Greedy Algorithms: Review

Michael Levin

Higher School of Economics

Algorithmic Toolbox
Data Structures and Algorithms

Main Ingredients

- Safe move
- Prove safety
- Solve subproblem
- Estimate running time

Safe Moves

- Put max digit first
- Refill at the farthest reachable gas station
- Cover leftmost point
- Use item with maximum value per unit of weight

Optimization

- Assume everything is somehow sorted
- Which sort order is convenient?
- Greedy move can be faster after sorting

General Strategy

Problem

General Strategy

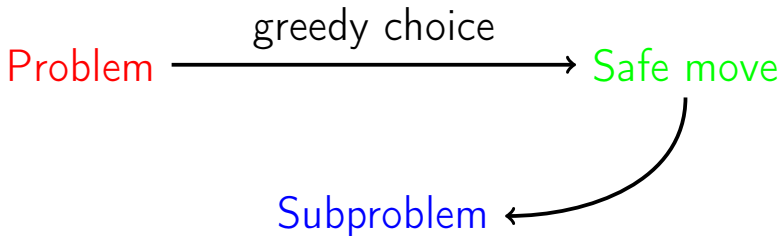Problem $\xrightarrow{\text{greedy choice}}$

■ Make a greedy choice

General Strategy

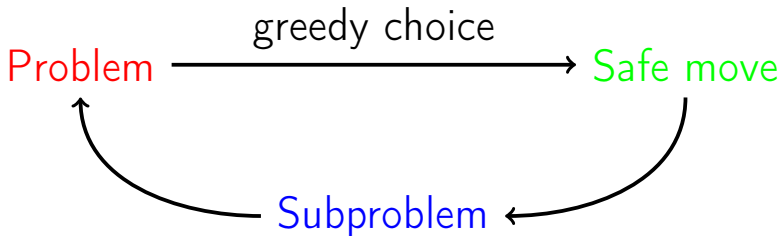Problem $\xrightarrow{\text{greedy choice}}$ Safe move

- Make a greedy choice
- Prove that it is a safe move

General Strategy

Problem $\xrightarrow{\text{greedy choice}}$ Safe move

Safe move $\rightarrow$ Subproblem

- Make a greedy choice
- Prove that it is a safe move
- Reduce to a subproblem

General Strategy

- Make a greedy choice
- Prove that it is a safe move
- Reduce to a subproblem
- Solve the subproblem