

Objectives

Complete Search

Dr. Mattox Beckman

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
DEPARTMENT OF COMPUTER SCIENCE

Your Objectives:

- ▶ Describe four patterns of brute force;
- ▶ Describe the times when a brute force solution is necessary.
- ▶ Describe some techniques to optimize brute force algorithms.

What is it?

- ▶ You must traverse the entire problem space to get the answer.
- ▶ Sometimes you can prune the problem space.

8	6	7	5	3	0	9
---	---	---	---	---	---	---

```

0 max=a[0]; // why not just but 0 here?
1 for(int i=1; i<7; i++)
2   if (a[i]>max) max=a[i];

```

When to Use It

- ▶ Tradeoffs
 - ▶ Bad: It's **slow!**
 - ▶ Good: It's simple! More likely to give correct solution.
- ▶ Three situations:
 - ▶ When you have no choice.
 - ▶ When the problem set is small.
 - ▶ To verify your real solution!

Categories

- ▶ Code Pattern
 - ▶ Iterative
 - ▶ Recursive
- ▶ Traversal Pattern
 - ▶ Filtering
 - ▶ Generating

Speed

- ▶ Use bits instead of boolean arrays
- ▶ Use primitive types when appropriate:
 - ▶ `int32` instead of `int64`
 - ▶ arrays instead of `vector`
 - ▶ character arrays instead of `string`
- ▶ Prefer iteration to recursion
 - ▶ The STL algorithm include has `next_permutation`, which is very fast
- ▶ Declare large data structures in the global scope