My Project

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Chapter 1

Class Index

1.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 2

File Index

2.1 File List

Here is a list of all documented files with brief descriptions:

Chapter 3

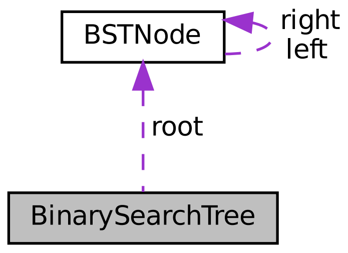
Class Documentation

3.1 BinarySearchTree Class Reference

The class for a Binary Search Tree.

`#include <DSA.h>`

Collaboration diagram for BinarySearchTree:



Public Types

- enum order { PRE, IN, POST }

  An enumeration of the possible orders in which the tree may be traversed.

Public Member Functions

- BinarySearchTree ()

  Construct a new Binary Search Tree object with no root.
- void insert (long long int val)

  Inserts data in the Binary Search Tree.
- void traverse (BSTNode ∗T, order tt)

  traverses a Binary Search Tree in a given manner from a given node
- long long int height (BSTNode ∗T)

  Returns the height of a Node in a Binary Search Tree.

Public Attributes

- BSTNode ∗ root

  A pointer to the root of the Binary Search Tree.

3.1.1 Detailed Description

The class for a Binary Search Tree.

3.1.2 Member Enumeration Documentation

3.1.2.1 order

```
enum BinarySearchTree::order
```

An enumeration of the possible orders in which the tree may be traversed.

Enumerator

PRE	Preorder traversal
IN	Inorder traversal
POST	Postorder traversal

3.1.3 Constructor & Destructor Documentation

3.1.3.1 BinarySearchTree()

```
BinarySearchTree::BinarySearchTree ( )
```

Construct a new Binary Search Tree object with no root.

3.1.4 Member Function Documentation

3.1.4.1 height()

```
long long int BinarySearchTree::height (
             BSTNode * T )
```

Returns the height of a Node in a Binary Search Tree.

Parameters

T	the Node whose height is to be found

Returns

the height

3.1.4.2 insert()

```
void BinarySearchTree::insert (
             long long int val )
```

Inserts data in the Binary Search Tree.

Parameters

val	Data to be inserted in the Binary Search Tree

3.1.4.3 traverse()

```
void BinarySearchTree::traverse (
             BSTNode * T,
             order tt )
```

traverses a Binary Search Tree in a given manner from a given node

Parameters

T	Node from which we start our traversal
tt	Manner in which we traverse the Binary Search Tree (Preorder/Inorder/Postorder)

The documentation for this class was generated from the following files:

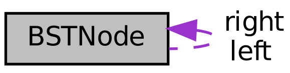
- DSA.h
- DSA.cpp

3.2 BSTNode Class Reference

The class for each node in a Binary Search Tree.

```
#include <DSA.h>
```

Collaboration diagram for BSTNode:



Public Member Functions

- BSTNode (long long int val)

  Construct a new BSTNode object with no left or right children.

Public Attributes

- long long int info

  Data stored in the node.
- long long int level

  Level of the node (Distance from the root)
- BSTNode ∗ left

  Pointer to the left child of the node.
- BSTNode ∗ right

  Pointer to the right child of the node.

3.2.1 Detailed Description

The class for each node in a Binary Search Tree.

3.2.2 Constructor & Destructor Documentation

3.2.2.1 BSTNode()

```
BSTNode::BSTNode (
              long long int val )
```

Construct a new BSTNode object with no left or right children.

Parameters

val	Data to be stored in the node

The documentation for this class was generated from the following files:

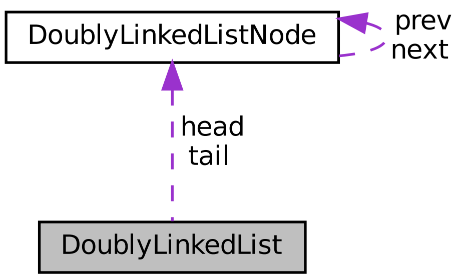
- DSA.h
- DSA.cpp

3.3 DoublyLinkedList Class Reference

The class for a doubly linked list.

```
#include <DSA.h>
```

Collaboration diagram for DoublyLinkedList:



Public Member Functions

- DoublyLinkedList ()

  Construct a new Doubly Linked List object with the head and tail pointers initialized to null.
- void insert (long long int data)

  Inserts the given data at the tail of the Doubly Linked List.
- void printer (string sep=", ")

  Prints out the entire Doubly Linked List.
- void reverse ()

  Reverses the list.

Public Attributes

- DoublyLinkedListNode ∗ head

  A pointer to the head of the doubly linked list.
- DoublyLinkedListNode ∗ tail

  A pointer to the tail of the doubly linked list.

3.3.1 Detailed Description

The class for a doubly linked list.

3.3.2 Constructor & Destructor Documentation

3.3.2.1 DoublyLinkedList()

```
DoublyLinkedList::DoublyLinkedList ( )
```

Construct a new Doubly Linked List object with the head and tail pointers initialized to null.

3.3.3 Member Function Documentation

3.3.3.1 insert()

```
void DoublyLinkedList::insert (
             long long int data )
```

Inserts the given data at the tail of the Doubly Linked List.

Parameters

data	The data to be inserted

3.3.3.2 printer()

```
void DoublyLinkedList::printer (
             string sep = ", " )
```

Prints out the entire Doubly Linked List.

Parameters

sep	An optional parameter that denotes the separater of the values. By default it is ", "

3.3.3.3 reverse()

```
void DoublyLinkedList::reverse ( )
```

Reverses the list.

The documentation for this class was generated from the following files:

- DSA.h
- DSA.cpp

3.4 DoublyLinkedListNode Class Reference

The class for each node in a doubly linked list.

```
#include <DSA.h>
```

Collaboration diagram for DoublyLinkedListNode:

DoublyLinkedListNode
prev
next

Public Member Functions

- DoublyLinkedListNode ()

  Construct a new Doubly Linked List Node object, with data set to -1 and the pointers to the previous and next nodes set to null.
- DoublyLinkedListNode (long long int val)

  Construct a new Doubly Linked List Node object with pointers to the previous and next nodes set to null.

Public Attributes

- long long int data

  An integer describing the data stored in the node.
- DoublyLinkedListNode ∗ next

  A pointer to the next node in the Doubly Linked List.
- DoublyLinkedListNode ∗ prev

  A pointer to the previous node in the Doubly Linked List.

3.4.1 Detailed Description

The class for each node in a doubly linked list.

3.4.2 Constructor & Destructor Documentation

3.4.2.1 DoublyLinkedListNode() [1/2]

```
DoublyLinkedListNode::DoublyLinkedListNode ( )
```

Construct a new Doubly Linked List Node object, with data set to -1 and the pointers to the previous and next nodes set to null.

3.4.2.2 DoublyLinkedListNode() [2/2]

```
DoublyLinkedListNode::DoublyLinkedListNode (
            long long int val )
```

Construct a new Doubly Linked List Node object with pointers to the previous and next nodes set to null.

Parameters

val	Data to be stored in the node

The documentation for this class was generated from the following files:

- DSA.h
- DSA.cpp

3.5 Heap Class Reference

The class for a Heap.

```
#include <DSA.h>
```

Public Member Functions

- Heap ()

  Construct a new Heap object with no elements.
- int parent (int i)

  Returns the index of the parent of a particular element.
- int left (int i)

  Returns the index of the left child of an element with a given index.
- int right (int i)

  Returns the index of the left child of an element with a given index.
- void insert (long long int val)

  Inserts the given value into the heap.
- long long int size ()

  Returns the number of elements currently in the heap.
- long long int min ()

  Returns the minimum element of the heap.
- void Heapify (int root_index)

  Converts the tree rooted at a given element into a heap, given that both its left and right subtrees are already heaps.
- void deleteMin ()

  Removes the minimum element of the heap from the heap.

3.5.1 Detailed Description

The class for a Heap.

3.5.2 Constructor & Destructor Documentation

3.5.2.1 Heap()

```
Heap::Heap ( )
```

Construct a new Heap object with no elements.

3.5.3 Member Function Documentation

3.5.3.1 deleteMin()

```
void Heap::deleteMin ( )
```

Removes the minimum element of the heap from the heap.

Exceptions

Heap Empty	Exception

3.5.3.2 Heapify()

```
void Heap::Heapify (
             int root_index )
```

Converts the tree rooted at a given element into a heap, given that both its left and right subtrees are already heaps.

Parameters

root_index	The index at which the tree to be converted to a heap is rooted

3.5.3.3 insert()

```
void Heap::insert (
             long long int val )
```

Inserts the given value into the heap.

Parameters

val	The value to be inserted in the heap

3.5.3.4 left()

```
int Heap::left (
             int i )
```

Returns the index of the left child of an element with a given index.

Parameters

i	The given index

Returns

int

3.5.3.5 min()

```
long long int Heap::min ( )
```

Returns the minimum element of the heap.

Exceptions

Heap Empty	Exception

Returns

long long int

3.5.3.6 parent()

```
int Heap::parent (
            int i )
```

Returns the index of the parent of a particular element.

Parameters

i	The index of the element whose parent's index we are trying to find

Returns

int

3.5.3.7 right()

```
int Heap::right (
            int i )
```

Returns the index of the left child of an element with a given index.

Parameters

i	The given index

Returns

int

3.5.3.8 size()

```
long long int Heap::size ( )
```

Returns the number of elements currently in the heap.

Returns

long long int

The documentation for this class was generated from the following files:

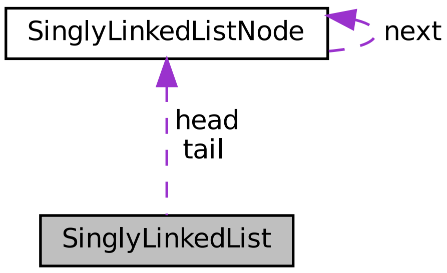
- DSA.h
- DSA.cpp

3.6 SinglyLinkedList Class Reference

The class for a singly linked list.

```
#include <DSA.h>
```

Collaboration diagram for SinglyLinkedList:



Public Member Functions

- SinglyLinkedList ()

  Constructs a new Singly Linked List object with head and tail pointers both set to null.
- void insert (long long int data)

  Inserts data into a linked list at the end.
- SinglyLinkedListNode ∗ find (long long int data)

  Returns a pointer to first node containing the data.
- bool deleteVal (long long int data)

  Deletes a given value from a linked list.
- void printer (string sep=", ")

  Prints out the entire singly linked list.
- void reverse ()

  Reverses our list.

Public Attributes

- SinglyLinkedListNode ∗ head

  Pointer to the head node of the list (a public variable)
- SinglyLinkedListNode ∗ tail

  Pointer to the tail node of the list (a public variable)

3.6.1 Detailed Description

The class for a singly linked list.

3.6.2 Constructor & Destructor Documentation

3.6.2.1 SinglyLinkedList()

```
SinglyLinkedList::SinglyLinkedList ( )
```

Constructs a new Singly Linked List object with head and tail pointers both set to null.

Parameters

None	

3.6.3 Member Function Documentation

3.6.3.1 deleteVal()

```
bool SinglyLinkedList::deleteVal (
             long long int data )
```

Deletes a given value from a linked list.

Parameters

data	(value to be deleted)

Returns

true (if the data was successfully deleted)

false (if the data was not present in the list)

3.6.3.2 find()

```
SinglyLinkedListNode * SinglyLinkedList::find (
             long long int data )
```

Returns a pointer to first node containing the data.

Parameters

data	(The data to be found)

Returns

SinglyLinkedListNode∗

tail (if the data occurs first at the tail or if it is not present at all)

3.6.3.3 insert()

```
void SinglyLinkedList::insert (
             long long int data )
```

Inserts data into a linked list at the end.

Parameters

data	(The inserted data)

Returns

void

3.6.3.4 printer()

```
void SinglyLinkedList::printer (
             string sep = ", " )
```

Prints out the entire singly linked list.

Parameters

sep	An optional parameter that denotes the separater of the values. By default it is ", "

3.6.3.5 reverse()

```
void SinglyLinkedList::reverse ( )
```

Reverses our list.

The documentation for this class was generated from the following files:

- DSA.h
- DSA.cpp

3.7 SinglyLinkedListNode Class Reference

The class for each node in a singly linked list.

```
#include <DSA.h>
```

Collaboration diagram for SinglyLinkedListNode:

Public Member Functions

- SinglyLinkedListNode ()
  Construct a new Singly Linked List Node object with next as null and data as -1.
- SinglyLinkedListNode (long long int val)
  Construct a new Singly Linked List Node object with next as null and data as -1.

Public Attributes

- long long int data
  A large integer to store data. This variable is public.
- SinglyLinkedListNode ∗ next
  A pointer to the next node. This variable is public.

3.7.1 Detailed Description

The class for each node in a singly linked list.

3.7.2 Constructor & Destructor Documentation

3.7.2.1 SinglyLinkedListNode() `[1/2]`

```
SinglyLinkedListNode::SinglyLinkedListNode ( )
```

Construct a new Singly Linked List Node object with next as null and data as -1.

Parameters

None	

3.7.2.2 SinglyLinkedListNode() `[2/2]`

```
SinglyLinkedListNode::SinglyLinkedListNode (
            long long int val )
```

Construct a new Singly Linked List Node object with next as null and data as -1.

Parameters

val	(A large integer)

The documentation for this class was generated from the following files:

- DSA.h
- DSA.cpp

3.8 Trie Class Reference

The class for a Suffix-Trie.

```
#include <DSA.h>
```

Public Member Functions

- Trie ()

  Construct a new Trie object with no nodes and an empty Dictionary.
- bool find (Trie $*$T, char c)

  Checks if a character is present in the dictionary.
- void insert (string s)

  Inserts a string into the Suffix Trie.
- bool checkPrefix (string s)

  Checks if a prefix of a given string is present in our Trie.
- long long int countPrefix (string s)

  Counts the number of prefixes of a given string present in our Trie.

Public Attributes

- long long int count

  Count of nodes in the trie.
- std::map$<$ char, Trie $*$ $>$ nodes

  Dictionary of pointers to nodes with characters as keys and pointers to Tries as values.

3.8.1 Detailed Description

The class for a Suffix-Trie.

3.8.2 Constructor & Destructor Documentation

3.8.2.1 Trie()

```
Trie::Trie ( )
```

Construct a new Trie object with no nodes and an empty Dictionary.

3.8.3 Member Function Documentation

3.8.3.1 checkPrefix()

```
bool Trie::checkPrefix (
             string s )
```

Checks if a prefix of a given string is present in our Trie.

Parameters

s	The given string

Returns

true if any prefix of the given string is present in our Trie

false if no prefix of the given string is present in our Trie

3.8.3.2 countPrefix()

```
long long int Trie::countPrefix (
             string s )
```

Counts the number of prefixes of a given string present in our Trie.

Parameters

s	The given string

Returns

The number of prefixes of this string

3.8.3.3 find()

```
bool Trie::find (
            Trie * T,
            char c )
```

Checks if a character is present in the dictionary.

Parameters

T	A pointer to the trie
c	The character whose existence in the dictionary is to be checked

Returns

true If the character is present

false If the character is not present

3.8.3.4 insert()

```
void Trie::insert (
            string s )
```

Inserts a string into the Suffix Trie.

Parameters

s	The string to be inserted

The documentation for this class was generated from the following files:

- DSA.h
- DSA.cpp

Chapter 4

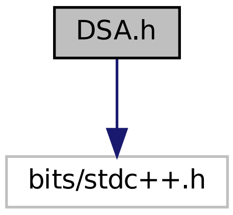
File Documentation

4.1 DSA.h File Reference

Some implementations of common Data Structures and Algorithms.

`#include <bits/stdc++.h>`

Include dependency graph for DSA.h:



Classes

- class SinglyLinkedListNode

  The class for each node in a singly linked list.
- class SinglyLinkedList

  The class for a singly linked list.
- class DoublyLinkedListNode

  The class for each node in a doubly linked list.
- class DoublyLinkedList

  The class for a doubly linked list.
- class BSTNode

  The class for each node in a Binary Search Tree.
- class BinarySearchTree

  The class for a Binary Search Tree.
- class Trie

  The class for a Suffix-Trie.
- class Heap

  The class for a Heap.

Macros

- #define **ll** long long int
- #define **vi** vector<int>
- #define **vll** vector<ll>

Functions

- ostream & operator<< (ostream &out, const SinglyLinkedListNode &node)

    A function that prints out the data in a node object.
- SinglyLinkedList merge (SinglyLinkedList list1, SinglyLinkedList list2)

    Merges two sorted singly linked lists and returns the new list.
- ostream & operator<< (ostream &out, const DoublyLinkedListNode &node)

    Prints out the data in a node.
- ostream & operator<< (ostream &out, const BSTNode &node)

    Prints out the data stored in a node.

4.1.1 Detailed Description

Some implementations of common Data Structures and Algorithms.

Author

210050023

Date

28th September 2022

4.1.2 Function Documentation

4.1.2.1 merge()

```
SinglyLinkedList merge (
            SinglyLinkedList list1,
            SinglyLinkedList list2 )
```

Merges two sorted singly linked lists and returns the new list.

Parameters

list1	A sorted singly linked list
list2	Another sorted singly linked list

Returns

SinglyLinkedList

4.1.2.2 operator<<() [1/3]

```
ostream& operator<< (
            ostream & out,
            const BSTNode & node )
```

Prints out the data stored in a node.

Parameters

out	The stream to which data is to be printed
node	The node whose data is to be printed

Returns

ostream&

4.1.2.3 operator<<() [2/3]

```
ostream& operator<< (
            ostream & out,
            const DoublyLinkedListNode & node )
```

Prints out the data in a node.

Parameters

out	Stream in which data is to be printed
node	Node whose data is to be printed

Returns

ostream&

4.1.2.4 operator<<() [3/3]

```
ostream& operator<< (
            ostream & out,
            const SinglyLinkedListNode & node )
```

A function that prints out the data in a node object.

Parameters

out	(The stream)
node	(The node object)

Returns

ostream&

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