



Full Stack Software Development

Course: Data Structures and Algorithm

Lecture On: Queues



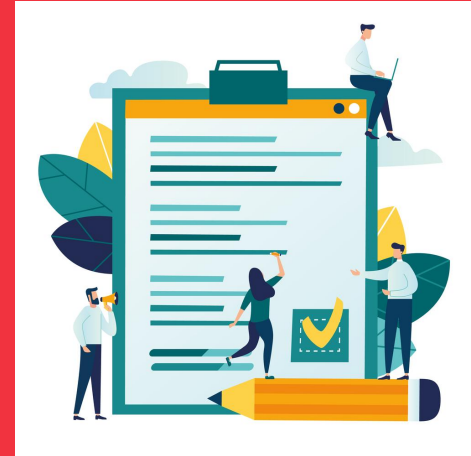
Full Stack Software Development

Course: Data Structures and Algorithm

Lecture On: Queues

In the previous class, we covered....

- Stacks



Homework Discussion

1. Write a program that would reverse a stack

Today's Agenda

1 Queues



Poll 1 (15 Sec.)

Stack is a First In First Out(FIFO) type of data structure?

1. True
2. False

Poll 1 (Answer)

Stack is a First In First Out(FIFO) type of data structure?

1. True
2. False



Queue

The Queue data structure is similar to that of a Stack. Queue is a restricted form of an Array. As the name suggests, the data in the data structure acts like a queue, just like the ones we see all around us, be it a ticket counter outside a cinema, entry queues to a concert, etc.

As we can understand, the person who is at the beginning of the queue will be the one who gets service and leaves the queue first. The last person, unfortunately, has to wait for everyone else to be serviced first.



Queue

Queue

To put it a bit more formally, we can only insert data at the **'rear'** of the queue and take data out from the **'front'** of the Queue. These operations are known as **'enqueue'** (inserting data) and **'dequeue'** (taking data out). Just like Stacks, at any given time, we can access only one data element in the data structure.

Queues are known as a **'FIFO'** data structure, which stands for **'First In, First Out'**. As the name suggests, the data element that is 'first in' will be the one that will be 'first out' of the data structure.

Poll 2 (15 Sec.)

Which of the following is a FIFO/LILO data structure?

1. Queue
2. Stack
3. Array
4. Linked List

Poll 2 (Answer)

Which of the following is a FIFO/LILO data structure?

1. **Queue**
2. Stack
3. Array
4. Linked List

Array Implementation

Just like Stacks, Queues can be implemented using Arrays or Linked Lists. We will be exploring the implementation of Queues using Arrays here.

The implementation will almost be the same as that of a Stack. However, for Queues, we will have to keep track of not the 'top' but the 'front' and the 'rear' of the data structure. At the start, we will be initialising both the trackers ('front' and 'rear') with a value of -1.

As we have seen, Queues support the following two operations:

- **enqueue:** We would add data to the 'rear' of the queue and update the necessary tracker.
- **dequeue:** We would remove data from the 'front' of the queue and update the necessary tracker.

Poll 3 (15 Sec.)

While performing enqueue operation, we remove the data from the 'rear' of the queue and update the necessary tracker.

1. True
2. False

Poll 3 (Answer)

While performing enqueue operation, we remove the data from the 'rear' of the queue and update the necessary tracker.

1. True

2. **False**

Poll 4 (15 Sec.)

While performing dequeue operation, we remove the data from the 'front' of the queue and update the necessary tracker.

1. True
2. False

Poll 4 (Answer)

While performing dequeue operation, we remove the data from the 'front' of the queue and update the necessary tracker.

1. True

2. False

Hands-on Coding

- [Write a program to implement Queue using Array](#)
- [Write a program to implement Queue using Singly Linked List.](#)

Poll 5 (15 Sec.)

What is the time complexity of *enqueue* operation in a queue implemented using singly linked list?

1. $O(n)$
2. $O(1)$
3. $O(\log n)$
4. $O(n^2)$

Poll 5 (Answer)

What is the time complexity of *enqueue* operation in a queue implemented using singly linked list?

1. $O(n)$
2. **$O(1)$**
3. $O(\log n)$
4. $O(n^2)$

Poll 6 (15 Sec.)

What is the time complexity of *dequeue* operation in a queue implemented using singly linked list?

1. $O(n)$
2. $O(1)$
3. $O(\log n)$
4. $O(n^2)$

Poll 6 (Answer)

What is the time complexity of *dequeue* operation in a queue implemented using singly linked list?

1. $O(n)$
2. **$O(1)$**
3. $O(\log n)$
4. $O(n^2)$

Poll 7 (15 Sec.)

Which of the following is expected to have a constant time complexity?

1. `pop()` in stack implemented using linked list
2. `enqueue()` in queue implemented using linked list
3. Adding element at the beginning of singly linked list
4. All of the above

Poll 7 (Answer)

Which of the following is expected to have a constant time complexity?

1. pop() in stack implemented using linked list
2. enqueue() in queue implemented using linked list
3. Adding element at the beginning of singly linked list
4. **All of the above**

Hands-on Coding

Write programs to:

- [Implement Stack using Queues.](#)
- [Implement Queue using Stacks.](#)
- [Sort a Queue](#)

Poll 8 (15 Sec.)

Stack can be implemented using which of the following data structure/s?

1. Array
2. Linked List
3. Queue
4. All of the above

Poll 8 (Answer)

Stack can be implemented using which of the following data structure/s?

1. Array
2. Linked List
3. Queue
4. **All of the above**

Poll 9 (15 Sec.)

Queue can be implemented using which of the following data structure/s?

1. Array
2. Linked List
3. Stack
4. All of the above

Poll 9 (Answer)

Queue can be implemented using which of the following data structure/s?

1. Array
2. Linked List
3. Stack
4. **All of the above**

Homework

1. Reverse a queue

Tasks to complete after the session

| |
|------------------|
| Homework |
| MCQs |
| Coding Questions |

In the next class...

- Strings



Thank You!