
数据结构与算法分析

作业 08

本次作业共有 6 道题，前 3 题需要将代码提交至在线评测系统

1. 编写一个随机生成网络的程序，详见评测系统
2. 用 List 实现 Dijkstra's Algorithm，详见评测系统
3. 用 Heap 实现 Dijkstra's Algorithm，详见评测系统。
4. 用随机网络生成程序生成不同规模，不同疏密程度的随机网络，对比测试用 List 实现和用 Heap 实现的 Dijkstra's Algorithm 的运行时间，简述你的测试方法，展示你的测试结果，并简要分析总结。

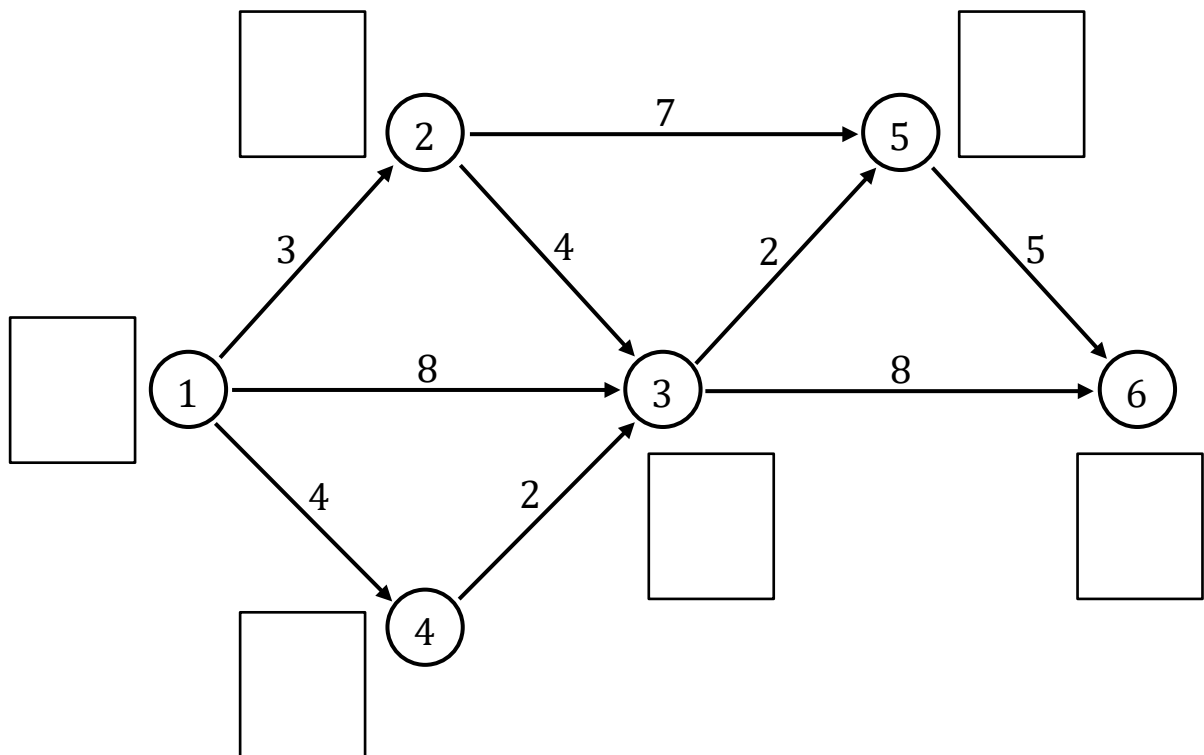
5. Design of a Greedy Algorithm

Consider a connected network $G = (N, A)$ where N is the set of nodes and A the set of edges. A k -coloring of $G = (N, A)$ is a function $C: N \rightarrow \{0, 1, 2, \dots, k-1\}$ such that $C(i)$ is different from $C(j)$, $\forall (i, j) \in A$. In other words, two adjacent nodes cannot have the same color.

- a) Please show that a tree is 2-colorable, which means you can use two colors to color each node in a tree and every two adjacent nodes have different colors.
- b) Assume that our objective is to develop a k -coloring with the minimum number of colors. Please design a greedy algorithm to determine a k -coloring with a minimum k . Note your algorithm does not have to be optimal. Please focus on applying the greedy design technique instead. There is not a single answer to this question.
- c) If your algorithm is optimal, please provide a proof. Otherwise, please provide a counter example where your algorithm fails to determine the minimum number of colors to color your counter-example graph.
- d) Which data structure would you use to implement your algorithm? Please provide an order analysis for the run time of your algorithm.

最后一题在下一页，请将下一页打印出来，在顶部写上自己的姓名等信息，完成该题，与其他纸质作业一起在下节课上提交

6. 对于下面的网络



- a. 请在下方的表格中给出该网络的 Star Representation, 注意表格中可能有多余的行, 留空即可

arc ID	fr	to	cost	trace

i	point	rpoint

- b. 请在上图中使用 Dijkstra's Algorithm 求出节点 1 到其他所有节点的最短距离: 在各个节点旁边的方框中给出节点 1 到该节点的最短距离, 以及最短路上的前驱结点, 要求保留求解过程 (将中间过程用单横线划去)