COMP 202: Data Structures and Algorithms
Lab work 1: Linked Lists

1 Purpose

To implement linear data structures.

In this exercise, you will implement linked lists.

You will keep your code and reports in a Git repository, such as GitLab[1], GitHub[2] etc.

2 Background

Linear data structures organize data elements in a linear manner, i.e. each data element has only unique successor. Array, stack, queue, linked lists etc. are some examples of linear data structures.

2.1 Linked list

A *linked list* is a data structure composed of nodes, each node holding some information and a pointer to another node in the list.

If a node has a link only to its successor in the sequence, the list is called a *singly linked list.* In a singly linked list, one cannot traverse a list backward.

3 Tasks

1. Implement a singly linked list with the following operations:
   (a) *isEmpty()*: Returns true if the list is empty, and false otherwise
   (b) *addToHead(data)*: Inserts an element to the beginning of the list
   (c) *addToTail(data)*: Inserts an element to the end of the list
   (d) *add(data, predecessor)*: Inserts an element after the given predecessor node
   (e) *removeFromHead()*: Removes the first node in the list
   (f) *remove(data)*: Removes the node with the given data
   (g) *retrieve(data, outputNodePointer)*: Returns the pointer to the node with the requested data
   (h) *search(data)*: Returns true if the data exists in the list, and false otherwise
   (i) *traverse()*: Displays the contents of the list

   Also, write a test program to check if the implementation works properly.

[1] https://gitlab.com

[2] https://github.com

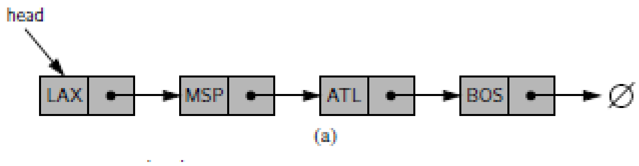

Figure 1: Singly linked list

4 Lab work submission

Submit your work via Canvas **within 2 weeks**. Your submission must include the following:

1. Your code
2. A report containing
   (a) the output of your program, and
   (b) answers to the questions posed in the labsheet, if any.
3. Link to your Git repository must be in a comment. Your repository must be private. The user whom you must give access will be communicated during the lab session.