spanning trees

Let G be an undirected graph. A spanning tree for G is a connected acyclic subgraph that includes the set \( V \) of all vertices of G.

A graph cannot have a spanning tree unless it is connected. Conversely, every connected graph has a spanning tree.

Algorithm to find a spanning tree

spanning tree algorithm (p.270)

Initialization:

\( x = \) some fixed arbitrary vertex of G where the tree will start to grow

\( V_0 = \{x\} \) the set of vertices in our tree

\( E_0 = \emptyset \) the set of edges in our tree

repeat until \( V_0 = V \)

pick vertices \( v \in V_0 \) and \( v' \in V_0 \) such that \( (v,v') \in E \) (E denotes the set of edges of G.)

let \( V_0 = V_0 \cup \{v'\} \) and let \( E_0 = E_0 \cup \{(v,v')\} \)

endrepeat

output: \( E_0 \), the set of edges in the tree

depth first and breadth first

The spanning tree algorithm is very general; it does not specify how the new edges should be chosen at each iteration.

There are two fundamentally different ways to add the new edges: depth first, and breadth first.

Homework: p.278: 6,8,11a, 12,20,21,22,23

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we discussed #6 and #8 on p. 278

representing a tree as a list