Data Structures and its Applications

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DATA STRUCTURES AND ITS APPLICATIONS

Stacks – Linked List Implementation

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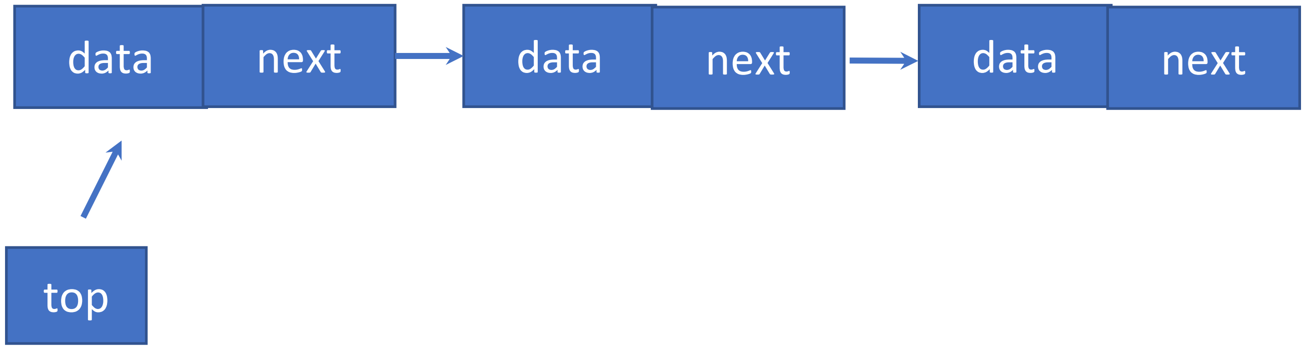
Stacks – linked list implementation

- A stack can be easily implemented through the linked list. In the Implementation by a linked list, the stack contains a top pointer. which is "head" of the stack. The pushing and popping of items happens at the head of the list.



Structure of the stack

```
struct node
{
  int data;
  struct node *next;
 }
struct node *top
top=NULL;
```

Stacks – linked list implementation

Note :

- Items of the stack represented as the linked list.
- Each item is a node
- Top is a pointer that points to the first node (top of the stack)
- Top is initially NULL (Empty stack)
- Insertion and deletion happens at the front of the list
- stack size is not limited.

Operations on the stack

- Push : Inserting an element at the front of the list
- Pop : delete an element from the front of the list
- Display : displaying the list

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```
//implements the push operation
void push(int x, struct node **top)
  {
       struct node *temp;
       temp=(struct node*)malloc(sizeof(struct node));
       temp->data=x;
       temp->next=*top; // insert in front of the list
       *top=temp; // make top points to the new top node
   }
```

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Stacks – linked list implementation

```
//implements the pop operation
//returns top element, -1 if stack is empty
int pop(struct node **top)
    {
         int x;
        struct node *q;

        if(*top==NULL)
         {
           printf("Empty Stack\n");
            return -1;
          }
//implements the pop operation

else
          {
            q=*top;
             x=q->data; // get the top element
            *top=q->next; // make top point to the next top
            free(q); // free the memory of the node
             return(x);
           }
     }
```

```
//implements the display  operation
void display(struct node *top)
    {
       if(top==NULL)
         printf("Empty Stack\n");
       else
        {
          while(top!=NULL)
          {
            printf("%d->“,top->data);
            top=top->next;
           }
         }
     }
```

Another representation of structure of stack

```
struct node
{
  int data;
  struct node *next;
};
struct stack
{
   struct node *top;
}

struct stack s;
s.top=NULL;
```

Stacks – linked list implementation

```
//implements the push operation
void push(int x, struct node * s)
//s is pointer to structure stack
  {
       struct node *temp;
       temp=(struct node*)malloc(sizeof(struct node));
       temp->data=x;
       temp->next=s->top; // insert in front of the list
       s->top=temp; // make top points to the new top node
   }
```

Stacks – linked list implementation

```
//implements the pop operation
//returns top element, -1 if stack is empty
int pop(struct node *s)
    {
         int x;
        struct node *q;

        if(s->top==NULL)
         {
           printf("Empty Stack\n");
            return -1;
          }
```

//implements the pop operation

```
else
        {
          q=s->top;
           x=q->data; // get the top element
          s->top=q->next; // make top point to the next top
          free(q); // free the memory of the node
           return(x);
         }
    }
```

```
//implements the display  operation
void display(struct node *s)
     {
         struct node *q;
         if(s->top==NULL)
           printf("Empty Stack\n");
         else
          {
            q=s->top;
            while(q!=NULL)
            {
              printf("%d->“,q->data);
              top=q->next;
             }
           }
      }
```

Write an Algorithm to reverse a string

```
//prints the text in a reverse order
reverse(t)
{
  i=0;
 //push all the characters on to the stack
  while(t[i]!='\0')
  {
     push(s,t[i]);
     i=i+1;
  }
```

Stacks – Application

pop all the characters from the stack until the stack is empty

```
while(!empty(s))
 {
    x= pop(s);
    print(x)
   }
}
```

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THANK YOU

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