Greedy

Greedy is good

beOI Training

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"The point is, ladies and gentleman, that 'greed', for lack of a better word, is good."
Gordon Gecko, Wall Street

Traits of a greedy person

A greedy person

- Doesn't care about the future
- Doesn't dwell on the past
- Looks only at the present situation
- Takes the biggest/best thing currently available

Traits of a greedy algorithm

A greedy algorithm

- Makes the locally optimal choice at any state.
- Doesn't know anything about a future state.
- Doesn't go back for fixing mistakes.

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No! This is not an algorithm, but a **heuristic** (use Dijkstra)

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We have an unlimited amount of coins.
How can we give a certain amount of money with the least amount of coins?

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Counterexample

Try making 6 cents with 4,3,1

Does it ever work?

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... seems like it doesn't

But sometimes it does!

Interval scheduling

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How can we schedule the most number of activities?

Let's try some ideas:

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Load balancing

Certain number of containers C.
Certain number of items S with a certain mass M_i.
$1 \leq S \leq 2C$
Minimize inbalance:

$$A = \frac{\sum_{j=1}^{S} M_j}{C}, Imbalance = \sum_{i=1}^{C} |X_i - A|$$

where X_i is the total mass in chamber i

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Here's a hint: make sure there are exactly $2C$ items by adding dummy elements.

Sort the items and pair heaviest with the lightest.

Can you prove this works?

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- Every greedy algorithm has the **greedy choice property**(Reach global optimum from local optimum) and the **optimal substructure property**(Optimal solution to subproblems $=>$ optimal solution to problem)

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- Every greedy algorithm has the **greedy choice property**(Reach global optimum from local optimum) and the **optimal substructure property**(Optimal solution to subproblems $=>$ optimal solution to problem)
- Hard to prove, easy to code $=>$ just try it (or find a counterexample)