Data Structures and Algorithms

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Linked Lists

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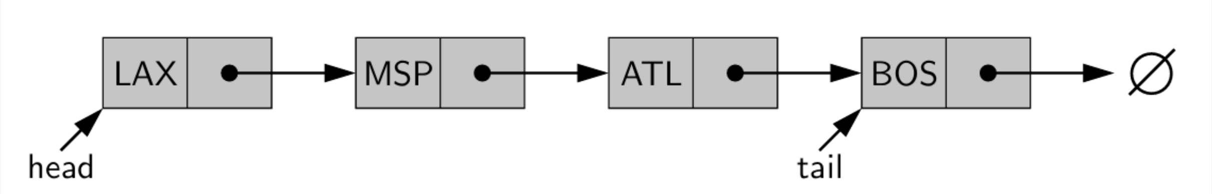
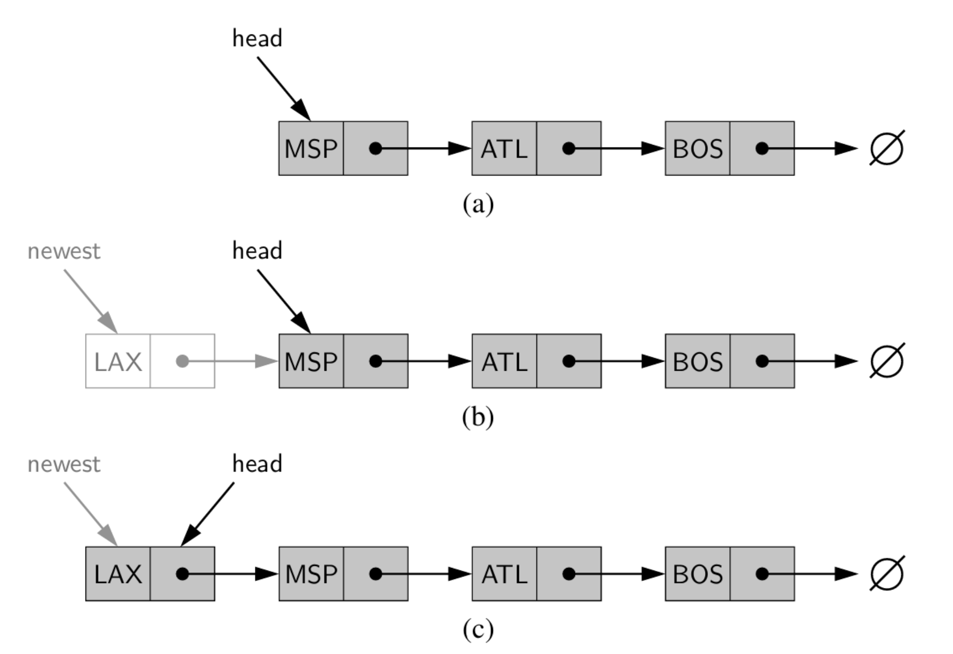
A linked list is a dynamic data structure consisting of a sequence of elements called nodes, where each node stores data and a pointer to the next node in the sequence.

Singly Linked Lists

A singly-linked list is the simplest type of linked list, where each node contains some data and a reference to the next node in the sequence.



Inserting at the Head

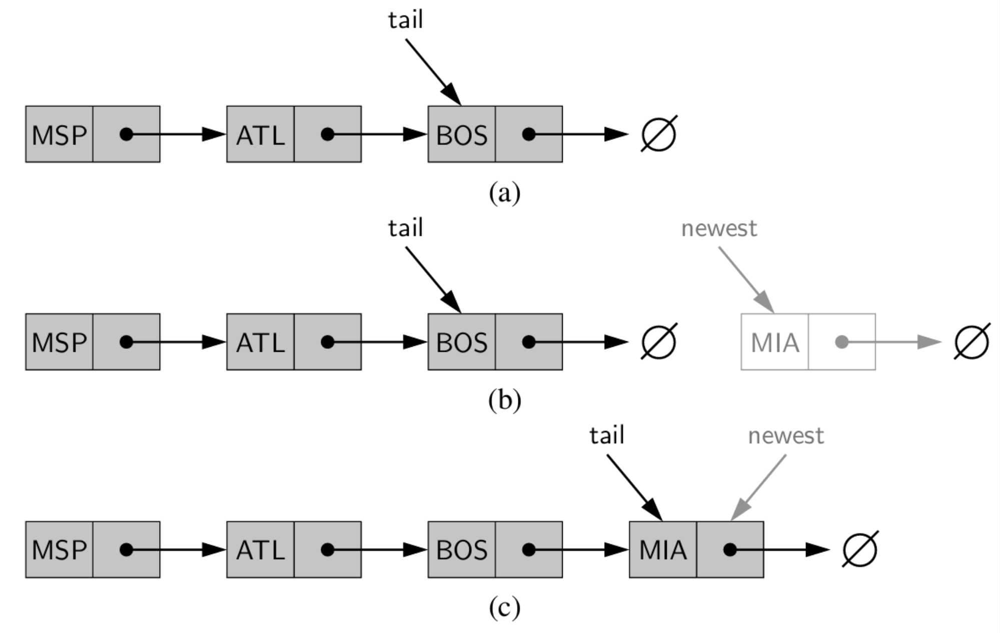


(a)

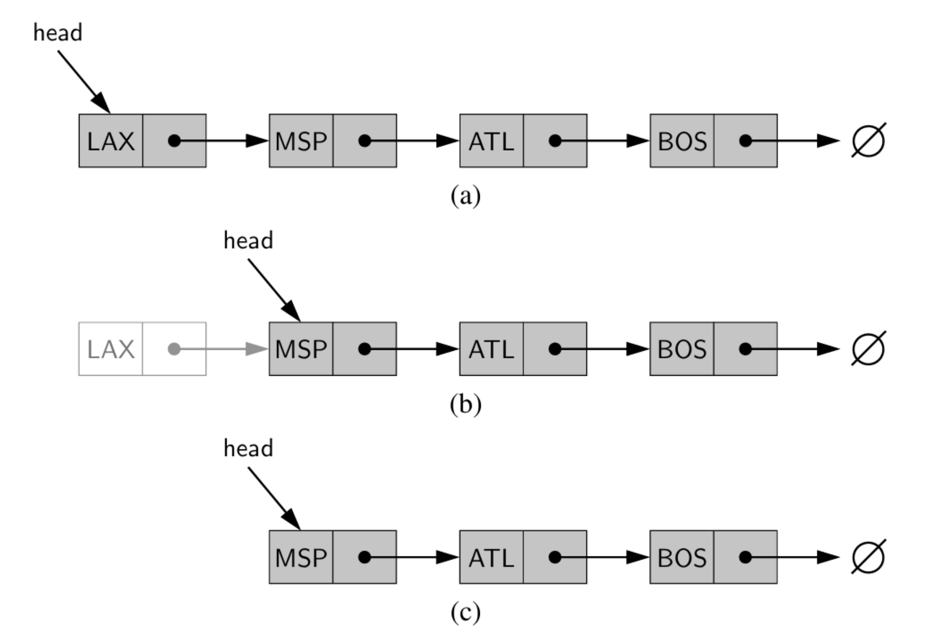
(b)

(c)

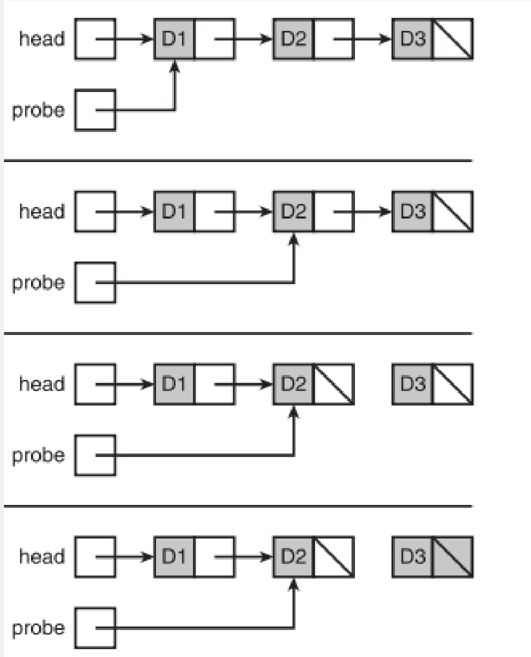
Inserting at the Tail



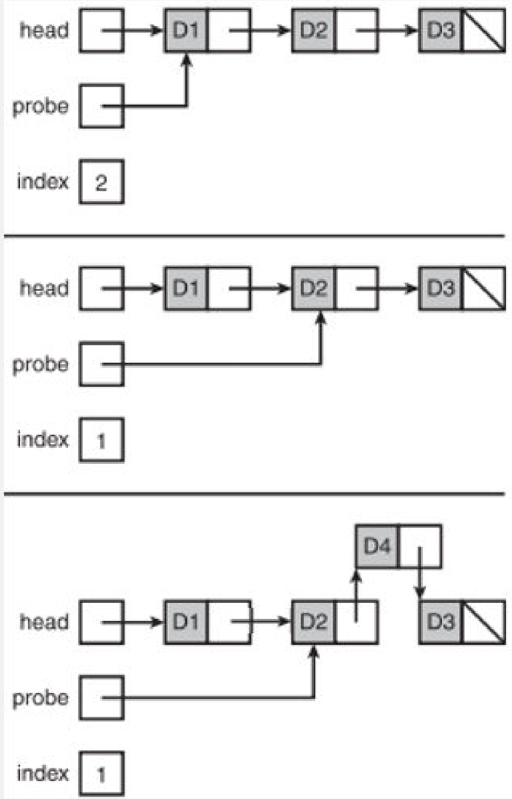
Removing at the Head



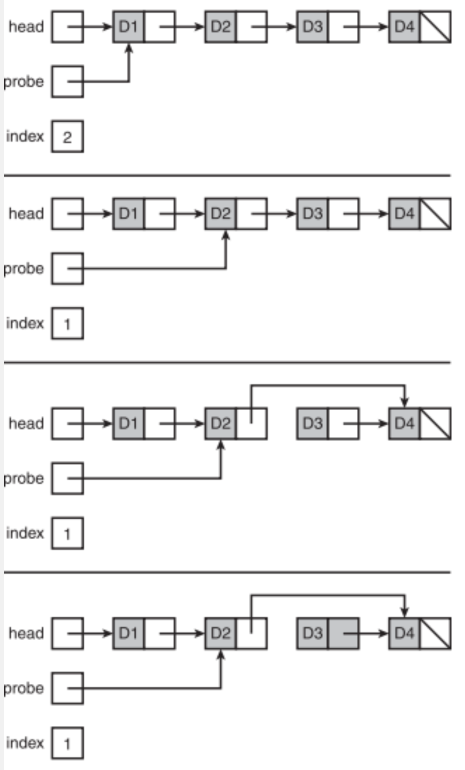
Removing at the Tail



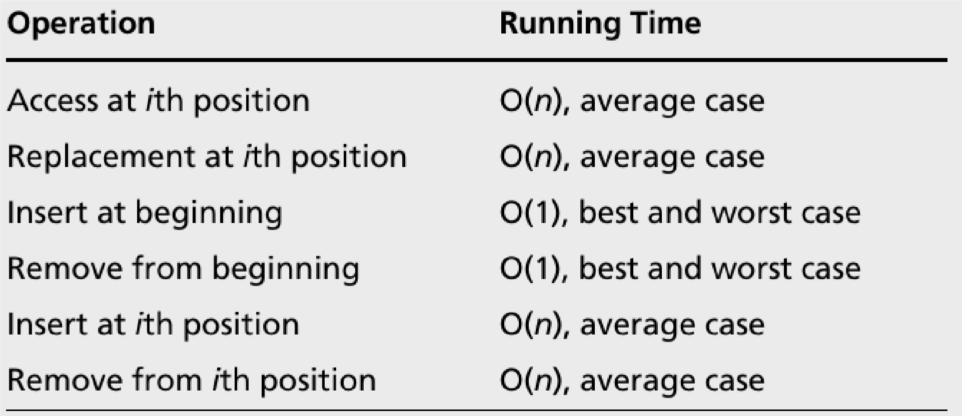
Inserting at any position



Removing at any position



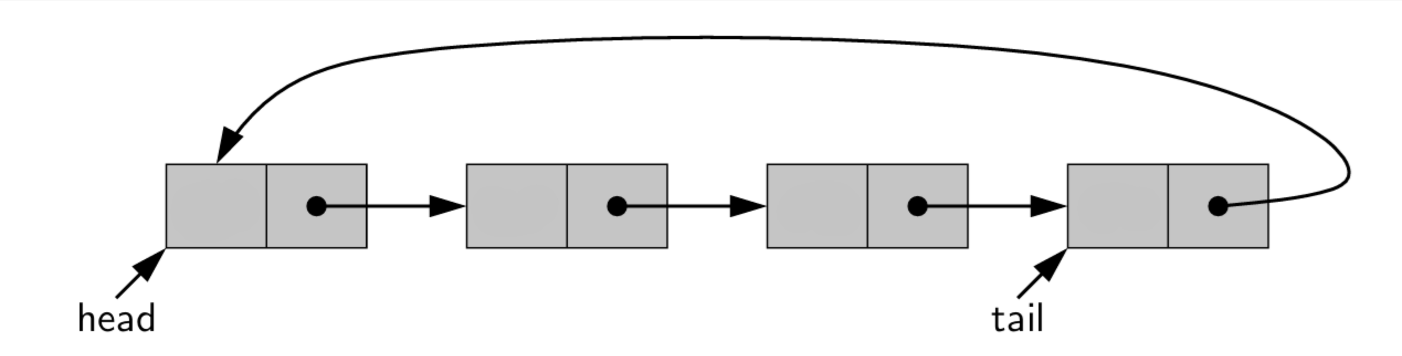
The Running Times of Operations on Singly Linked Structures



Operation	Running Time
Access at *i*th position	O(*n*), average case
Replacement at *i*th position	O(*n*), average case
Insert at beginning	O(1), best and worst case
Remove from beginning	O(1), best and worst case
Insert at *i*th position	O(*n*), average case
Remove from *i*th position	O(*n*), average case

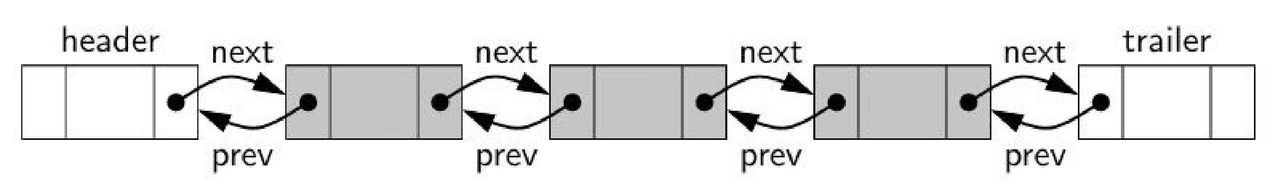
Circularly Linked Lists

A circularly linked list is a variation of a linked list in which the last node points back to the first node, forming a circular structure instead of ending with a NULL pointer.
This structure can be implemented using singly or doubly linked lists.

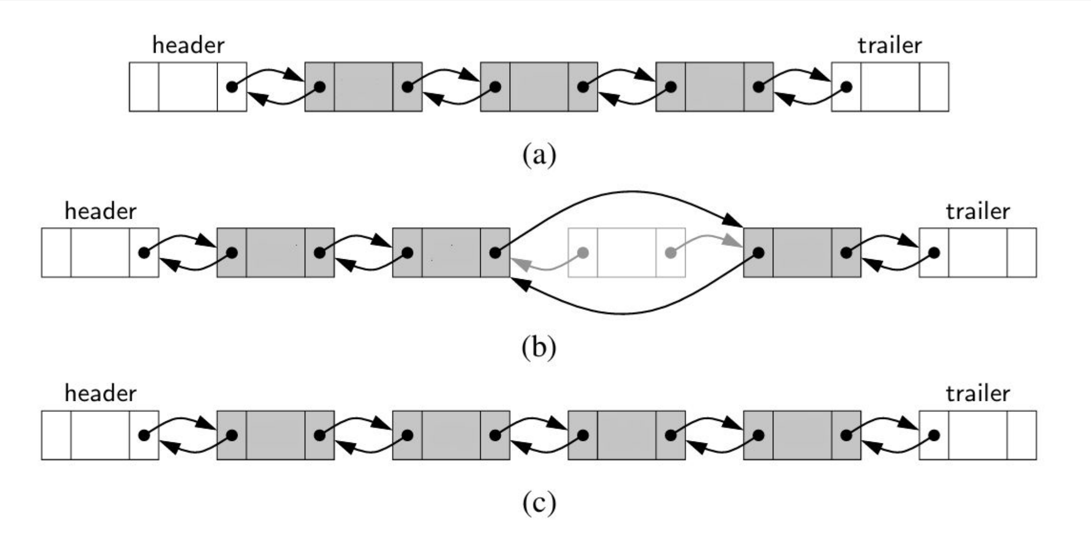


Doubly Linked Lists

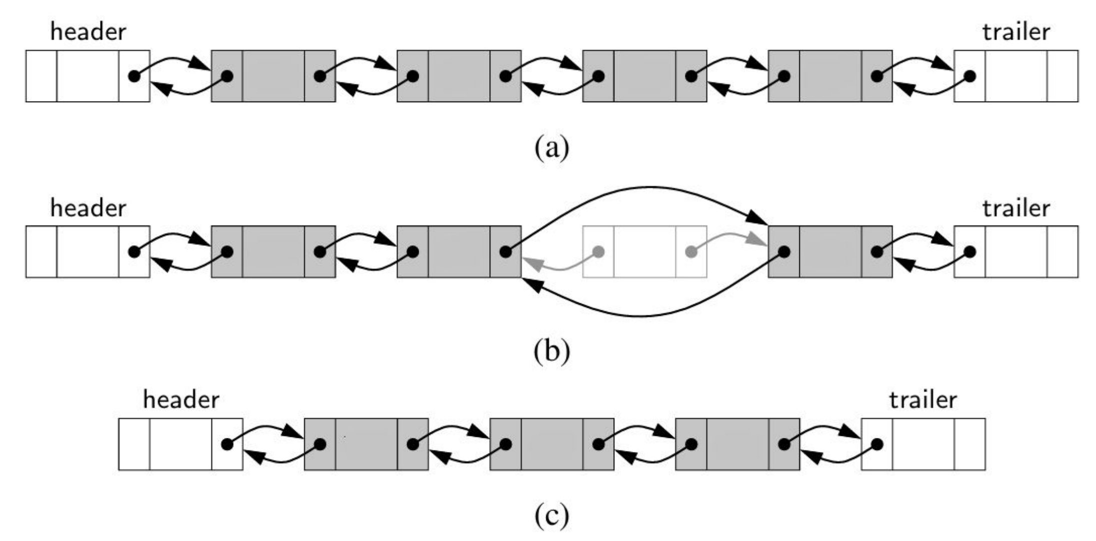
A doubly linked list is a type of linked list in which each node contains three components: a data field, a pointer to the next node, and a pointer to the previous node. This bidirectional structure allows efficient traversal in both forward and backward directions.



Inserting to a Doubly Linked Lists



Deleting to a Doubly Linked Lists



References

1) Fundamentals of Python: Data Structures / Kenneth A. Lambert

2) Introduction to algorithms / Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein.

3) Data Structures and Algorithms in Python / Michael T. Goodrich, Robert Tamassia, Michael H. Goldwasser