DSME

Queue

Data Structures Made Easy

DUBLIN CITY UNIVERSITY

Contents

1. ***Definition***

A queue is a non-linear data structure that implements the addition of new elements and the deletion of existing elements within the queue. Deletion of an element involves removing the elements from the front of the queue. A queue inherits the FIFO (First In First Out) order.

There are two types of queues:

- **Bounded Queue**: A queue that has a maximum size implemented upon it. It contains a sequence of objects that increments and decrements at one end of the queue only.

- **Unbounded Queue:** Similar to a bounded queue, but there is no bound on the queue size.

2. ***Implementation***

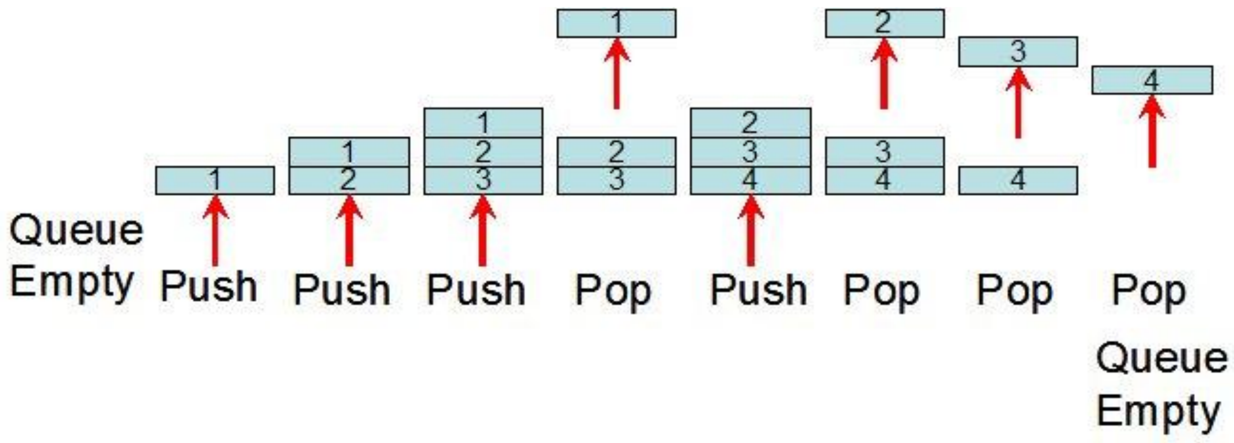
A queue works as follows:

1. Specify the type of data that is desired to be stored.

2. Insert the elements into the queue.

3. Retrieve the element at the front of the queue. That element was originally inserted first into the queue before other elements.

3. ***Example***



4. ***Functions***

The implementation of a queue involves the following functions

- **Queue<Object>()**
  This constructor creates an empty queue that holds the object type, which is specified upon the creation of the queue.

- **enq(Object obj)**
  This enqueue function inserts an object at the back of the queue.

- **deq()**
  This dequeue function is used to remove the object from the front of the queue.

5. ***Bounded Queue Pseudocode***

```
function enq ( T t ){

    if size of array >= length of sequence_1
        sequence_2 = new sequence [ length of sequence_1 * 2 ]
        copy sequences
        sequence_1 = sequence_2

    sequence [ tail ] = t
    tail = tail + 1 mod length of sequence
    increment size
}

function deq (){

    if size is 0
        return
    else
        temporary = sequence [ head ]
        head = head + 1 mod length of sequence
        decrement size
        return temp
}
```

6. ***Unbounded Queue Pseudocode***

```
class Node < T >{

    T item
    Node null

    constructor Node
}

function enq ( T t ){

    new Node

    if tail != null
        tail.next = node
    else
        head = node

    tail = node
}

function deq (){

    if size is 0
        return

    T = head.item
    head = head.Node
    return
}
```

6. ***Complexity***

The only considerations to be made in relation to the complexity of a queue are the operations it performs. The operations of enqueue and dequeue possess a time complexity of O(1) on average.

7. ***Advantages of Queues***

A queue is considered to be a data structure that is easy to implement. A strong advantage of using a queue is that they are used to prioritise operations in operating systems, such as categorizing data for various simulations.

8. ***Disadvantages of Queues***

A queue is considered to be of minimal use when compared to other optimal data structures. Based on the structure of queues, they suffer from slow access to other items, which can increase the computational time of the application.

9. ***References***

Morris J. 1998. *Queues* [Online]. Available from:
http://www.cs.auckland.ac.nz/~jmor159/PLDS210/queues.html

Robert C. 2013. *The Advantages of a Queue in Data Structure* [Online]. Available from:
http://www.ehow.com/info_8763624_advantages-queue-data-structure.html