Resources: Searching and Sorting Data

TidBIT

A binary search, which can only be performed on a sorted data structure that allows random access to the elements, only requires log2n total guesses to determine if a value is in the data structure, where n is the total number of elements in the set. That means that as the input size increases, the number of guesses only increases logarithmically, which makes this a very fast algorithm. For example, with 128 elements in a set, the binary search algorithm would only require at most 7 guesses. A set with 1,024 elements would only require at most 10 guesses.

It's amazing to think that a set of just over 1,000,000 numbers would only require at most 20 guesses to find if a number exists! Compare that with a linear search that would require 1,000,000 guesses to potentially find a number, and you see why it is so useful to analyze different algorithms.

Required Resources

Textbook: *Data Structures and Algorithms*, Chapter 3 ⬀ (/d2l/common/dialogs/quickLink/quickLink.d2l? ou=1860222&type=lti&rcode=snhu-2534437&srcou=1040994)
This zyBooks reading will provide you with information on the following topics:

- Representing information as bits, data structures, the relation between data structures and algorithms, abstract data types, applications of abstract data types, and algorithm efficiency
- Searching, binary searches

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- Sorting, selection sort, insertion sort, shell sort, quicksort, merge sort, radix sort, and fast sorting algorithms

Additional Support (Optional)

Video: Selection Sort in 3 Minutes ↗ (https://www.youtube.com/watch?v=g-PGLbMth_g) (2:42)
This video demonstrates how a selection sort works.

Video: Insertion Sort in 2 Minutes ↗ (https://www.youtube.com/watch?v=JU767SDMDvA) (2:18)
This video demonstrates how an insertion sort works.

Reading: Know Thy Complexities! ↗ (course_documents/Big-O%20Cheatsheet.pdf?ou=1860222)
This resource discusses the Big-O complexities of common algorithms. An accessible version is also available on the Big-O Cheat Sheet ↗

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Activity Details

Task: View this topic

Explore these resources, which will help you learn how to explore techniques related to searching and sorting.