

堆栈、队列 (Stack、Queue)

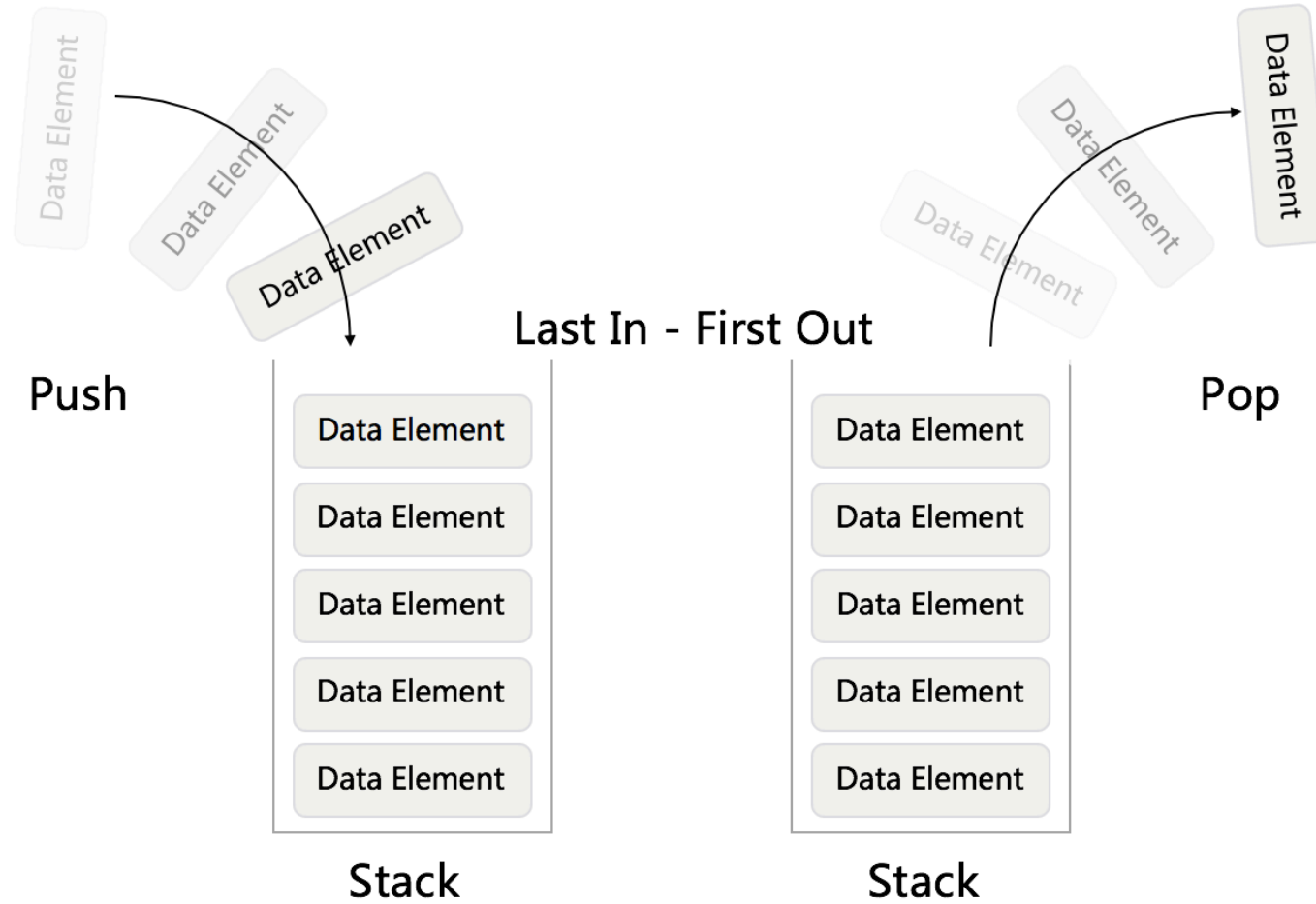
本节内容

1. Stack - First In First Out (FIFO)
 - Array or Linked List
2. Queue - First In Last Out (FILO)
 - Array or Linked List

Stack



Stack



Queue





Last In Last Out

First In First Out

Queue

Common Data Structure Operations

Data Structure	Time Complexity								Space Complexity
	Average				Worst				Worst
	Access	Search	Insertion	Deletion	Access	Search	Insertion	Deletion	
<u>Array</u>	$\theta(1)$	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n)$
<u>Stack</u>	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(1)$	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(1)$	$\theta(n)$
<u>Queue</u>	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(1)$	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(1)$	$\theta(n)$
<u>Singly-Linked List</u>	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(1)$	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(1)$	$\theta(n)$
<u>Doubly-Linked List</u>	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(1)$	$\theta(n)$	$\theta(n)$	$\theta(1)$	$\theta(1)$	$\theta(n)$
<u>Skip List</u>	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n \log(n))$
<u>Hash Table</u>	N/A	$\theta(1)$	$\theta(1)$	$\theta(1)$	N/A	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n)$
<u>Binary Search Tree</u>	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n)$
<u>Cartesian Tree</u>	N/A	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	N/A	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n)$
<u>B-Tree</u>	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(n)$
<u>Red-Black Tree</u>	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(n)$
<u>Splay Tree</u>	N/A	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	N/A	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(n)$
<u>AVL Tree</u>	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(n)$
<u>KD Tree</u>	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(\log(n))$	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n)$	$\theta(n)$

图片来源: <http://www.bigocheatsheet.com/>

Big O Cheat Sheet

LEGEND

TIME Complexity  VS.  SPACE Complexity

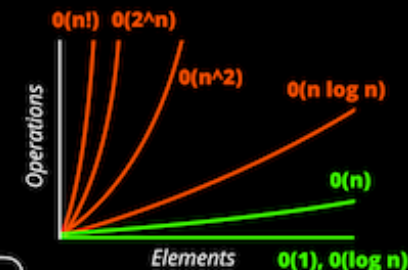
 Good  Fair  Bad

 Good  Fair  Bad

<BIG-O-CHEATSHEET>



www.bigocheatsheet.com



DATA STRUCTURE

Operations

ARRAY SORTING

Algorithms

 DATA Structure

 TIME Complexity

 SPACE Complexity

 ARRAY Algorithms

 TIME Complexity

 SPACE Complexity

Average

Worst

Best

Average

Worst

Worst

 Access

 Search

 Insertion

 Deletion

 Access

 Search

 Insertion

 Deletion

Array



$\Theta(1)$

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

$\Theta(1)$

$\Theta(n)$

$\Theta(n)$

$\Theta(1)$

$\Theta(1)$

$\Theta(n)$

Stack



$\Theta(n)$

$\Theta(n)$

$\Theta(1)$

$\Theta(1)$

$\Theta(n)$

$\Theta(n)$

$\Theta(1)$

$\Theta(1)$

$\Theta(1)$

$\Theta(n)$

Queue



$\Theta(n)$

$\Theta(n)$

$\Theta(1)$

$\Theta(1)$

$\Theta(n)$

$\Theta(n)$

$\Theta(1)$

$\Theta(1)$

$\Theta(1)$

$\Theta(n)$

Singly-Linked List



$\Theta(n)$

$\Theta(n)$

$\Theta(1)$

$\Theta(1)$

$\Theta(n)$

$\Theta(n)$

$\Theta(1)$

$\Theta(1)$

$\Theta(1)$

$\Theta(n)$

Doubly-Linked List



$\Theta(n)$

$\Theta(n)$

$\Theta(1)$

$\Theta(1)$

$\Theta(n)$

$\Theta(n)$

$\Theta(1)$

$\Theta(1)$

$\Theta(1)$

$\Theta(n)$

Skip List



$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

$\Theta(n \log(n))$

Hash Table



N/A

$\Theta(1)$

$\Theta(1)$

$\Theta(1)$

N/A

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

Binary Search Tree



$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

Cartesian Tree



N/A

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

N/A

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

B-Tree



$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(n)$

Red-Black Tree



$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(n)$

Splay Tree



N/A

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

N/A

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(n)$

AVL Tree



$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(n)$

KD Tree



$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(\log(n))$

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

$\Theta(n)$

Quicksort



$\Omega(n \log(n))$

$\Theta(n \log(n))$

$\Theta(n^2)$

$\Theta(\log(n))$

Mergesort



$\Omega(n \log(n))$

$\Theta(n \log(n))$

$\Theta(n \log(n))$

$\Theta(n)$

Timsort



$\Omega(n)$

$\Theta(n \log(n))$

$\Theta(n \log(n))$

$\Theta(1)$

Heapsort



$\Omega(n \log(n))$

$\Theta(n \log(n))$

$\Theta(n \log(n))$

$\Theta(1)$

Bubble Sort



$\Omega(n)$

$\Theta(n^2)$

$\Theta(n^2)$

$\Theta(1)$

Insertion Sort



$\Omega(n)$

$\Theta(n^2)$

$\Theta(n^2)$

$\Theta(1)$

Selection Sort



$\Omega(n^2)$

$\Theta(n^2)$

$\Theta(n^2)$

$\Theta(1)$

Tree Sort



$\Omega(n \log(n))$

$\Theta(n \log(n))$

$\Theta(n^2)$

$\Theta(n)$

Shell Sort



$\Omega(n \log(n))$

$\Theta(n(\log(n))^2)$

$\Theta(n(\log(n))^2)$

$\Theta(1)$

Bucket Sort



$\Omega(n+k)$

实战题目

1. <https://leetcode.com/problems/backspace-string-compare/description/>
2. <https://leetcode.com/problems/implement-queue-using-stacks/solution/>
3. <https://leetcode.com/problems/implement-stack-using-queues/description/>
4. <https://leetcode.com/problems/valid-parentheses/description/>