

CS583 Lecture 07

Minimum Spanning Tree

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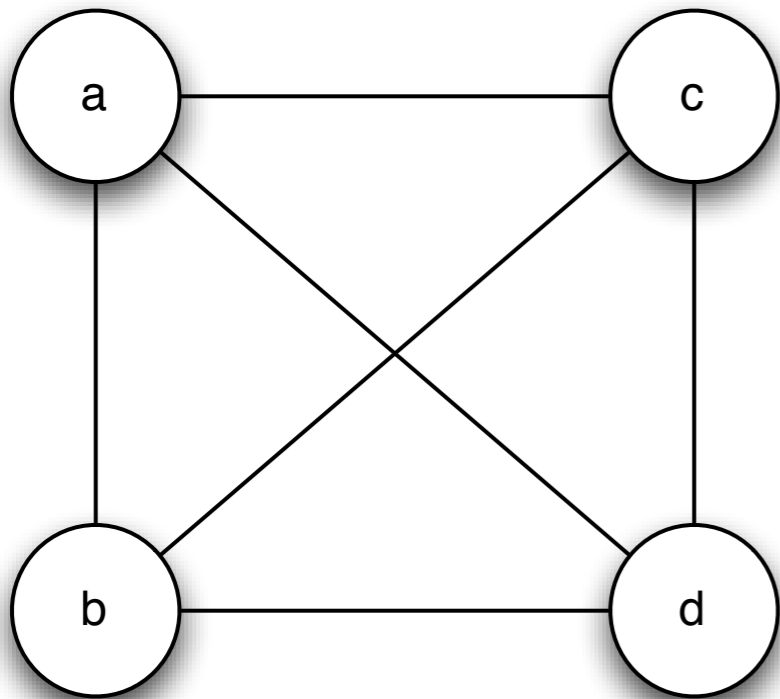
some materials here are based on Prof. Shehu, and Prof. Wang's past lecture notes

Weight of Graph

- spanning tree
- weight of the tree
- Minimum spanning tree of unweighed graph
- Minimum spanning tree of weighed graph
 - brute force
 - Kruskal's algorithm
 - Prim's algorithm
 - Boruvka's algorithm
 - Hybrid

Brute force MST

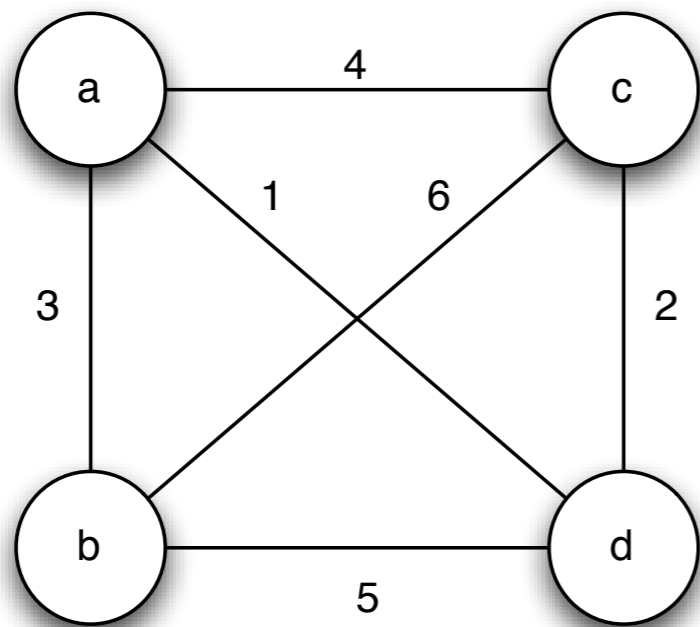
- Generate all possible MSTs and pick the lightest one



how many spanning trees for this graph?

Kruskal's algorithm

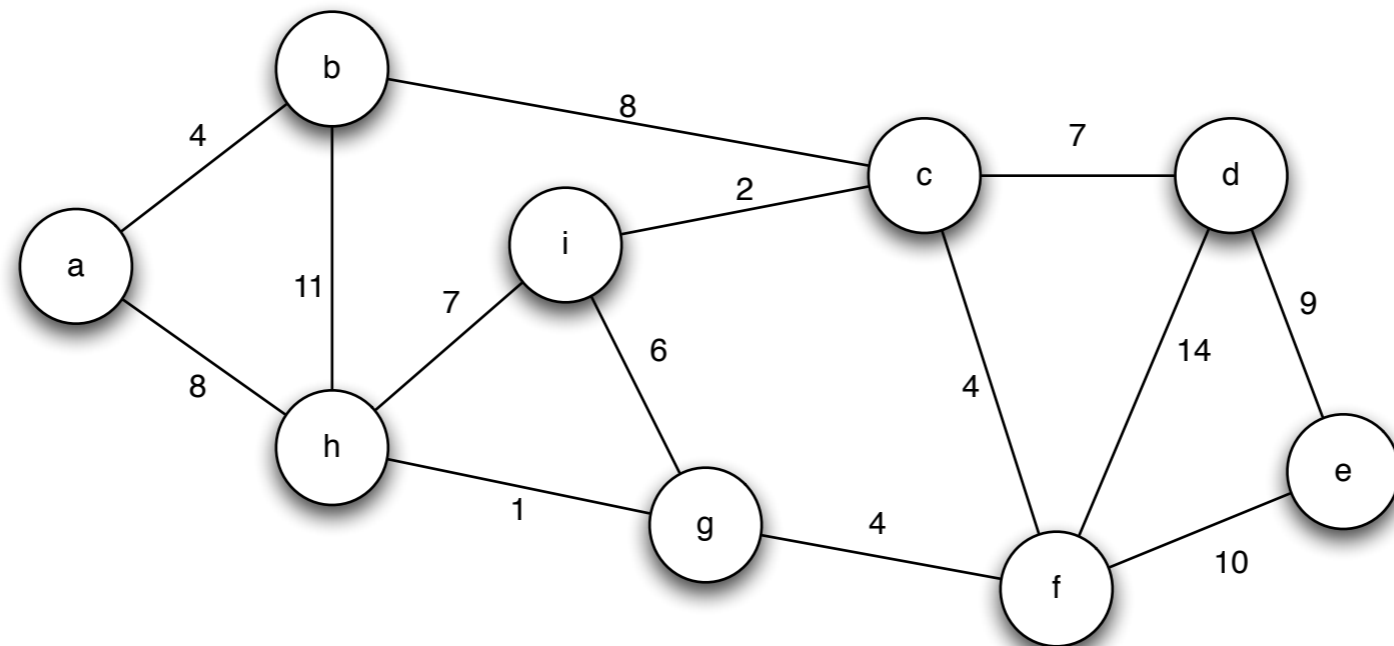
- sort all edges (light to heavy)
- add edges to the tree in sorted order



- correctness and time complexity?

Kruskal's algorithm

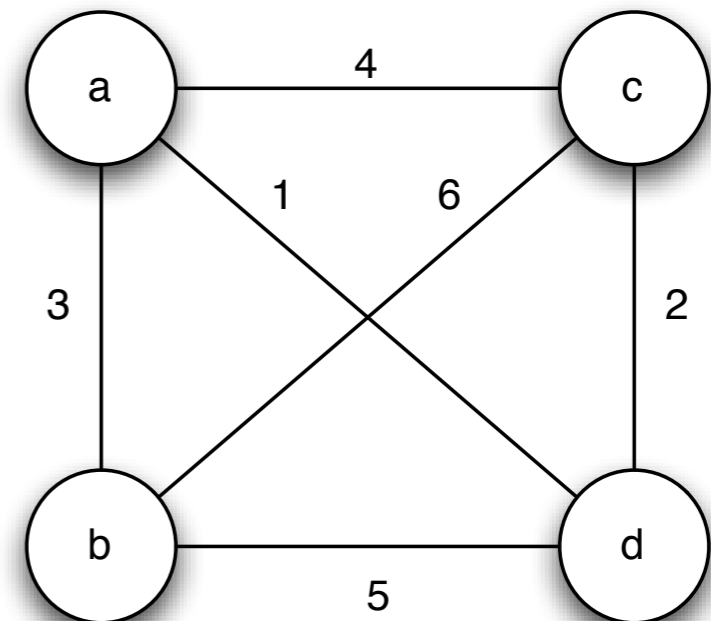
- examples



Prim's algorithm

- add a random vertex the MST
- add the lightest edge between current MST vertices and non MST vertices

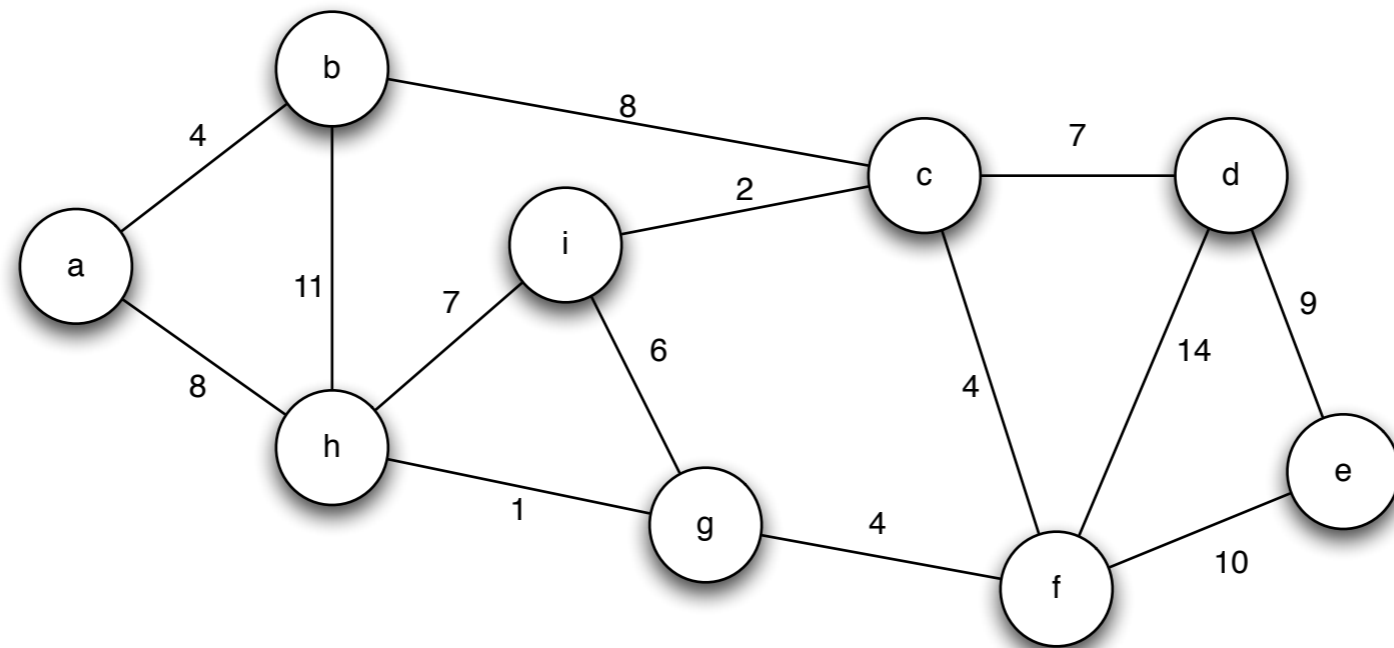
- repeat _____ times



- correctness and time complexity?

Prim's Algorithm

- examples

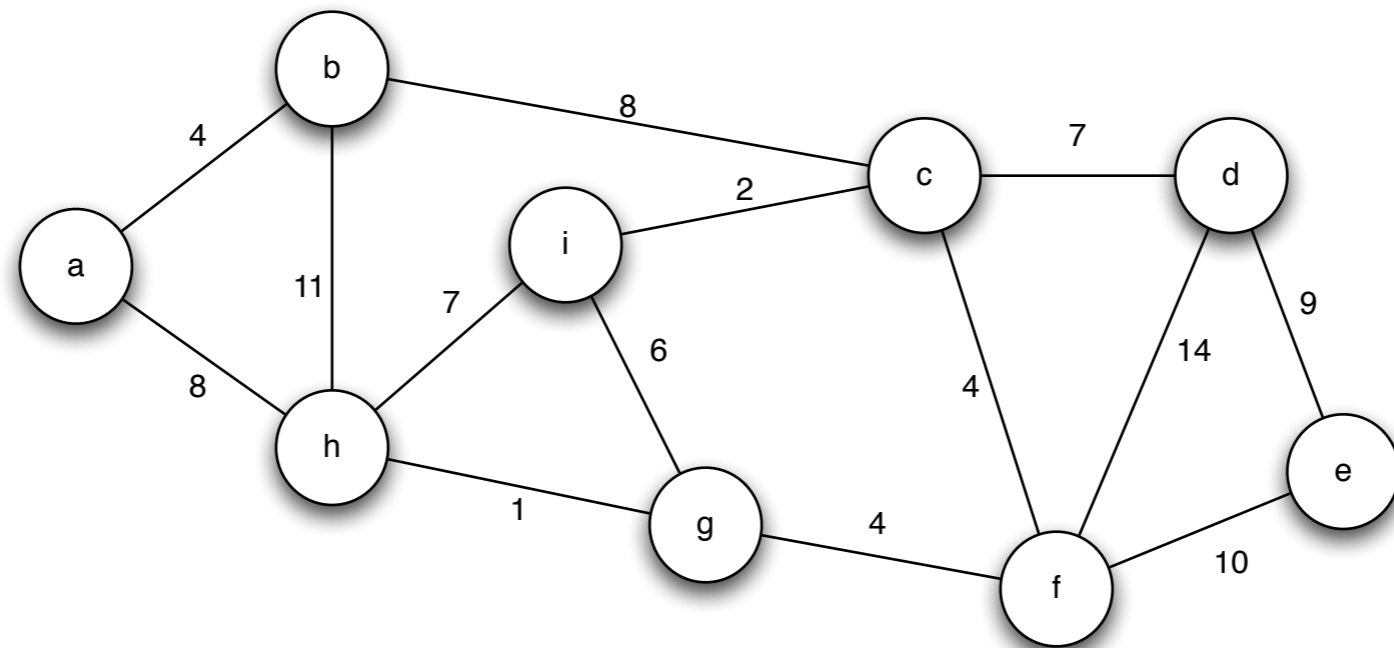


Boruvka's Algorithm

- let each node in G be a tree by itself
- for each tree T add a lightest edges between T and $G-T$
- repeat _____ times
- correctness and time complexity?

Boruvka's Algorithm

- examples



Hybrid Algorithm

- perform Boruvka's algorithm for $\log \log n$ times
- perform Prim's algorithm on _____ nodes
- correctness and time complexity?