

Java Collection: Extensive repetition s. Code

## Graphs

Tree:

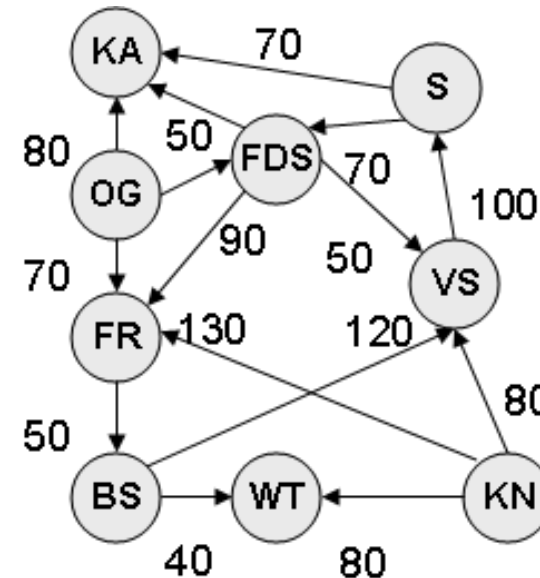
- 0..1 ingoing branches
- 0...n outgoing branches

Graph

- 0..n ingoing branches
- 0...n outgoing branches

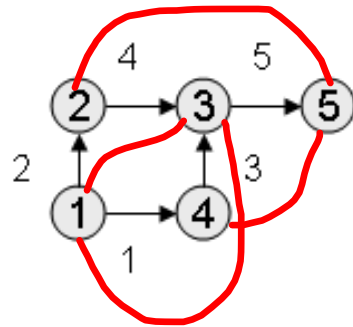
Uses Cases

- Route planning
  - > shortest distance between nodes
  - > traveling salesman
- Flows (strom, good, sewage)
  - > maximum throughput
- Project management
  - > critical path
  - > shortest time
- Google page rank



gerichtet / ungerichtet | direct / non-directed  
graphs

gewichtet / ungewichtet | weighted /  
unweighted graphs

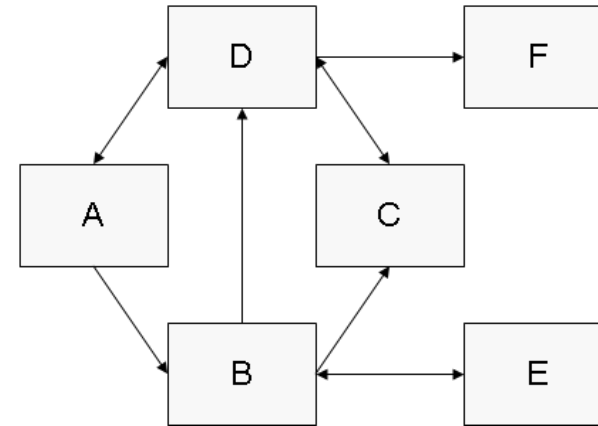


Adjazenzmatrix / Adjacency Matrix

Transitive Hülle / Transitive Envelope

	1	2	3	4	5
1		2	4	1	9
2			4		9
3					5
4			3		8
5					

## Google Page Rank Algorithm



$$A = \frac{4}{5} * (\frac{1}{3} * D) + \frac{1}{5}$$

$$B = \frac{4}{5} * (\frac{1}{2} * A + E) + \frac{1}{5}$$

$$C = \frac{4}{5} * (\frac{1}{3} * B + \frac{1}{3} * D) + \frac{1}{5}$$

$$D = \frac{4}{5} * (\frac{1}{2} * A + \frac{1}{3} * B + C) + \frac{1}{5}$$

$$E = \frac{4}{5} * (\frac{1}{3} * B) + \frac{1}{5}$$

$$F = \frac{4}{5} * (\frac{1}{3} * D) + \frac{1}{5}$$

$\frac{4}{5}$  = Damping Factor (Dämpfungsfaktor). It expresses the percentage of visitors coming via links, the rest (here 20% =  $\frac{1}{5}$ ) directly navigates the web page.

$$A = \frac{4}{5} * (\frac{1}{3} * 1) + \frac{1}{5} = \frac{7}{15}$$

$$B = \frac{4}{5} * (\frac{1}{2} * 1 + 1) + \frac{1}{5} = \frac{14}{10}$$

$$C = \frac{4}{5} * (\frac{1}{3} * 1 + \frac{1}{3} * 1) + \frac{1}{5} = \dots$$

$$D = \frac{4}{5} * (\frac{1}{2} * 1 + \frac{1}{3} * 1 + 1) + \frac{1}{5}$$

$$E = \frac{4}{5} * (\frac{1}{3} * 1) + \frac{1}{5}$$

$$F = \frac{4}{5} * (\frac{1}{3} * 1) + \frac{1}{5}$$

$$A = \frac{4}{5} * (\frac{1}{3} * D) + \frac{1}{5}$$

$$B = \frac{4}{5} * (\frac{1}{2} * \frac{7}{15} + E) + \frac{1}{5} =$$

$$C = \frac{4}{5} * (\frac{1}{3} * \frac{14}{10} + \frac{1}{3} * D) + \frac{1}{5}$$

$$D = \frac{4}{5} * (\frac{1}{2} * \frac{7}{15} + \frac{1}{3} * \frac{14}{10} + C) + \frac{1}{5}$$

$$E = \frac{4}{5} * (\frac{1}{3} * \frac{14}{10}) + \frac{1}{5}$$

$$F = \frac{4}{5} * (\frac{1}{3} * D) + \frac{1}{5}$$