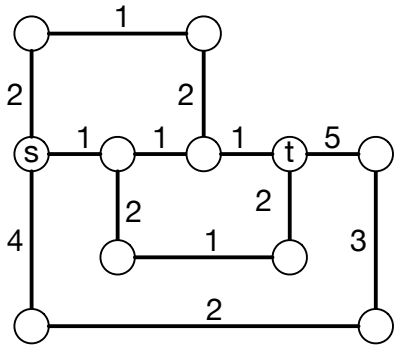
Energy Informatics

https://proglang.informatik.uni-freiburg.de/teaching/energy-informatics/2018ws/

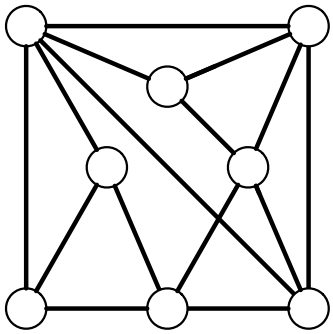
Exercise Sheet 12 – Graph algorithms

2019-01-28

Exercise 1 (Manual computations)
Consider the following undirected graph with the shown flow capacities on the edges.



1. Find the shortest path p between s and t (with respect to the hop distance).
2. Find a series of flow augmenting paths and show each resulting flow.
3. Compute the maximum flow on from s to t.
4. Find the minimum cut between s and t and compare the result to the maximum flow.
5. Is the above graph 2-connected? Is it 3-connected? How about the following graph?



6. Which of the above graphs is 2-edge-connected or 3-edge-connected?

Exercise 2 (Implementation)
We now want to implement the shortest path algorithm in Python.

Consider a graph as a dictionary that associates vertices to set of edges. Edges contains the destination vertice, and a weight. Vertices can be represented by strings or integers.

1. Implement the two graphs above.
2. Write functions to return the number of vertices and edges and the maximum degree of the graph.
3. Implement a function that prints vertices of a graph in Breadth-First order.
4. Implement shortest-path algorithm for graphs without weights with a BFS.
5. Implement the Bellman-Ford Algorithm.