

Brute Force

- is a straightforward approach to solving a problem, usually directly based on the problem statement & definitions of the concepts involved.

Selection Sort.

Selection Sort A [0 -- n-1]

// Sorts given array

// Input A [0 -- n-1]

// Output A [0 -- n-1] in ascending order.

for i ← 0 to n-2 do.

 min ← i

 for j ← i+1 to n-1 do.

 IF A[j] < A[min]

 min ← j

 swap A[i] and A[min]

Analysis

$$C(n) = \sum_{i=0}^{n-2} \sum_{j=i+1}^{n-1} 1$$

$$= \sum_{i=0}^{n-2} (n-1) - (i+1) + 1 = \sum_{i=0}^{n-2} (n-1-i)$$

$$= \frac{n(n-1)}{2}$$

$\Theta(n^2)$

80 40 65 42 83.

40 80 65 42 83

40 42 65 80 83.

Bubble Sort:

- Comparing adjacent elements of the list and exchange them if they are out of order.

$A_0 \dots A_j \rightarrow A_{j+1} \dots A_{n-i-1} / A_{n-i} \leq \dots A_{n-1}$

Pseudo code:

BubbleSort A [0 -- n-1]

// sort a given array by bubble sort

// input An array A[0--n-1]

// output Array A[0--n-1] in ascending order.

for i $\leftarrow 0$ to n-2 do

 for j $\leftarrow 0$ to n-2-i do

 IF A[j+1] < A[j]

 Swap A[j] and A[j+1]

(B)

$$\begin{aligned}
 C(n) &= \sum_{i=0}^{n-2} \sum_{j=0}^{n-2-i} 1 \\
 &= \sum_{i=0}^{n-2} (n-2-i) + 1 \\
 &= \frac{n(n+1)}{2} \in \Theta(n^2)
 \end{aligned}$$

45 68 90 29 34

45 68 90 29 34

45 68 29 90 34

45 68 29 34 90.

II

45 68 29 34 90.

45 29 68 34 90.

45 29 34 68 90.

III

29 45 34 68 90.

29 34 45 68 90.

Worst Case.

$$S_{\text{worst}}(n) = C(n) = \frac{(n-1)n}{2} \in \Theta(n^2)$$

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Sequential search

$\text{Seq}(A[0 \dots n-1], k)$

// Input A, k.

// Output k or -1

$A[n] \leftarrow k$

$i \leftarrow 0$

while $A[i] \neq k$ do

$i \leftarrow i + 1$

if $i > n$ return i

else return -1

Bruce Force String Matching

Given a string of n characters called the text and a string of m characters called the pattern. find a substring of the text that matches the pattern

$t = p_0 \dots t_{i+j}$

$p_j = \dots t_{i+m-1}$

$t_0 \dots t_i \dots t_{i+1} \dots t_{i+m-1} \dots t_{n-1}$

$\downarrow \quad \downarrow$

p_0

$\dots p_j \dots p_{m-1} \dots$

Pattern P

Text T