Lab Discussion 10

Exercise 1. Explore the definition of the class Graph:

- **(i)** Represent graphs of your choice and explore the operations to find outgoing edges, to insert vertices and edges, and to remove them.
- **(ii)** Explore depth-first and breadth-first search on your graphs.
- **(iii)** Implement an operation *incomingEdges* that returns for a given vertex v all edges (w, v) in your graph.
- **(iv)** Modify the class such that an edge is stored only once, but participates in two doubly linked lists providing outgoing and incoming edges of different nodes (see slide 299).
- **(v)** Compare the space requirements of your modified class with the original class Graph.
- **(vi)** Compare the time required for basic operations (insertion/deletion of edges, determination of outgoing/incoming edges) of your modified class with the original class Graph.

Exercise 2. Implement a class DiGraph of directed graphs:

- **(i)** Define basic operations for the insertion and deletion of edges and the determination of outgoing/incoming edges.
- **(ii)** Implement depth-first and breadth-first search on directed graphs.
- **(iii)** Implement a program that checks, if a given directed graph is acyclic.