

CS101 - Data Abstraction

DS Basics - Module3

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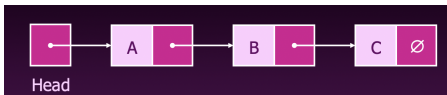
April 20, 2021



- **Linked List:** A series of connected data items called Nodes.
- A **Node** contains at least a piece of data item (of any type) and a link (pointer) to the next node in the list.

Three Properties

- **All nodes** should be linked to each other.
- **Head** pointer to the first node.
- **Last** node points to null.



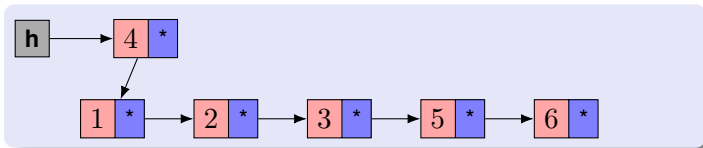
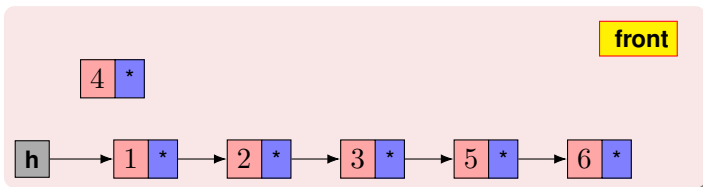
Pros and Cons of Linked List

- **Not** stored contiguously. Random distribution of data items in memory.
- **Better** space management.
- **Worst** search performance.
- **Better** insert and delete performance.

Core Operations on Linked List

- **IsEmpty** determine whether or not the list is empty.
- **Insert** inserts a new node at the front, end, and/or a particular position.
- **Search** find a node with a given value.
- **Delete** delete a node with a given value.
- **Display** print all the nodes in the list.

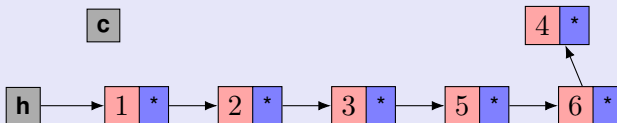
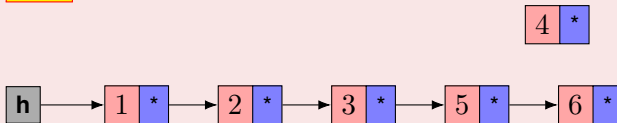
Singly Linked List - Insert (Front)



- 1 Create a new temp node with the value to be inserted.
- 2 Assign next of the temp node to the node pointed by the next of the head node $N(0)$.
- 3 Assign next of the head node $N(0)$ to temp node.

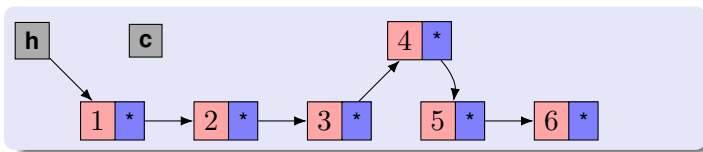
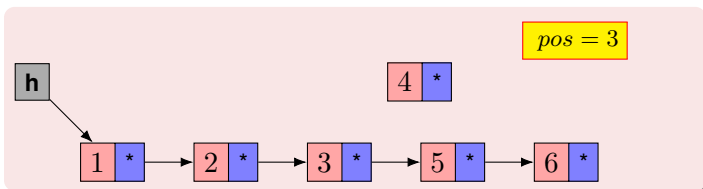
Singly Linked List - Insert (End)

end



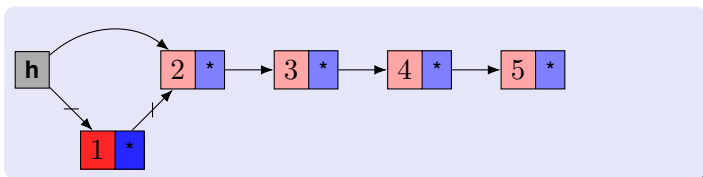
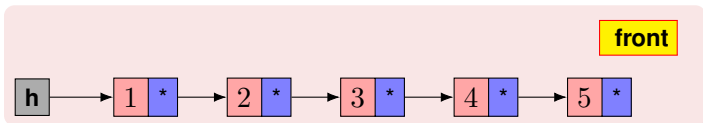
- 1 Create a new temp node with the value to be inserted.
- 2 Traverse through the list till last node using current pointer.
- 3 Assign next of the last node to the temp node.

Singly Linked List - Insert (Specific Position)



- 1 Create a new temp node with the value to be inserted.
- 2 Traverse through the list till $pos - 1$ using current pointer.
- 3 Assign next of the temp node to the node pointed by the next of $N(pos - 1)$
- 4 Assign next of $N(pos - 1)$ to the temp node.

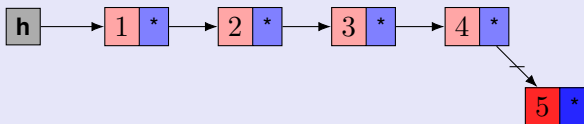
Singly Linked List - Delete (Front)



- 1 Assign next of the head node $N(0)$ to node pointed by the next of the first node.
- 2 Free up the first node.

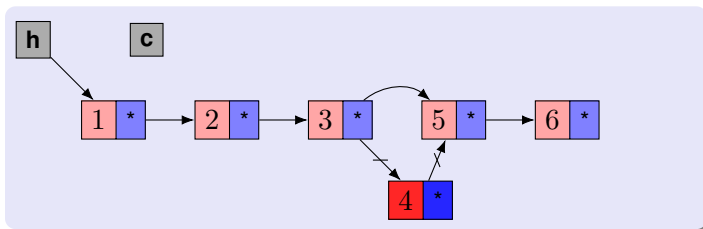
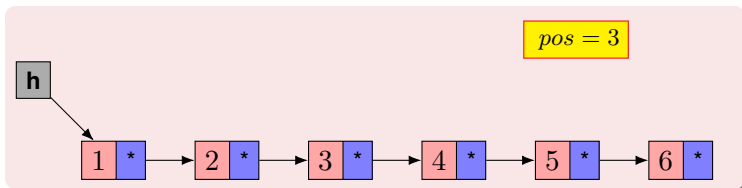
Singly Linked List - Delete (End)

end



- 1 Traverse through the list till the previous of last node using current pointer.
- 2 Assign next of the previous of last node to null reference.
- 3 Free up the last node.

Singly Linked List - Delete (Specific Position)



- 1 Traverse through the list till $pos - 1$ using current pointer.
- 2 Assign next of the node $N(pos - 1)$ to the node pointed by the next of $N(pos)$.
- 3 Free up node $N(pos)$.

- **PS** the sll folder in course repo.

- **Doubly Linked List, Stacks, Queues**

Reading Assignment

- **GT** Chapter 7 - 7.1, 7.3

Questions?

Please ask if there are any Questions!