

Doubly Linked Lists

Lecture 19
Section 18.5

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- 1 Doubly Linked Lists
- 2 Doubly Linked List Nodes
- 3 Inserting and Deleting
- 4 Assignment

Outline

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Doubly Linked Lists

- Adding a tail pointer to the `LinkedList` class greatly helped the `pushBack()` function, but it did not help the `popBack()` function.
- That was because we could not “back up” from the tail.
- To facilitate both `pushBack()` and `popBack()`, we could add “backward” pointers to every node.
- Then we could back up from any node to its predecessor.

Doubly Linked Lists

Definition (Doubly Linked List)

A **doubly linked list** is a linked list in which each node has two links: a forward link to its successor node and a backward link to its predecessor node.



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Doubly Linked List Node Data Members

DoublyLinkedListNode Data Members

- `T m_value` - The value stored in the node.
- `DoublyLinkedListNode* m_prev` - A pointer to the previous node.
- `DoublyLinkedListNode* m_next` - A pointer to the next node.

- A doubly linked list must use doubly linked list nodes.

Doubly Linked List Data Members

DoublyLinkedList Data Members

- **int** `m_size` - Number of elements in the list.
- `DoublyLinkedListNode*` `m_head` - Pointer to the first node.
- `DoublyLinkedListNode*` `m_tail` - Pointer to the last node.

Chasing Pointers

- We can move both forwards and backwards in the list.
- When chasing pointers, it is not necessary to keep a pointer to the previous node.

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Inserting and Deleting in a Doubly Linked List

- Apply the 12-step method to
 - Insert a node into a doubly linked list.
 - Delete a node from a doubly linked list.

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- Read Section 18.5.