

DataStructure

October 1, 2019

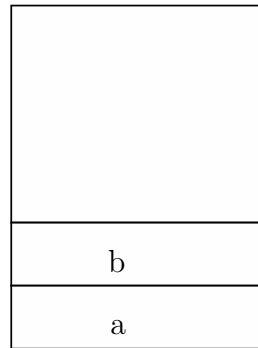
1 Stack

This is a famous example of using STACK as a DataStructure, mainly, Evaluation of different expressions.

- infix $a/b-c+d*e-a*c$
- postfix $ab/c-de*+ac*-$
- prefix $-+-/abc*de*ac$

1.1 Evaluate Prefix Expression Using Stack

a b / c - d e * + a c * -



Take every element to the stack, and evaluate whenever operation comes.

2 Queue

Queue has FIFO structure, that is, first element that got in get to go out first.

- **Objects** : a finite ordered list of elements
- Functions
 - Queue Create(max size)
 - Boolean IsFull(Queue *Q)
 - Boolean IsEmpty(Queue *Q)
 - Boolean Add(Queue *Q, Element)
 - Boolean Delete(Queue *Q, Element)

- null

```
Queue Create(100)
typedef struct{
    int item[100];
    int front = -1;
    int rear = -1
} Queue;
Queue Q;
Isfull(&Q);
```

```
boolean Is Full(Queue *pQ){
return (pQ-> rear == 99);
}
```

```
boolean IsEmpty(Queue *pQ){
return()
}
```

3 Binary Search Tree

Problem: Given x and $S[1,2,\dots,n]$, find an index k such that $S[k] = x$

* An array S has items in sorted order.

Example code:

```
index bs(index low index high)
{
    index min;
    if(low > high) return 0; //ending condition
    else {
        mid = (low + high) /2
        if ( x == S[mid]) return mid;
        else if (x < S[mid]) return bs[low,mid-1];
        else return bs(mid+1 , high);
    }
}
```

Time Complexity:

- - worst case: $x|$ does not exist.
- recurrence relation with $n = 2^k$.

$$\begin{cases} W(n) &= W(n/2) + a \\ W(1) &= a \end{cases}$$