Data Structure

Course code: CSE134

Instructor

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Topic: Deletion, Search, Counting

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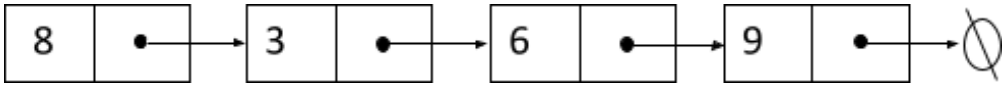
Spring-2021

a) Consider the following linklist:



The "Node" contains integer data member "info" and a pointer member "link". Write function for the following operation:

1) Find a data item in the list, and then insert a newnode next to it.

2) Delete a node from the nth position of the list.

Solution of (1):

```
#include<stdio.h>

struct node

{

   int info;
```

```
    struct node *link;
};
typedef struct node node;
node *head;
void display();
void search_data(int key);
void insert_end();
int main()
{
    node *node2, *node3, *node4;
    head = (node*)malloc(sizeof(node));
    node2 = (node*)malloc(sizeof(node));
    node3 = (node*)malloc(sizeof(node));
    node4 = (node*)malloc(sizeof(node));

    head->info = 8;
    head->link = node2;

    node2->info = 3;
    node2->link = node3;
```

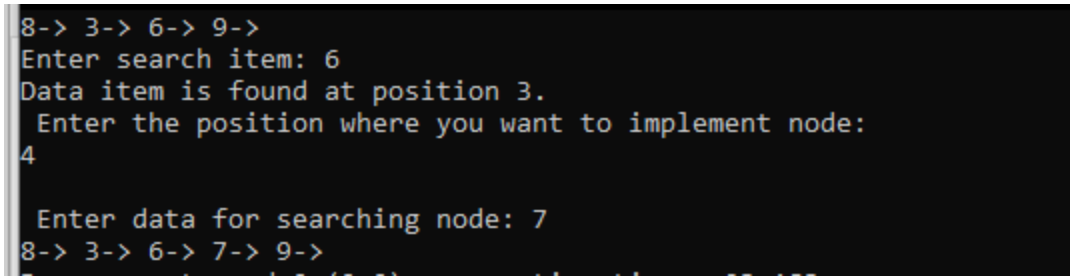
```
    node3->info = 6;
    node3->link = node4;

    node4->info = 9;
    node4->link = NULL;

    display();
    int key;
    printf("\nEnter search item: ");
    scanf("%d", &key);
    search_data(key);

    insert_end();
    display();
    return 0;
}
```

void insert_end()

```
{
    int pos, i;
    node *temp, *newNode, *prev, *current;
    newNode = (node*) malloc (sizeof(node));
```

```
    temp = head;
    printf("\n Enter the position where you want to implement node: \n");
    scanf("%d",&pos);
    printf("\n Enter data for searching node: ");
    scanf("%d",&newNode->info);
    for(i=1; i<pos; i++)
    {
        prev = temp;
        current = temp->link;
        temp = temp->link;
    }
    newNode->link = current;
    prev->link = newNode;
}
void display()
{
    node *temp;
    temp = head;
    while(temp!= NULL)
    {
        printf("%d-> ", temp->info);
```

```
        temp = temp->link;
    }
}
void search_data(int key)
{
    int  pos=1;
    node *temp;
    temp = head;
    while(temp != NULL)
    {
        if(key == temp->info)
        {
            printf("Data item is found at position %d.", pos);
            break;
        }
        temp = temp->link;
        pos++;
    }
}
```



Solution of (2):

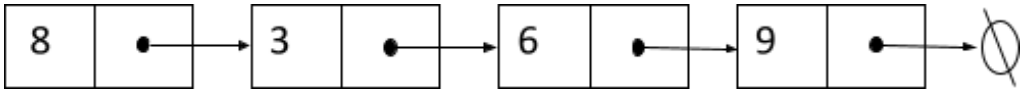
```
#include<stdio.h>
struct node
{
   int info;
   struct node *link;
};
typedef struct node node;
node *head;
void display();

int main()
{
   node *node2, *node3, *node4;
   head = (node*)malloc(sizeof(node));
```

```
node2 = (node*)malloc(sizeof(node));

node3 = (node*)malloc(sizeof(node));

node4 = (node*)malloc(sizeof(node));


head->info = 8;

head-> link = node2;

node2->info = 3;

node2-> link = node3;

node3->info = 6;

node3-> link = node4;

node4->info = 9;

node4-> link = NULL;


display();

int pos;

node *temp, *prev, *current;

printf("\nEnter position you want to delete: ");

scanf("%d", &pos);

temp = head;

for(int i=1; i<pos; i++){

   prev = temp;
```

```
        current = temp-> link;
        temp = temp-> link;
    }
    prev-> link = current-> link;
    free(current);
     display();
    return 0;
}
void display()
{
    node *temp;
    temp = head;
    while(temp!= NULL)
    {
        printf("%d-> ", temp->info);
        temp = temp-> link;
    }
}
```

```
8-> 3-> 6-> 9->
Enter position you want to delete: 3
8-> 3-> 9->
```

Spring-2022



The “Element” contains integer data member “information” and a pointer member “link”. Write the function for the following operation—

1. Find a data item in the list.

Solution:

```
#include<stdio.h>

struct node

{

   int information;

   struct node * link;

};

typedef struct node node;

node *head;

void display();


int main()

{

   node *node2, *node3, *node4;

   head = (node*)malloc(sizeof(node));
```

```
node2 = (node*)malloc(sizeof(node));

node3 = (node*)malloc(sizeof(node));

node4 = (node*)malloc(sizeof(node));


head-> information = 8;

head-> link = node2;

node2-> information = 3;

node2-> link = node3;

node3-> information = 6;

node3-> link = node4;

node4-> information = 9;

node4-> link = NULL;


display();

int pos;

node *temp, *prev, *current;

printf("\nEnter position you want to delete: ");

scanf("%d", &pos);

temp = head;

for(int i=1; i<pos; i++){

   prev = temp;
```

```
        current = temp-> link;
        temp = temp-> link;
    }
    prev-> link = current-> link;
    free(current);
     display();
    return 0;
}
void display()
{
    node *temp;
    temp = head;
    while(temp!= NULL)
    {
        printf("%d-> ", temp-> information);
        temp = temp->link;
    }
}
```

```
8-> 3-> 6-> 9->
Enter position you want to delete: 3
8-> 3-> 9->
```

Fall-2020

//Deletion and counting.....

3(b):

To prove your skills, create a Linked List with n Nodes and insert 10 in the list also. DataSoft Ltd. Doesn't like odd numbers. So, delete the odd numbers and show them how many nodes in the link exists. (*n= length of your student id*)

Solution:

```
#include<stdio.h>

struct node

{

   int data;

   struct node *next;

};

typedef struct node node;

node *head;

void createNode(int n);

void display();

void delete_odd();

void insert();

int main()

{
```

```
    int n;
    printf("Enter Your id length for link list size: ");
    scanf("%d", &n);

    createNode(n);
    insert();
    display();
    delete_odd();
    printf("\nAfter deleting odd number");
    display();

    int nodeCount = countNodes();
    printf("\nNumber of nodes in the linked list: %d\n", nodeCount);
    return 0;
}
void delete_odd()
{
    node *temp, *prev, *current;
    temp = head;
    prev = temp;
    current  = temp->next;
```

```
    while (current != NULL)
    {
        if (current->data % 2 != 0)
        {
            prev->next = current->next;
            temp = current;
            current = current->next;
            free(temp);
        }
        else
        {
            prev = current;
            current = current->next;
        }
    }
}
int countNodes()
{
    int count = 0;
    node *temp;
    temp = head;
```

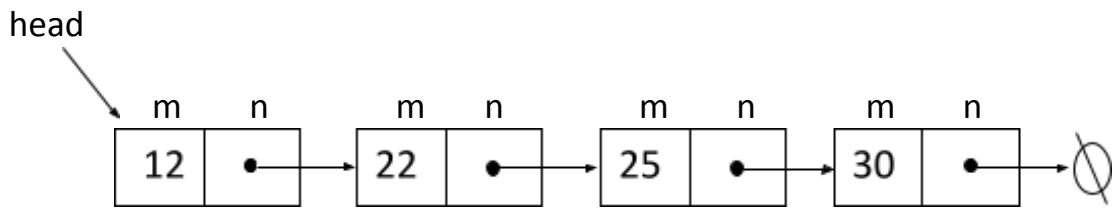
```
    while (temp != NULL)
    {
        count++;
        temp  = temp->next;
    }
    return count;
}
void insert()
{
    node *newNode;
    newNode = (node*) malloc(sizeof(node));
    newNode->data = 10;
    newNode->next = head;
    head = newNode;
}
void createNode(int n)
{
    head = (node*) malloc (sizeof(node));
    printf("Enter data for node 1: ");
    scanf("%d", &head->data);
    head->next = NULL;
```

```
    node *temp, *newNode;
    temp = head;
    for(int i=2; i<=n; i++)
    {
        newNode = (node*) malloc (sizeof(node));
        printf("Enter data for node %d: ",i);
        scanf("%d", &newNode->data);
        newNode->next=NULL;
        temp->next = newNode;
        temp = temp->next;
    }
}
void display()
{
    printf("\n");
    node *temp;
    temp = head;
    while(temp!= NULL)
    {
        printf("%d-> ", temp->data);
```

```
        temp = temp->next;
    }
}
```

```
Enter Your id length for link list size: 9
Enter data for node 1: 1
Enter data for node 2: 2
Enter data for node 3: 3
Enter data for node 4: 4
Enter data for node 5: 5
Enter data for node 6: 6
Enter data for node 7: 7
Enter data for node 8: 8
Enter data for node 9: 9

10-> 1-> 2-> 3-> 4-> 5-> 6-> 7-> 8-> 9->
After deleting odd number
10-> 2-> 4-> 6-> 8->
Number of nodes in the linked list: 5
```

Fall-2022



2(a). Construct a function to find a data item in the list and insert a new node after it.

Solution:

```
#include<stdio.h>

struct node

{

    int m;
```

```
    struct node *n;
};
typedef struct node node;
node *head;
void display();
void search_data(int key);
void insert_end();
int main()
{
    node *node2, *node3, *node4;
    head = (node*)malloc(sizeof(node));
    node2 = (node*)malloc(sizeof(node));
    node3 = (node*)malloc(sizeof(node));
    node4 = (node*)malloc(sizeof(node));

    head->m = 12;
    head->n = node2;
    node2->m = 22;
    node2->n = node3;
    node3->m = 25;
    node3->n = node4;
```

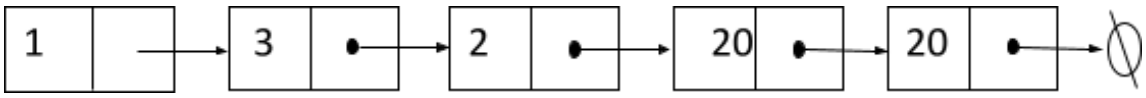
```
    node4->m = 30;
    node4->n = NULL;

    display();
    int key;
    printf("\nEnter search item: ");
    scanf("%d", &key);
    search_data(key);

    insert_end();
    display();
    return 0;
}
void insert_end()
{
    node *temp, *newNode;
    newNode = (node*) malloc (sizeof(node));
    printf("Enter the data for last node: ");
    scanf("%d", &newNode->m);
    newNode->n = NULL;
    temp = head;
```

```
    while(temp->n != NULL)
    {
        temp = temp->n;
    }
    temp->n = newNode;
}
void display()
{
    node *temp;
    temp = head;
    while(temp!= NULL)
    {
        printf("%d-> ", temp->m);
        temp = temp->n;
    }
}
void search_data(int key)
{
    int  pos=1;
    node *temp;
    temp = head;
```

```
    while(temp != NULL)
    {
        if(key == temp->m)
        {
            printf("\nData item is found at position %d.\n\n", pos);
            break;
        }
        temp = temp->n;
        pos++;
    }
}
```

```
12-> 22-> 25-> 30->
Enter search item: 25

Data item is found at position 3.

Enter the data for last node: 35
12-> 22-> 25-> 30-> 35->
```

Summer-2020



2(c). Delete the last Node of the link list.

2(d). Count how many Nodes in the link list.

Solution-2(c):

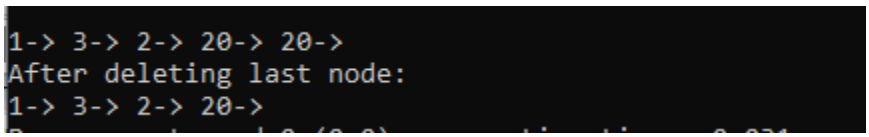
```
#include<stdio.h>
struct node
{
   int info;
   struct node *next;
};
typedef struct node node;
node *head;
void display();
void delete_end();
int main()
{
   node *second, *third, *fourth, *fifth;
   head = (node*)malloc(sizeof(node));
   second = (node*)malloc(sizeof(node));
   third = (node*)malloc(sizeof(node));
   fourth= (node*)malloc(sizeof(node));
   fifth = (node*)malloc(sizeof(node));

   head->info = 1;
```

```
    head->next = second;
    second->info = 3;
    second->next = third;
    third->info = 2;
    third->next = fourth;
    fourth->info = 20;
    fourth->next = fifth;
    fifth->info = 20;
    fifth->next = NULL;

    display();
    delete_end();
    printf(“\nAfter deleting last node: ”);
    display();
    return 0;
}
void display()
{
    printf("\n");
    node *temp;
    temp = head;
```

```
    while(temp!= NULL)
    {
        printf("%d-> ", temp->info);
        temp = temp->next;
    }
}
```

void delete_end()

```
{
    node *temp, *prev;
    temp = head;
    while(temp->next != NULL)
    {
        prev = temp;
        temp = temp->next;
    }
    prev->next = NULL;
    free(temp);
}
```



Solution-2(d):

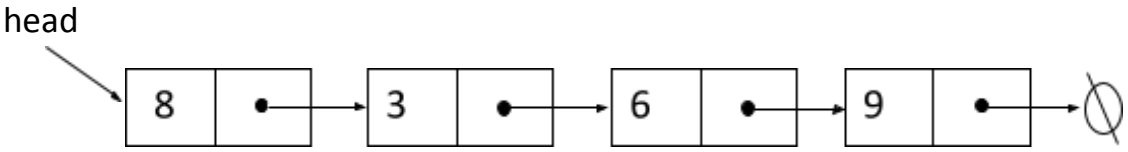
```
#include<stdio.h>
struct node
{
   int info;
   struct node *next;
};
typedef struct node node;
node *head;
void display();
void count();
int main()
{
   node *second, *third, *fourth, *fifth;
   head = (node*)malloc(sizeof(node));
   second = (node*)malloc(sizeof(node));
   third = (node*)malloc(sizeof(node));
   fourth= (node*)malloc(sizeof(node));
   fifth = (node*)malloc(sizeof(node));
```

```
    head->info = 1;
    head->next = second;
    second->info = 3;
    second->next = third;
    third->info = 2;
    third->next = fourth;
    fourth->info = 20;
    fourth->next = fifth;
    fifth->info = 20;
    fifth->next = NULL;

    display();
    count();
    return 0;
}
void count()
{
    int count =0;
    node *temp;
    temp = head;
    while(temp != NULL)
```

```
    {
        temp = temp->next;
        count++;
    }
    printf("\nTotal Number of node is %d\n", count);
}
void display()
{
    printf("\n");
    node *temp;
    temp = head;
    while(temp!= NULL)
    {
        printf("%d-> ", temp->info);
        temp = temp->next;
    }
}
```

```
1-> 3-> 2-> 20-> 20->
Total Number of node is 5
```

Summer-2021



(a). The “Node” contains integer data member “your first name” and a pointer member “your last name”. Write the function to find a data item in the list, and then insert a new node before of it.

Solution:

```
#include<stdio.h>

struct node

{

   int mehedi;

   struct node *saim;

};

typedef struct node node;

node *head;

void display();

void search_data(int key);

int main()

{

   node *node2, *node3, *node4;

   head = (node*)malloc(sizeof(node));

   node2 = (node*)malloc(sizeof(node));
```

```
node3 = (node*)malloc(sizeof(node));
node4 = (node*)malloc(sizeof(node));

head->mehedi = 8;
head->saim = node2;
node2->mehedi = 3;
node2->saim = node3;
node3->mehedi = 6;
node3->saim = node4;
node4->mehedi = 9;
node4->saim = NULL;

display();
int key;
printf("\nEnter search item: ");
scanf("%d", &key);
search_data(key);

insert_before();
display();
return 0;
```

```
}
void display()
{
   node *temp;
   temp = head;
   while(temp!= NULL)
   {
      printf("%d-> ", temp->mehedi);
      temp = temp->saim;
   }
}
void search_data(int key)
{
   int  pos=1;
   node *temp;
   temp = head;
   while(temp != NULL)
   {
      if(key == temp->mehedi)
      {
         printf("Data item is found at position %d.", pos);
```

```
            break;
        }
        temp = temp->saim;
        pos++;
    }
}
void insert_before()
{
    int pos, i;
    node *temp, *newNode, *prev, *current;
    newNode = (node*) malloc (sizeof(node));
    printf("\nEnter the position where you want to implement node: ");
    scanf("%d",&pos);

    printf("\nEnter data for newNode: ");
    scanf("%d",&newNode->mehedi);
    temp = head;
    for(i=0; i<pos; i++)
    {
        prev = temp;
        current = temp->saim;
```

```
        temp = temp->saim;
    }
    newNode->saim = current;
    prev->saim = newNode;
}
```

```
8-> 3-> 6-> 9->
Enter search item: 6
Data item is found at position 3.
Enter the position where you want to implement node: 2

Enter data for newNode: 5
8-> 3-> 5-> 6-> 9->
```