

1.4 Importance of Analyzing Algorithms

Need to recognize limitations of various algorithms for solving a problem. Need to understand relationship between problem size and running time. When is a running program not good enough? Need to learn how to analyze an algorithm's running time without coding it. Need to learn techniques for writing more efficient code. Need to recognize bottlenecks in code as well as which parts of code are easiest to optimize.

1.4.1 The Selection Problem

Problem: given a group of n numbers, determine the k^{th} largest

Algorithm 1

- Store numbers in an array
- Sort the array in descending order
- Return the number in position k

Algorithm 2

- Store first k numbers in an array
- Sort the array in descending order
- For each remaining number, if the number is larger than the k^{th} number, insert the number in the correct position of the array
- Return the number in position k

Example

Input: is a sequence of integers stored in an array.

Output: the minimum.



Problem: Description of Input-Output relationship.

Algorithm: A sequence of computational step that transform the input into the output.

Data Structure: An organized method of storing and retrieving data.

Our task: Given a problem, design a *correct* and *good* algorithm that solves it.

Example Algorithm A

Problem: The input is a sequence of integers stored in array.

Output: the minimum.

Design Analysis And Algorithm Notes

Emilie Sanchez



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