Data Structures

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Who am I?

- ► Master of Engineering: Computer Science (KUL)
 - Computational informatics
- ► Realdolmen: acADDemICT in 09/2015
- ► Current project: Planning infrastructure @ Infrabel



Outline

1 Introductory Data Structures

Array Linked List Hash Table Heap Red-Black Tree

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- 2 Java Collection API & Map API Java Collection API Java Map API
- 3 Advanced Data Structures Stuff...



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What are Data Structures?

Data Structure¹

A way in which data are stored for efficient search and retrieval. Different data structures are suited for different problems.

- ightharpoonup Data type \neq data structure
- ▶ java.util.HashSet vs. hash table
- array vs. array

¹Encyclopædia Britannica

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Array

Definition

- ► An indexed set of related elements²
- ► An assemblage of items that are randomly accessible by integers, the index³
- ► Example: linear array



²Oxford Dictionary

 $^{^3}$ National Institute of Standards & Technology

- ▶ get
- ▶ set
- ▶ indexOf



- ▶ get
- ▶ set
- ▶ indexOf



- ▶ get
- ▶ set
- ▶ indexOf



get(1)

- ightharpoonup get O(1)
- ▶ set
- ▶ indexOf



Operations

- ightharpoonup get O(1)
- ▶ set
- ▶ indexOf



set(2)

Operations

- ightharpoonup get O(1)
- ▶ set
- ▶ indexOf



set(2)

Operations

- ightharpoonup get O(1)
- ▶ set O(1)
- ▶ indexOf



set(2)

Operations

- ightharpoonup get O(1)
- ightharpoonup set O(1)
- ► indexOf



Operations

- ightharpoonup get O(1)
- ▶ set O(1)
- ▶ indexOf



Operations

- ightharpoonup get O(1)
- ▶ set O(1)
- ▶ indexOf



- ightharpoonup get O(1)
- ightharpoonup set O(1)
- ▶ indexOf



indexOf(object)

Operations

- ightharpoonup get O(1)
- ▶ set O(1)
- ▶ indexOf



Operations

- ightharpoonup get O(1)
- ▶ set O(1)
- ▶ indexOf



- ▶ get
- O(1) O(1)
- ▶ set
 indexOf
 - O(n)



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Linked List

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Linked List

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Hash Table

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Tree

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Binary Heap

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Binary Min-Heap



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Java Collection API

Java Collection API

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Java Map API

Java Map API

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