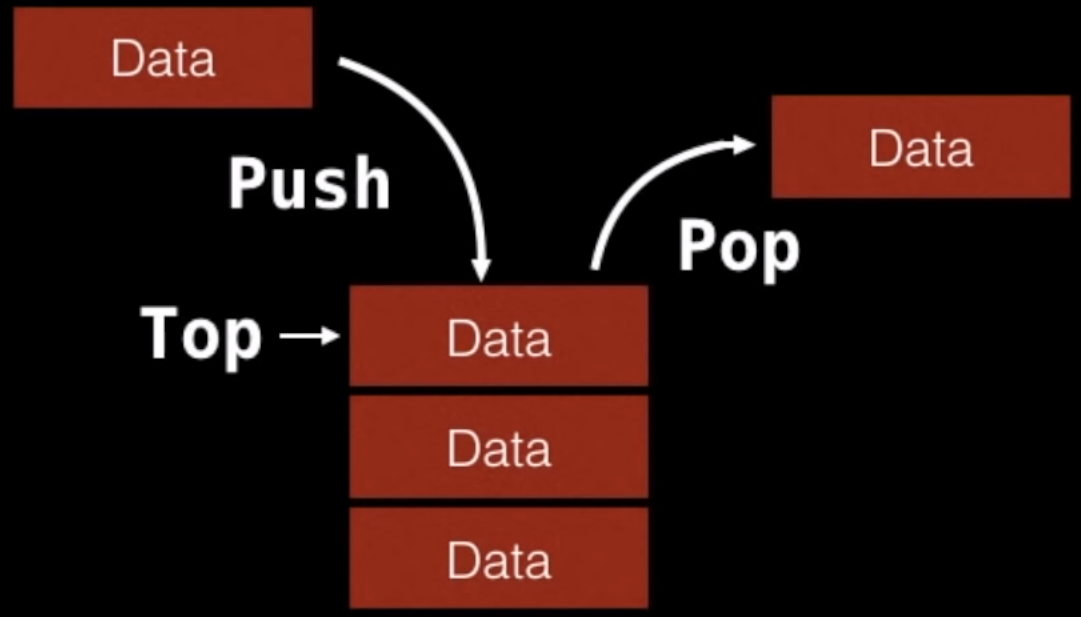
Stack

Outline

- Discussion about Stacks
  - What is a Stack?
  - When and where is a Stack used?
  - Complexity Analysis
  - Stack usage examples
- Implementation details
  - Pushing elements on stack
  - Popping elements from stack
- Code Implementation

What is a Stack?

A stack is a one-ended linear data structure which models a real world stack by having two primary operations, namely **push** and **pop**.



What is a Stack?

Instructions

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pop()
push('Onion')
push('Celery')
push('Watermelon')
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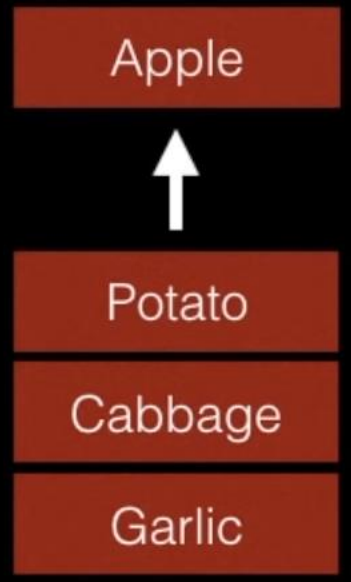

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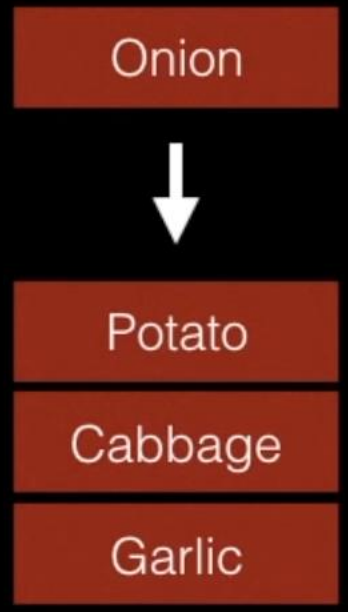

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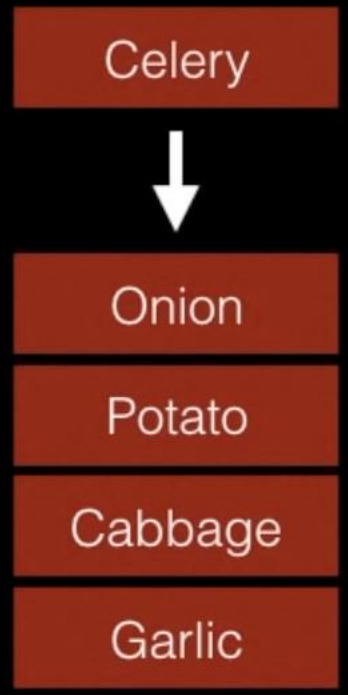

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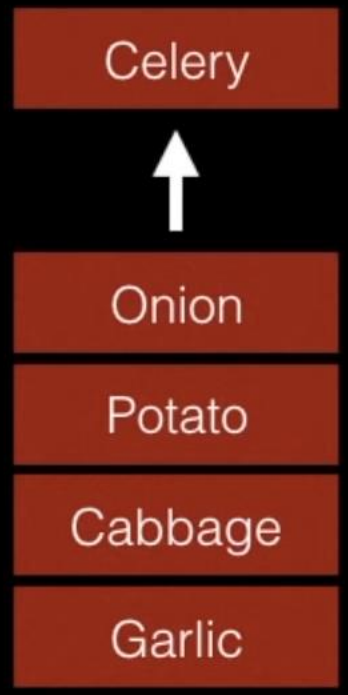

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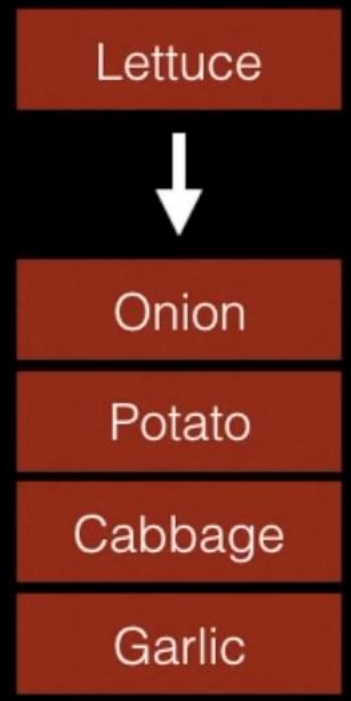

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When and where is a Stack used?

- Used by undo mechanisms in text editors.
- Used in compiler syntax checking for matching brackets and braces.
- Can be used to model a pile of books or plates.
- Used behind the scenes to support recursion by keeping track of previous function calls.
- Can be used to do a Depth First Search (DFS) on a graph.

Complexity Analysis

Complexity

Pushing	O(1)
Popping	O(1)
Peeking	O(1)
Searching	O(n)
Size	O(1)

Example - Brackets

Problem: Given a string made up of the following brackets: ()[]{}, determine whether the brackets properly match.

Example – Brackets

Bracket Sequence:

[[{}](())]

Current Bracket: ø

Reversed Bracket: ø

Example – Brackets

Bracket Sequence:

[[{}](())]

Current Bracket: [

Reversed Bracket:]

Example – Brackets

Bracket Sequence:

[[{}](())]

Current Bracket: [

Reversed Bracket:]

Example – Brackets

Bracket Sequence:

[[{}](())]

Current Bracket: {

Reversed Bracket: }

Example – Brackets

Bracket Sequence:

[[{}](())]

Current Bracket: }

Reversed Bracket: {

Example – Brackets

Bracket Sequence:

[[{}]()]

Current Bracket:]

Reversed Bracket: [

Example – Brackets

Bracket Sequence:

[[{}](())]

Current Bracket: (

Reversed Bracket:)

Example – Brackets

Bracket Sequence:

[[{}]()]

Current Bracket:)

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Bracket Sequence:

Current Bracket:]

Reversed Bracket: [

Example – Brackets

Bracket Sequence:

[{})[]

Current Bracket: ø

Reversed Bracket: ø

Example – Brackets

Bracket Sequence:

[{})[]

Current Bracket: [

Reversed Bracket:]

Example – Brackets

Bracket Sequence:

[{})[]

Current Bracket: {

Reversed Bracket: }

Example – Brackets

Bracket Sequence:

[{})[]

Current Bracket: }

Reversed Bracket: {

Example – Brackets

Bracket Sequence:

[{})[]

Current Bracket:)

Reversed Bracket: (

Example – Brackets

Bracket Sequence:

[{})[] ⟶ Invalid

Current Bracket:)

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