

Lecture 4-3

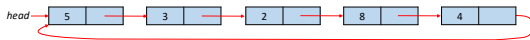
More on Linked List

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DATA STRUCTURES & ALGORITHMS

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Circular Linked List

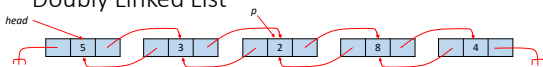


- Used in round-robin time-sharing mechanism.

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Doubly Linked List



- Easy to go back and forward
 - Used to implement undo/redo functionality
- Easy to delete at the spot.
 - To delete at p, given p.previous and p.next
 - p.next.previous = p.previous
 - p.previous.next = p.next
 Now, no one point at p
 Time complexity is still $O(1)$.

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Top 20 Linked List Interview Question

- Taken from  GeeksforGeeks website
<https://www.geeksforgeeks.org/top-20-linked-list-interview-question/>

- Let explore some of them.

Note that all the questions assume singly linked list, the kind we talk about in previous two video lectures.

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1. Rotate a Linked List

- Given a singly linked list, rotate the linked list counter-clockwise by k nodes. Where k is a given positive integer.
- For example, if the given linked list is
10->20->30->40->50->60
and k is 4, the list should be modified to
50->60->10->20->30->40
Assume that k is smaller than the count of nodes in a linked list.

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2. Delete N nodes after M nodes of a linked list

- Example 2:
 - Input:
 - M = 3, N = 2
 - Linked List: 1->2->3->4->5->6->7->8->9->10
 - Output:
 - Linked List: 1->2->3->6->7->8
- Example 1:
 - Input:
 - M = 2, N = 2
 - Linked List: 1->2->3->4->5->6->7->8
 - Output:
 - Linked List: 1->2->5->6
- Example 3:
 - Input:
 - M = 1, N = 1
 - Linked List: 1->2->3->4->5->6->7->8->9->10
 - Output:
 - Linked List: 1->3->5->7->9

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3. Merge a linked list into another linked list at alternate positions

- Given two linked lists, insert nodes of second list into first list at alternate positions of first list.
 - For example, if first list is 5->7->17->13->11 and second is 12->10->2->4->6, the first list should become 5->12->7->10->17->2->13->4->11->6 and second list should become empty.
- The nodes of second list should only be inserted when there are positions available.
 - For example, if the first list is 1->2->3, and second list is 4->5->6->7->8, then first list should become 1->4->2->5->3->6, and second list to 7->8.

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4. Reverse a linked list

- Given pointer to the head node of a linked list, the task is to reverse the linked list. We need to reverse the list by changing the links between nodes.

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5. N^{th} node from end of linked list

- Given a linked list consisting of L nodes and given a number N. The task is to find the N^{th} node from the end of the linked list.

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6. Find the middle of a given linked list

- Given a singly linked list, find the middle of the linked list.
 - For example, if the given linked list is 1->2->3->4->5 then the output should be 3.
- If there are even nodes, then there would be two middle nodes, we need to print the second middle element.
 - For example, if given linked list is 1->2->3->4->5->6 then the output should be 4.

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7. Remove duplicate element from sorted Linked List

- Given a singly linked list consisting of N nodes. The task is to remove duplicates (nodes with duplicate values) from the given list (if exists).

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8. Add 1 to a number represented as linked list

- Number is represented in linked list such that each digit corresponds to a node in linked list. Add 1 to it. For example, 1999 is represented as (1->9->9->9) and adding 1 to it should change it to (2->0->0->0).

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9. Reverse a Linked List in groups of given size.

Example 1:

Input:
LinkedList: 1->2->3->4->5->6->7->8
K = 4

Output: 4 2 2 1 8 7 6 5

Explanation:

The first 4 elements 1,2,3,4 are reversed first and then the next 4 elements 5,6,7,8. Hence, the resultant linked list is 4->2->3->1->8->7->6->5.

Example 2:

Input:
LinkedList: 1->2->3->4->5
K = 3

Output: 3 2 1 5 4

Explanation:

The first 3 elements are 1,2,3 are reversed first and then elements 4,5 are reversed. Hence, the resultant linked list is 3->2->1->5->4.

- Given a linked list of size N. The task is to reverse every k nodes (where k is an input to the function) in the linked list.
- If the number of nodes is not a multiple of k then left-out nodes, in the end, should be considered as a group and must be reversed (See Example 2 for clarification).

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10. Function to check if a singly linked list is palindrome

- Given a singly linked list of characters, write a function that returns true if the given list is a palindrome, else false.

- Palindrome Linked List



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11. Delete last occurrence of an item from linked list

- Need no explanation!

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Summary

- There are a lot of alternative to singly linked list that we learn.
 - We talk about two of them in this slides, circular linked list and doubly linked list.
- We explore a lot of "interview question" for linked list.

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