

## Lab Discussion 2

EXERCISE 1. Explore the class definitions `ALIST` and `DLIST` using unbounded arrays and doubly linked lists, respectively:

- (i) Create lists using the constructors with different elements and different sizes.
- (ii) Explore the functions defined on `ALIST` and `DLIST` objects with different arguments.
- (iii) Define a sequence of function calls on your example objects for `ALIST` such that `allocate` and `deallocate` methods will be executed.
- (iv) Create really `huge lists` so that it becomes difficult to execute the list functions.
- (v) Define a modified `class SLIST`, which represents singly linked lists with an additional pointer from the dummy node to the last node of the list. Repeat (i) – (iv) for objects of this class.

EXERCISE 2. Create a derived class `RLIST` of lists with elements that have a `fixed record structure`, e.g. recording students with first name, last name and student id.

- (i) `Modify the ALIST functions` to deal with the structured lists, i.e. for any modification you have to check that the new list element has the correct type.
- (ii) Modify the class further using an attribute of the record structure as key (e.g. `student_id`), i.e. a list cannot contain two records with the same value of the key attribute.
- (iii) Explore how the `complexity` of `set_item`, `insert` and `append` could be optimised.

EXERCISE 3. Continue the previous exercise with a new `project` method on `RLIST`.

- (i) A projection operation on a record removes some attributes. Implement a projection operation on structured lists that applies the same projection to all list elements.
- (ii) Implement a modified `projection method`, where it is required that all elements of the resulting list are distinct.
- (iii) Analyse the complexity in both cases and discuss how sorting can be used to improve complexity.

EXERCISE 4. Explore the idea of the `splice method` either on `ALIST`, `DLIST` or `SLIST`.

Show how to express other operations using the `splice` method. If necessary, modify the implementation of the `splice` method.