

ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ

Institute of technology of Cambodia

Department of Information and communication Engineering



The lesson taking about Linked list function in c++

TP15 : Linked list

TP: Algorithm and Programming II

Lecturer: BOU CHANNA

Student: VEN THON

ID: e20191250

Group: I3-GIC-C

Year: 2022-2023

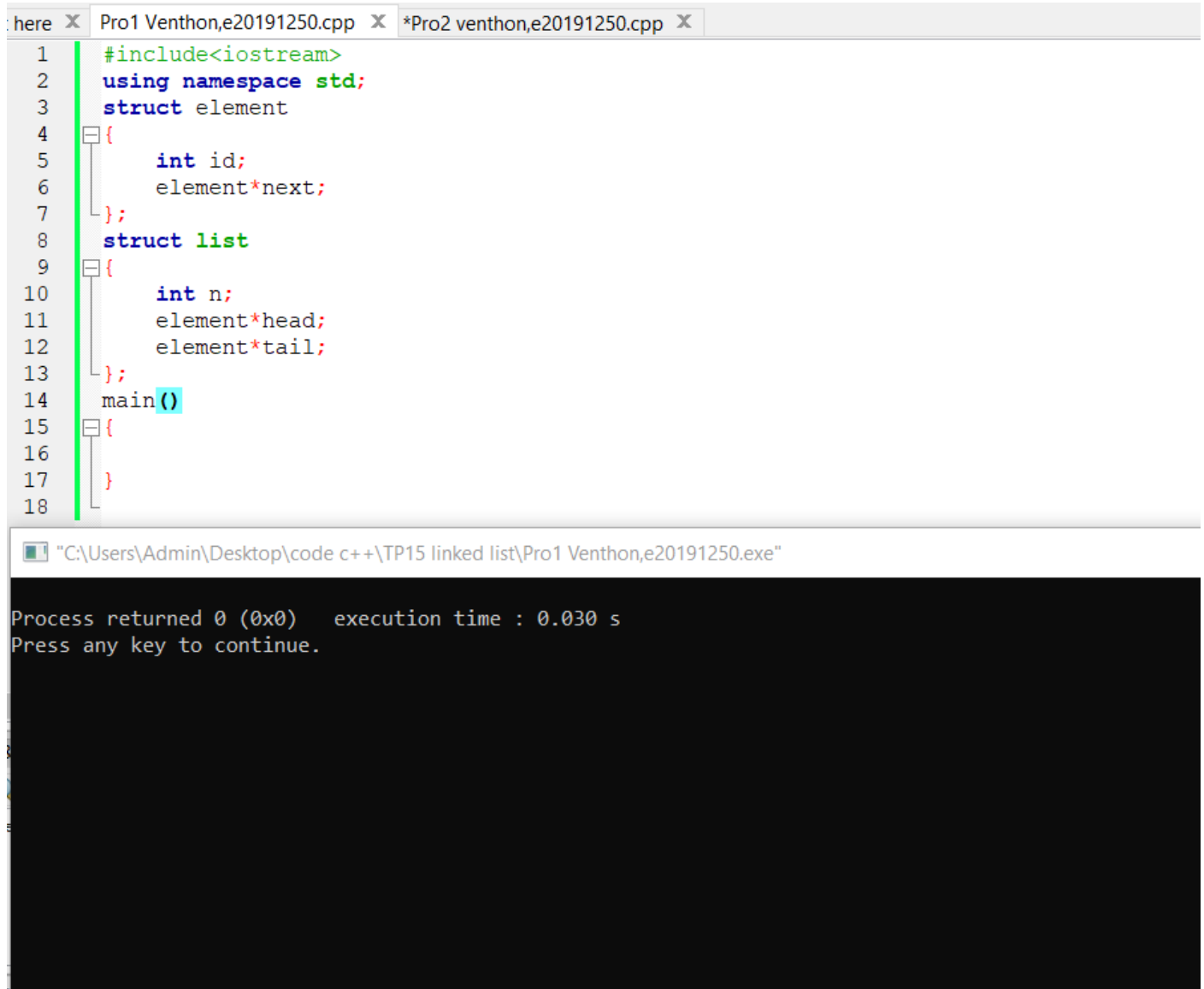
Contents

Problem1:.....	3
Problem2:.....	4
Problem3:.....	6
Problem4:.....	8
Problem5:.....	11

Problem1:

We want to store a list of all engineer students' IDs at ITC (more students are added every year thus the list should be able to store unlimited number of student IDs). Define a linked list data structure for this kind of problem.

Hint: Create a structure element and list. Data in element is ITC's student ID.



```
here X Pro1 Venthon,e20191250.cpp X *Pro2 venthon,e20191250.cpp X
1  #include<iostream>
2  using namespace std;
3  struct element
4  {
5      int id;
6      element*next;
7  };
8  struct list
9  {
10     int n;
11     element*head;
12     element*tail;
13 };
14 main()
15 {
16 }
17
18
```

"C:\Users\Admin\Desktop\code c++\TP15 linked list\Pro1 Venthon,e20191250.exe"

Process returned 0 (0x0) execution time : 0.030 s
Press any key to continue.

Problem2:

In addition to problem #1, create 3 functions

- a function to create an empty list,
- a function to add data to the list,
- a function to display all data in the list.

Then in main program, call these three functions to test and see the result. Try to add 10 ID data of students into the list.

```
Start here x Pr2 venthon,e20191250.cpp x
1  #include<iostream>
2  using namespace std;
3  struct element
4  {
5      string ID;
6      element*next;
7  };
8  struct list
9  {
10     int n;
11     element*head;
12     element*tail;
13 };
14 list *createEmptyList()
15 {
16     list*ls;
17     ls=new list;
18     ls->n=0;
19     ls->head=NULL;
20     ls->tail=NULL;
21     return ls;
22 }
23 void insertToEnd(list*ls, string newID)
24 {
25     element*ele;
26     ele=new element;
27     ele->ID=newID;
28     ele->next=NULL;
29     if(ls->n==0)
30     {
31         ls->head=ele;
32         ls->tail=ele;
33     }else{
34         ls->tail->next=ele;
35         ls->tail=ele;
36     }
37     ls->n=ls->n+1;
38 }
```

```

38 }
39 void displayList(list*ls)
40 {
41     element*tmp;
42     tmp=ls->head;
43     while(tmp!=NULL)
44     {
45         cout<<tmp->ID<<" ";
46         tmp=tmp->next;
47     }
48 }
49 main()
50 {
51     list*ls;
52     ls=createEmptyList();
53     int n;
54     cout<<"\n\tEnter number Students you want: "; cin>>n;
55     for(int k=0; k<n; k++)
56     {
57         string newID;
58         cout<<"Enter id of student: ";
59         cin>>newID;
60         insertToEnd(ls,newID);
61     }
62     cout<<"\n All id of student "<<endl;
63
64     displayList(ls);
65 }
66

```

"C:\Users\Admin\Desktop\code c++\TP15 linked list\Pr2 venthon,e20191250.exe"

```

Enter number Students you want: 10
Enter id of student: e20001
Enter id of student: e20002
Enter id of student: e20003
Enter id of student: e20004
Enter id of student: e20005
Enter id of student: e20006
Enter id of student: e20007
Enter id of student: e20008
Enter id of student: e20009
Enter id of student: e20010

All id of student
e20001 e20002 e20003 e20004 e20005 e20006 e20007 e20008 e20009 e20010
Process returned 0 (0x0)   execution time : 60.945 s
Press any key to continue.

```

Problem3:

Create a singly linked list that can store integer numbers. Create 4 functions i) create list, ii) add data to end of list, iii) add data to beginning of list, iv) display data in list. Then ...

- Create an empty list
- Add the number 7 to the beginning of the list
- Add 1 to the beginning of the list
- Display all numbers in the list
- Add 0 to the end of the list
- Add the number 4 to the end of the list
- Display all numbers in the list

Start here x Pro3 venthon,e20191250.cpp x

```
1  #include<iostream>
2  using namespace std;
3
4  struct element{
5      int num;
6      element *next;
7  };
8  struct list{
9      int n;
10     element *head;
11     element *tail;
12 };
13
14 list* createEmptyList(){
15     list *ls;
16
17     ls=new list;
18     ls->n=0;
19     ls->head = NULL;
20     ls->tail = NULL;
21
22     return ls;
23 }
24
```

```
25 void insertToEnd(list *ls, int numData){
26     element *ele;
27     ele=new element;
28     ele->num =numData;
29     ele->next=NULL;
30
31     if(ls->n == 0){
32         ls->head=ele;
33         ls->tail=ele;
34     }
35     else{
36         ls->tail->next =ele;
37         ls->tail =ele;
38     }
39     ls->n = ls->n +1;
40 }
41 void insertToBegin(list *ls, int numData){
42     element *tmp;
43     tmp=new element;
44     tmp->num=numData;
45     if (ls->n == 0){
46         tmp->next = NULL;
47         ls->head=tmp;
48         ls->tail=tmp;
49     }
50     else{
51         tmp->next = ls->head;
52         ls->head = tmp;
53     }
54     ls->n = ls->n +1;
55 }
56
```

```

56
57 void displayList(list *ls){
58     element *tmp;
59
60     tmp=ls->head;
61     while(tmp!=NULL){
62         cout<<tmp->num<<" ";
63
64         tmp=tmp->next;
65     }
66
67 }
68
69 main(){
70
71     list *ls;
72     ls = createEmptyList();
73
74     insertToBegin(ls, 1);
75     insertToBegin(ls, 7);
76     displayList(ls);
77     cout<<endl;
78
79     insertToEnd(ls, 0);
80     insertToEnd(ls, 4);
81     displayList(ls);
82
83 }
84

```

"C:\Users\Admin\Desktop\code c++\TP15 linked list\Pro3 venthon,e20191250.exe"

```

7 1
7 1 0 4
Process returned 0 (0x0)   execution time : 0.033 s
Press any key to continue.

```

Problem4:

Create a singly linked list for storing information of students. Each student has id, name, and average score. Then write a program to

- Create a function to ask for information (id, name, average score) for a student then add her/him to the list. The program does not add the student to the list when the input id is already exist in the list.
- Create a function to display information of all students in the list.

start here X Pro4 venthon,e20191250.cpp X

```
1  #include<iostream>
2  using namespace std;
3
4  struct element{
5      string name;
6      string id;
7      float avgscore;
8      element *next;
9  };
10 struct list{
11     int n;
12     element *head;
13     element *tail;
14 };
15
16 list* createEmptyList(){
17     list *ls;
18
19     ls=new list;
20     ls->n=0;
21     ls->head = NULL;
22     ls->tail = NULL;
23
24     return ls;
25 }
26
```

```
27 void insertToEnd(list *ls, string nameData, string idData, float avgscoreData){
28     element *ele;
29     ele=new element;
30     ele->name=nameData;
31     ele->id=idData;
32     ele->avgscore=avgscoreData;
33     ele->next=NULL;
34
35     if(ls->n == 0){
36         ls->head=ele;
37         ls->tail=ele;
38     }
39     else{
40         ls->tail->next =ele;
41         ls->tail =ele;
42     }
43     ls->n = ls->n +1;
44 }
```



```

45 void addAllstudent(list *ls, int n){
46     for(int k=0; k<n; k++){
47     {
48         string id;
49         string name;
50         float avgscore;
51         element*tmp;
52         tmp=ls->head;
53         End:
54         cout<<"\n\tEnter id: ";cin>>id;
55         while(tmp!=NULL)
56         {
57             if(id==tmp->id)
58             {
59                 cout<<"\t ID have to exist\n";
60                 goto End;
61             }
62             tmp=tmp->next;
63         }
64         cout<<"\tEnter your name: ";cin>>name;
65         cout<<"\tEnter AvgScore: ";cin>>avgscore;
66         insertToEnd(ls,name,id,avgscore);
67     }
68 }
69 void displayList(list *ls){
70     element *tmp;
71     tmp=ls->head;
72     cout<<"\tName"<<"\tID"<<"\tAvgScore"<<endl;
73     while(tmp!=NULL){
74         cout<<"\t"<<tmp->name<<"\t"<<tmp->id<<"\t"<<tmp->avgscore<<endl;
75         tmp=tmp->next;
76     }
77 }
78 }
79

```

```

80 main(){
81
82     list *ls;
83     ls = createEmptyList();
84     int option;
85     cout<<"\n\t1.Enter information all student.";
86     cout<<"\n\t2.Display information.";
87     cout<<"\n\t3.Exit.";
88     while(2>0)
89     {
90         cout<<"\n\tEnter option you want 1 to 2: ";cin>>option;
91         if(option==1)
92         {
93             int n;
94             cout<<"\n\tEnter number of student you want: ";cin>>n;
95             addAllstudent(ls, n);
96         }
97         if(option==2)
98         {
99             cout<<"\n";
100             displayList(ls);
101         }
102     }
103 }
104

```

```
1.Enter information all student.
2.Display information.
3.Exit.
Enter option you want 1 to 2: 1

Enter number of student you want: 4

Enter id: e2019
Enter your name: povloy
Enter Avgscore: 80

Enter id: e2020
Enter your name: rathana
Enter Avgscore: 85

Enter id: e2021
Enter your name: hong
Enter Avgscore: 90

Enter id: e2022
Enter your name: jack
Enter Avgscore: 95

Enter option you want 1 to 2: 2

Name    ID      Avgscore
povloy  e2019    80
rathana e2020    85
hong    e2021    90
jack    e2022    95

Enter option you want 1 to 2:
```

Problem5:

Get many numbers from a user and store in a singly linked list. The program asks a user for a number then store in the list. When users input 0, stop asking user for more numbers. Display all data in the list. Find summation of all data in the list and show the result.

art here X Pro4 venthon,e20191250.cpp X Pro5 venthon,e20191250.cpp X

```
1  #include<iostream>
2  using namespace std;
3
4  struct element{
5      int num;
6      element *next;
7  };
8  struct list{
9      int n;
10     element *head;
11     element *tail;
12 };
13
14 list* createEmptyList(){
15     list *ls;
16
17     ls=new list;
18     ls->n=0;
19     ls->head = NULL;
20     ls->tail = NULL;
21
22     return ls;
23 }
24
25 void insertToEnd(list *ls,int numData){
26     element *ele;
27     ele=new element;
28     ele->num=numData;
29     ele->next=NULL;
30
31     if(ls->n == 0){
32         ls->head=ele;
33         ls->tail=ele;
34     }
35     else{
36         ls->tail->next =ele;
37         ls->tail =ele;
38     }
39     ls->n = ls->n +1;
40 }
41
42 void displayList(list *ls){
43     element *tmp;
44     tmp=ls->head;
45     while(tmp!=NULL){
46         cout<<tmp->num<<"\t"<<endl;
47         tmp=tmp->next;
48     }
49 }
50 }
```

```

51  int sumAllnumber(list*ls)
52  {
53      int sum=0;
54      element*tmp;
55      tmp=ls->head;
56      while(tmp!=NULL)
57      {
58          sum=sum+tmp->num;
59          tmp=tmp->next;
60      }
61      return sum;
62  }
63  main()
64  {
65      list*ls;
66      ls=createEmptyList();
67      int n;
68      do{
69          cout<<"Enter number: ";cin>>n;
70          insertToEnd(ls,n);
71      }while(n!=0);
72      cout<<"\n\t Summation all number by input is: "<<sumAllnumber(ls)<<endl;
73  }
74

```

"C:\Users\Admin\Desktop\code c++\TP15 linked list\Pro5 vention,e20191250.exe"

```

Enter number: 1
Enter number: 2
Enter number: 3
Enter number: 4
Enter number: 5
Enter number: 0

```

Summation all number by input is: 15

```

Process returned 0 (0x0)   execution time : 26.721 s
Press any key to continue.

```