg=(float)sumOfscore(ls)/n;
113     cout<<"\n****Avg of all score is: "<<avg<<endl;
114     cout<<"*****the score more than Avg: "<<endl;
115     for(int k=0; k<n; k++)
116     {
117         float avg,score;
118         Element*tmp;
119         tmp=ls->head;
120         cout<<"\tName"<<"\tId"<<"\tSex"<<"\tsocre"<<endl;
121         if(avg<=score)
122         {
123             cout<<"\t"<<tmp->name<<"\t"<<tmp->id<<"\t"<<tmp->sex<<"\t"<<tmp->score<<endl;
124             tmp=tmp->next;
125         }
126     }
127 }
128
```

```
"C:\Users\Admin\Desktop\code c++\TP16 linked list\Problem4 Venthon,e2019
Enter your name: tuikio
Enter your id: e3039
Enter your sex: G
Enter your score: 60

***Information of student3 :
Enter your name: rathana
Enter your id: e2029
Enter your sex: F
Enter your score: 50


*****Display all information of student*****
        Name    Id      Sex     socre
        rathana e2029   F       50
        tuikio  e3039   G       60
        popo    e2029   M       40

****Avg of all score is: 50
*****the score more than Avg:
        Name    Id      Sex     socre
        rathana e2029   F       50
        Name    Id      Sex     socre
        rathana e2029   F       50
        Name    Id      Sex     socre
        rathana e2029   F       50

Process returned 0 (0x0)   execution time : 58.980 s
Press any key to continue.
```

Problem5:

reate a double linked that can store Englishalphabets (A-Z anda-z).a.Display the alphabets from Ato Z

rt here | Problem5 Venthon,e20191250.cpp

```cpp
#include<iostream>
using namespace std;
struct element{
    string alphabet;
    element*next;
    element*previous;
};
struct list{
    int n;
    element*head;
    element*tail;
};
list*createEmptyList()
{
    list*ls;
    ls=new list;
    ls->n=0;
    ls->head=NULL;
    ls->tail=NULL;
    return ls;
}
```

rt here | Problem5 Venthon,e20191250.cpp

```cpp
void insertToBegin(list*ls,string alphabetData)
{
    element*e;
    e=new element;
    e->alphabet=alphabetData;
    e->previous=NULL;
    if(ls->n==0)
    {
        e->next=NULL;
        ls->head=e;
        ls->tail=e;
    }else{
        e->next=ls->head;
        ls->head->previous=e;
        ls->head=e;
    }
    ls->n=ls->n+1;
}
void displayList(list*ls)
{
    element*tmp;
    tmp=ls->head;
    while(tmp!=NULL)
    {
        tmp=tmp->next;
    }
}

```

```cpp
main()
{
    list*ls;
    ls=createEmptyList();
    char ch='a';
    cout<<"\n*****All alphabet a to z*****"<<endl;
    while(ch<='z')
    {
        cout<<ch<<" ";
        ch=ch+1;
        displayList(ls);
    }
    cout<<endl;
    cout<<"\n*****All alphabet A to Z*****"<<endl;
    char let='A';
    while(let<='Z')
    {
        cout<<let<<" ";
        let=let+1;
        displayList(ls);
    }

}
```

tart here X Problem5 Venthon,e20191250.cpp X

"C:\Users\Admin\Desktop\code c++\TP16 linked list\Problem5 Venthon,e20191250.exe"

```
*****All alphabet a to z*****
a b c d e f g h i j k l m n o p q r s t u v w x y z

*****All alphabet A to Z*****
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
Process returned 0 (0x0)   execution time : 0.028 s
Press any key to continue.
```