

Introduction to Algorithms Chapter 1 Answers

Menno Schipper

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1 Chapter 1

1-1 Give a real-world example that requires sorting or a real-world example that requires computing a convex hull. While playing the card game patience, the goal of the game is to place each card from the deck in a way, such that each pile of cards is sorted in the end. This is an example of sorting in the real world.

Lets say you have a field of plants, and you want to place a fence around all plants in the field, using the least amount of wood. This is an example of a convex hull in the real world.

1-2 Other than speed, what other measures of efficiency might one use in the real-world setting?

Memory used, parallelism, readability

1-3 Select a data structure that you hvae seen previously, and discuss its strengths and limitations

A linked list is a structure that resembles an array. It is used to store a number of values. The strength of linked lists is that insertion and deletions can be done in constant time. In a normal array, this happens in linear time. The disadvantages of using a linked list is that random access lookup happens in linear time (instead of constant time in arrays) and the linked list uses more memory, since for each node you have to store the value AND a pointer to the next node

1-4 How are the shortest-path and traveling-salesman problems given above similar? How are they different?

The traveling-salesman and shortest-path algorithms are similar because in both problems, we wish to find the shortest path. In the shortest-path algorithm, we want to find the minimum distance to go from node A to node B. In the traveling-salesman problem, we wish to find the minimum distance such that we travel to each city and end up at the origin.

1-5 Come up with a real-world problem in which only the best solution will do. Then come up with one in which a solution that is "approximately" the best is good enough

An example where the solution must absolutely be correct is at the checkout in a store. You don't want customers to pay more or less money because the checkout system is not accurate enough. One example where it doesn't have to be accurate is (surprisingly enough) rockets. A rocket landed on the moon that used the constant Pi only up to 11 digits. This is still decently accurate, but it does use an approximation.