Stack and Queue

Overview

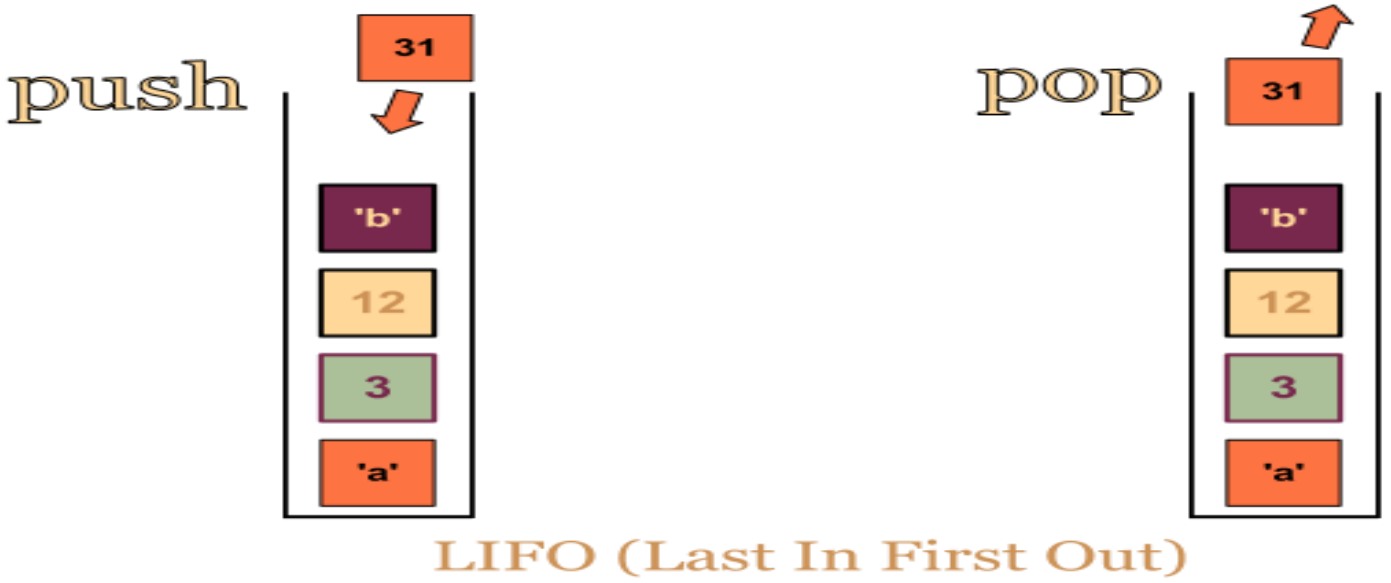
- *what is stack ?*
- *Stack in Programming.*
- *Basic operations of stack(Pushing, popping etc.)*
- *Implementation of Stacks*
- *Queue Definition*
- *Basic operations of queue*
  Enqueuing, dequeuing etc.
- *Implementation of queue*

Stack Overview

- *Stack Definition*
- *what is stack ?*
- *Condition of stack.*
- *Stack in Programming.*
- *Basic operations of stack(Pushing, popping etc.)*
- *Implementation of Stacks*

Stack Definition

We know that the Stack is LIFO Structure i,e Last in First Out. It is very useful data structure in C Programming. Stack can be implemented using the Linked List or Array.



Condition of stack

1.Stack is LIFO Structure ***[Last in First Out]***

2.Stack is Ordered List of ***Elements of Same Type****.*

3.Stack is Linear List

4.In Stack all Operations such as ***Insertion and Deletion*** *are permitted at only one end called* ***Top***

Stack in Programming

Similar is the idea of stack in Programming

1.You can add an element onto the stack.

2. You can remove the top most element.

3. You can see the top most element.

Fundamental operations

Push: Equivalent to an insert
Pop: Deletes the most recently inserted element
Top: Examines the most recently inserted element

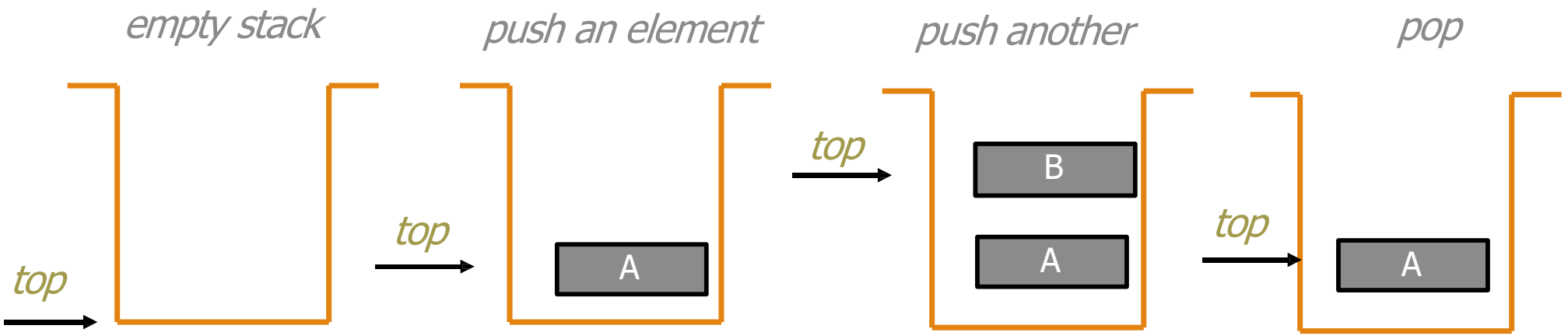
Push and Pop

Push

Add an element to the top of the stack

Pop

Remove the element at the top of the stack



Implementation of Stacks

- *Any list implementation could be used to implement a stack*
  - *Arrays (static: the size of stack is given initially)*
  - *Linked lists (dynamic: never become full)*

- *We will explore implementations based on array*
- *Let's see how to use an array to implement a stack first*

Array Implementation of Stack

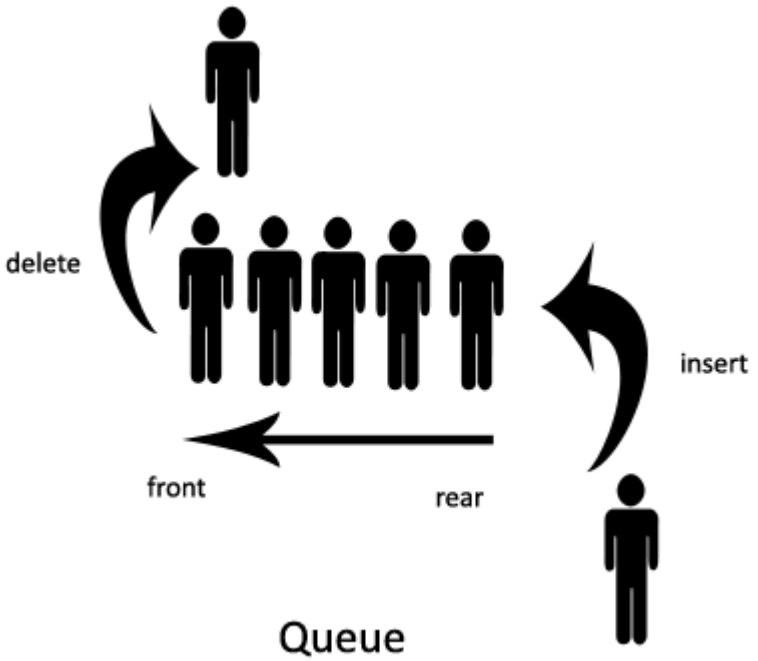
- https://pastebin.com/RYtiabd4

Queue Overview

- Queue Definition
- Basic operations of queue
  Enqueuing, dequeuing etc.
- Implementation of queue
  - Array
  - Linked list

What is Queue

- The Queue is like the List but with “limited” insertion and deletion.
- Insertion can be done only at the end or rear
- Deletion can only be done in the front
- FIFO – first-in-first-out data structure
- Operations
  - enqueue
  - dequeue



Basic operations of queue

Primary queue operations: Enqueue and Dequeue

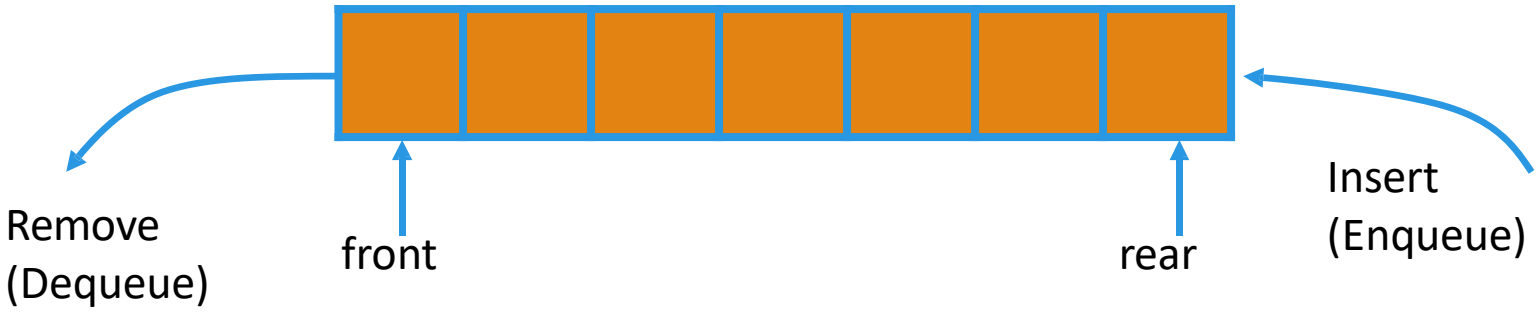
Like check-out lines in a store, a queue has a front and a rear.

Enqueue

- *Insert an element at the rear of the queue*

Dequeue

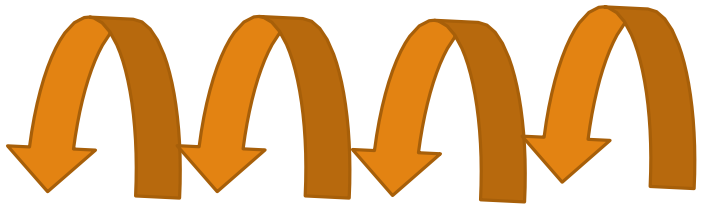
- *Remove an element from the front of the queue*



Implementation of Queue

- *Just as stacks can be implemented as arrays or linked lists, so with queues.*
- *Dynamic queues have the same advantages over static queues as dynamic stacks have over static stacks*

Array Implementation of Queue



10	13	16	19	22					

size=1 size=2 size=3 size=4 size=5

10	13	16	29	22					

size=1 size=2 size=3 size=4 size=5

Array implementation of Queue

https://pastebin.com/rFhLAQgv

Applications of Stacks

- *To **reverse a word**. You push a given word to stack - letter by letter - and then pop letters from the stack.*
- *An **"undo"** mechanism in text editors; this operation is accomplished by keeping all text changes in a stack.*

  - Undo/Redo stacks in Excel or Word.
- ***Language processing** :*

  -compiler's syntax check for matching braces is implemented by using stack.
- *A **stack of plates/books** in a cupboard.*
- *A **garage that is only one car wide**. To remove the first car in we have to take out all the other cars in after it.*
- *Wearing/Removing **Bangles**.*
- ***Back/Forward** stacks on browsers.*

Applications of Queues

- Serving requests on a single shared resource, like a printer, CPU task scheduling etc.
- Operating systems often maintain a queue of processes that are ready to execute or that are waiting for a particular event to occur.
- In real life scenario, Call Center phone systems uses Queues to hold people calling them in an order, until a service representative is free.