Stack Study Note

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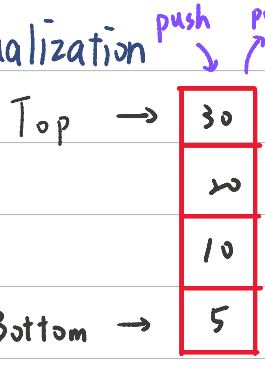
Stack Study Note

1. Definition

Stack is a linear data structure that follows the LIFO, last-In, First-Out, principle.

It sloves problems where the most recently added element must be accessed first.

2. Visualization



Operation push/pop always occur at the top.

3. Time / Space Complexity

Operation	Array Stack	Linked list Stack
Push	O(1)	O(1)
PoP	O(1)	O(1)
Peek	O(1)	O(1)
Space	O(n)	O(n)

4. charaterristics

- ordering : Linear, LIFO
- Indexing : No random access
- Dynamic size : Yes. fixed - linked list , dynamic - Array
- Memory layout : Array - contiguous . Linked list - nodes with point
- Typical operations : push , pop , top , peek , isEmpty

5. Limitations

- Not suitable if random access is needed
- Stack overflow possible in fixed-size array implementation
- Only the top is accessible, can't reach middle elements efficiently.

6. Use Cases

1. Function call stack (runtime stack)
2. Expression evaluation (postfix)
3. Backtracking algorithms (DFS, undo operations)

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6. Pros / Cons

Pros :

- Extremely simple and efficient (O(1) operations)
- Perfect for managing nested operations
- Can be implemented with arrays or linked list

Cons :

- Limited access pattern
- Not suitable for general data storage or searching