**Exercise 10: Write a program to implement following operations on the doubly linked list. (a) Insert a node at the front of the linked list. (b) Insert a node at the end of the linked list. (c) Delete a last node of the linked list. (d) Delete a node before specified position.**

#include <stdio.h>

#include <stdlib.h>

struct node

{

struct node \*prev;

int n;

struct node \*next;

}\*h,\*temp,\*temp1,\*temp2,\*temp4;

void insert1();

void insert2();

void insert3();

void traversebeg();

void traverseend(int);

void sort();

void search();

void update();

void delete();

int count = 0;

void main()

{

int ch;

h = NULL;

temp = temp1 = NULL;

printf("\n 1 - Insert at beginning");

printf("\n 2 - Insert at end");

printf("\n 3 - Insert at position i");

printf("\n 4 - Delete at i");

printf("\n 5 - Display from beginning");

printf("\n 6 - Display from end");

printf("\n 7 - Search for element");

printf("\n 8 - Sort the list");

printf("\n 9 - Update an element");

printf("\n 10 - Exit");

while (1)

{

printf("\n Enter choice : ");

scanf("%d", &ch);

switch (ch)

{

case 1:

insert1();

break;

case 2:

insert2();

break;

case 3:

insert3();

break;

case 4:

delete();

break;

case 5:

traversebeg();

break;

case 6:

temp2 = h;

if (temp2 == NULL)

printf("\n Error : List empty to display ");

else

{

printf("\n Reverse order of linked list is : ");

traverseend(temp2->n);

}

break;

case 7:

search();

break;

case 8:

sort();

break;

case 9:

update();

break;

case 10:

exit(0);

default:

printf("\n Wrong choice menu");

}

}

}

/\* TO create an empty node \*/

void create()

{

int data;

temp =(struct node \*)malloc(1\*sizeof(struct node));

temp->prev = NULL;

temp->next = NULL;

printf("\n Enter value to node : ");

scanf("%d", &data);

temp->n = data;

count++;

}

/\* TO insert at beginning \*/

void insert1()

{

if (h == NULL)

{

create();

h = temp;

temp1 = h;

}

else

{

create();

temp->next = h;

h->prev = temp;

h = temp;

}

}

/\* To insert at end \*/

void insert2()

{

if (h == NULL)

{

create();

h = temp;

temp1 = h;

}

else

{

create();

temp1->next = temp;

temp->prev = temp1;

temp1 = temp;

}

}

/\* To insert at any position \*/

void insert3()

{

int pos, i = 2;

printf("\n Enter position to be inserted : ");

scanf("%d", &pos);

temp2 = h;

if ((pos < 1) || (pos >= count + 1))

{

printf("\n Position out of range to insert");

return;

}

if ((h == NULL) && (pos != 1))

{

printf("\n Empty list cannot insert other than 1st position");

return;

}

if ((h == NULL) && (pos == 1))

{

create();

h = temp;

temp1 = h;

return;

}

else

{

while (i < pos)

{

temp2 = temp2->next;

i++;

}

create();

temp->prev = temp2;

temp->next = temp2->next;

temp2->next->prev = temp;

temp2->next = temp;

}

}

/\* To delete an element \*/

void delete()

{

int i = 1, pos;

printf("\n Enter position to be deleted : ");

scanf("%d", &pos);

temp2 = h;

if ((pos < 1) || (pos >= count + 1))

{

printf("\n Error : Position out of range to delete");

return;

}

if (h == NULL)

{

printf("\n Error : Empty list no elements to delete");

return;

}

else

{

while (i < pos)

{

temp2 = temp2->next;

i++;

}

if (i == 1)

{

if (temp2->next == NULL)

{

printf("Node deleted from list");

free(temp2);

temp2 = h = NULL;

return;

}

}

if (temp2->next == NULL)

{

temp2->prev->next = NULL;

free(temp2);

printf("Node deleted from list");

return;

}

temp2->next->prev = temp2->prev;

if (i != 1)

temp2->prev->next = temp2->next; /\* Might not need this statement if i == 1 check \*/

if (i == 1)

h = temp2->next;

printf("\n Node deleted");

free(temp2);

}

count--;

}

/\* Traverse from beginning \*/

void traversebeg()

{

temp2 = h;

if (temp2 == NULL)

{

printf("List empty to display \n");

return;

}

printf("\n Linked list elements from begining : ");

while (temp2->next != NULL)

{

printf(" %d ", temp2->n);

temp2 = temp2->next;

}

printf(" %d ", temp2->n);

}

/\* To traverse from end recursively \*/

void traverseend(int i)

{

if (temp2 != NULL)

{

i = temp2->n;

temp2 = temp2->next;

traverseend(i);

printf(" %d ", i);

}

}

/\* To search for an element in the list \*/

void search()

{

int data, count = 0;

temp2 = h;

if (temp2 == NULL)

{

printf("\n Error : List empty to search for data");

return;

}

printf("\n Enter value to search : ");

scanf("%d", &data);

while (temp2 != NULL)

{

if (temp2->n == data)

{

printf("\n Data found in %d position",count + 1);

return;

}

else

temp2 = temp2->next;

count++;

}

printf("\n Error : %d not found in list", data);

}

/\* To update a node value in the list \*/

void update()

{

int data, data1;

printf("\n Enter node data to be updated : ");

scanf("%d", &data);

printf("\n Enter new data : ");

scanf("%d", &data1);

temp2 = h;

if (temp2 == NULL)

{

printf("\n Error : List empty no node to update");

return;

}

while (temp2 != NULL)

{

if (temp2->n == data)

{

temp2->n = data1;

traversebeg();

return;

}

else

temp2 = temp2->next;

}

printf("\n Error : %d not found in list to update", data);

}

/\* To sort the linked list \*/

void sort()

{

int i, j, x;

temp2 = h;

temp4 = h;

if (temp2 == NULL)

{

printf("\n List empty to sort");

return;

}

for (temp2 = h; temp2 != NULL; temp2 = temp2->next)

{

for (temp4 = temp2->next; temp4 != NULL; temp4 = temp4->next)

{

if (temp2->n > temp4->n)

{

x = temp2->n;

temp2->n = temp4->n;

temp4->n = x;

}

}

}

traversebeg();

}