Review1. Final Review

2019年6月4日

20:29

Stable matching

* Perfect matching > stable matching.
* Men get best women while women get worst men.

Analysis

* Upper bound, lower bound, and tight bound.
  + Transitivity and additivity properties.

Graphs

* Bipartite: cannot contain odd cycles, vertices in same layer in BFS shouldn't have edges.

Greedy algorithm

* *Online and offline algorithm.*
* Shortest path: Dijkstra algorithm.
* MST: Kruskal algorithm, reverse-delete, Prim algorithm.
  + Cut property and cycle property.
* K-clustering problem: delete k-1 most expensive edges from MST.
* Huffman code: fixed length encoding and prefix code (average bits per letter).

Divide and conquer

* C:\6B739B25\03A01BEE-1755-4129-B904-F9EFE4845EE8.files\image001.png
* Classical problems: merge sort, counting inversions (sort-count, merge-count), closest pair of points, multiplication (complex, integer, Karatsuba).
* Fast Fourier transform: coefficient and point-value (multiply and evaluate).
  + C:\6B739B25\03A01BEE-1755-4129-B904-F9EFE4845EE8.files\image002.png
  + Decimation in frequency (low, high), time (even, odd).

Dynamic programming

* Classical problems: weighted interval scheduling, segmented least squares, knapsack problem, RNA secondary structure.
* Sequence alignment: gap penalty, mismatch penalty.
* Shortest path with negative weight: add scalar to weight, Bellman-Ford algorithm.

Network flow

* Maximum flow and minimum cut.
  + Capacity of cut and value of flow: weak duality, residual graph.
  + Augmenting path: bottleneck capacity.
    - Capacity scaling algorithm: Gf(Δ).
* Applications: bipartite matching, disjoint path.