**Contents**

[**1** **Introduction** 1](#_Toc444194532)

[**1.1** **Requirements** 1](#_Toc444194533)

[**2** **Technical Background** 1](#_Toc444194534)

[**2.1** **Linked list** 1](#_Toc444194535)

[**2.2** **Set, an abstract data type** 1](#_Toc444194536)

[**3** **Design and Implementation** 2](#_Toc444194537)

[**3.1** **The functions** 2](#_Toc444194538)

[**4** **Discussion** 3](#_Toc444194539)

[**5** **Conclusion** 3](#_Toc444194540)

[**References** 3](#_Toc444194541)

# **1 Introduction**

This assignment was to implement an ordered set ADT. The set relies on an ordering of elements and supports iteration over its elements in that order.

## **1.1 Requirements**

This program requires several functions. They have to:

* Adding an element to the set
* Getting the size of the set
* Checking if a specific element is in the set
* Getting a union of two sets
* Getting a difference of two sets
* Getting an intersection of two sets
* Iteration over the elements in the set

# **2 Technical Background**

## **2.1 Linked list**

Linked list is one of the simplest and most common data structures. They can be used to implement abstract data types (set). In a linked list, elements can easily be inserted or removed without reallocation or reorganization of the entire structure.[[1]](#footnote-1) A linked list is a collection of nodes where each node contains two things; the stored data and a pointer to the next node in the list. To access a linked list is the address for the first node, which is called the head of the list. The node is access by using a pointer called head. The last node points to a NULL value, which says that there are no more nodes in the list.

## **2.2 Set, an abstract data type**

A set is an abstract data type that can store values, without any particular order and no repeated values. Static sets allow only question operations on their elements, i.e. checking if the value is already in the set. An abstract data structure is a collection of data, and the data can be characters, numbers or other data types. Along with set, there are three other data structures, bunch, string and list.[[2]](#footnote-2)

There are four core set-theoretical operations, union (S, T), intersection (S, T), difference (S, T) and subset (S, T), the first three operations have been implemented in this assignment.

# **3 Design and Implementation**

The functions set\_union, set\_difference and set\_intersection all use a form of the merge algorithm. The merge algorithm takes two lists as input and produces a single list as output containing all the elements of the inputs lists.[[3]](#footnote-3) This algorithm does not sort the set, the function that has been used to do this was handed out with the precode.

## **3.1 The functions**

* set\_create
  + creates a set
* set\_destroy
  + destroys the given set
* set\_size
  + returns the size of the set
* set\_add
  + adds an element at the end of the set, for each element the set size will increase and sorts the set
* set\_contains
  + will return 1 if the element is contained in the set, otherwise it will return 0
* set\_union
  + is a version of the merge algorithm, it makes a set that contains all the elements of its input sets. If two elements are equal, it will only put one of them in the set
* set\_intersection
  + is a version of the merge algorithm, it makes a set of the elements that is contained in both sets
* set\_difference
  + is a version of the merge algorithm, it makes a set where it contains all elements of one set, but not the other one
* set\_copy
  + makes a copy out of the given set
* set\_createiterator
  + makes an iterator that can iterate over a set
* set\_destroyiterator
  + destroys the iterator
* set\_hasnext
  + if the iterator has reached the end, it will return 0, otherwise 1
* set\_next
  + returns the next element in the set

# **4 Discussion**

For the implementation of the set it was used linked list, this is easy to do, but it is ineffective, because it has to scan the hole list if it is to remove an element. To make it more efficient it could have been used trees or hash tables.

An advantages to use linked list are that they are a dynamic data structure, which can increase and decrease, allocate and deallocate memory while the program is still running.

A disadvantages to use linked list is that it has a tendency to use more memory due to the pointers that requires extra storage space.

# **5 Conclusion**

The problem is solved, as the output is the same as the expected-file. This assignment was solved step by step, which all have worked properly, it is possible to assume the problem has been solved correctly.

# **References**

[1] <https://en.wikipedia.org/wiki/Linked_list#Singly_linked_list>, February 25, 2016

[2] <https://en.wikipedia.org/wiki/Set_(abstract_data_type)>, February 25, 2016

[3] <https://en.wikipedia.org/wiki/Merge_algorithm>, February 25, 2016

1. https://en.wikipedia.org/wiki/Linked\_list#Singly\_linked\_list [↑](#footnote-ref-1)
2. https://en.wikipedia.org/wiki/Set\_(abstract\_data\_type) [↑](#footnote-ref-2)
3. https://en.wikipedia.org/wiki/Merge\_algorithm [↑](#footnote-ref-3)