冬

概述

黄药师道: "你拿了这图,到临安府找一家客店或是寺观住下,三月之后,我派人前来取回。图中一切,只许心记,不得另行抄录印摹。"

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基本术语

$$*G = (V; E)$$

vertex: n = |V|

edge|arc: e = |E|





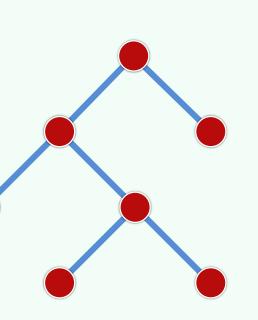
同一顶点自我邻接,构成自环(self-loop)

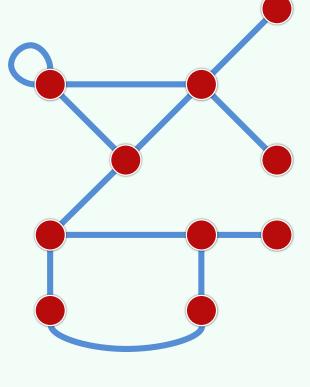
不含自环及重边,即为简单图 (simple graph)

非简单 (non-simple) 图, 暂不讨论

❖ 顶点与其所属的边,彼此关联 (incidence)

度(degree/valency):与同一顶点关联的边数



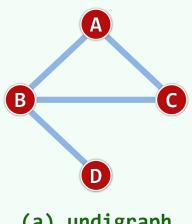


无向图 + 有向图

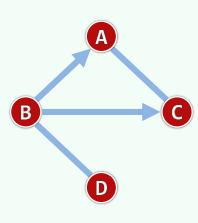
❖ 若邻接顶点u和v的次序无所谓

则(u, v)为无向边 (undirected edge)

❖ 所有边均无方向的图,即无向图 (undigraph)

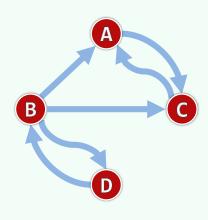






(b) mixed graph

- ❖ 反之,有向图 (digraph) 中均为有向边 (directed edge)
 - u、v分别称作边(u, v)的尾 (tail) 、头 (head)
- ❖ 无向边、有向边并存的图,称作混合图 (mixed graph)
- ❖ 有向图通用性更强,故本章主要针对有向图介绍相关结构及算法



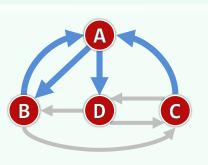
(c) digraph

路径 + 环路

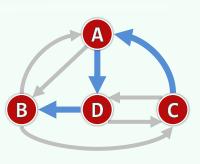
* 路径
$$\pi = \langle V_0, V_1, \ldots, V_k \rangle$$
长度 $|\pi| = k$



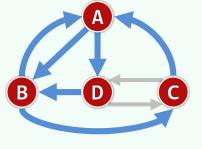
- ❖环/环路: v₀ = v_k
- ❖ 有向无环图 (DAG)
- ❖ 欧拉环路: |π| = |E|各边恰好出现一次
- **❖ 哈密尔顿环路:** |π| = |V|
 - 各顶点恰好出现一次



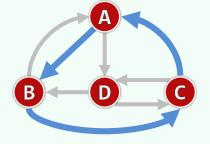




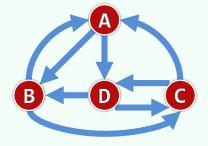
(ii) simple path



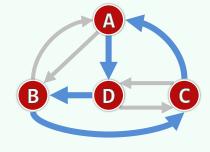
(i) cycle



(ii) simple cycle



(i) Eulerian tour

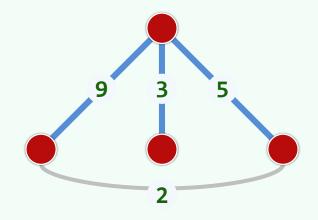


(ii) Hamiltonian tour

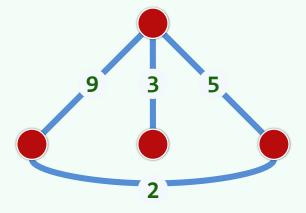
支撑树 + 带权网络 + 最小支撑树

❖ 图G = (V; E)的子图T = (V; F)若是树,即为其支撑树 (spanning tree)

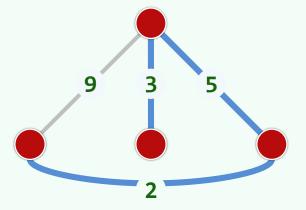
同一图的支撑树,通常并不唯一



spanning tree



weighted network
(triangle inequality?)



minimum spanning tree

- ❖ 各边e均有对应的权值wt(e),则为带权网络 (weighted network)
- ❖ 同一网络的支撑树中,总权重最小者为最小支撑树 (MST)