FIT1008 – Intro to Computer Science
Tutorial 8

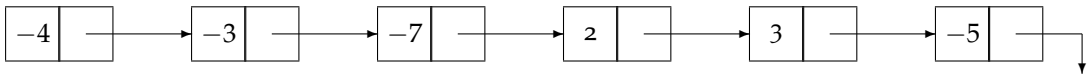
Semester 1, 2018

Objectives of this tutorial

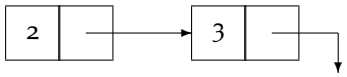
- To understand how linked structures and Iterators work

Exercise 1

Suppose `List` class implements a linked list. Add a method `delete_negative` to the class that, when the list contains numbers, eliminates from the list any node containing a negative element. For example, given the linked list:



where -4 is at the head of the list, a call to `the_list.delete_negative()` would leave the list as:



where 2 is at the head.

Exercise 2

Suppose `List` class implements a linked list and consider the following function that accepts two of those lists:

```
1  def mystery(a_list1, a_list2):
2      if a_list1.head is None:
3              a_list1.head = a_list2.head
4      else:
5              current1 = a_list1.head
6              current2 = a_list2.head
7              while current2 is not None:
8                  temp = current1.next
9                  current1.next = current2
10                 if current2.next is None:
11                         current2.next = temp
12                         current2 = None
13                 else:
14                         current1 = current2.next
```

```
15                      current2 = temp
16      a_list2.head = None
```

(i) Consider a call to `mystery(a_list1, a_list2)` where `a_list1` is a list with elements 1,2,5,3,8 (in that order) and `a_list2` is a list with elements 0,9,7,4,6,1,0,5 (in that order). Draw the memory diagram for the resulting lists before and after the function is executed and explain what the function does.

(ii) What happens to the heads of `a_list1` and `a_list2`. What does this mean for the algorithm?

(iii) What is the best and worst Big O time complexity of our `mystery` function in terms of the lengths n1 and n2 of the lists? Given an explanation.

Exercise 3

Write an iterator for a Circular Queue, that iterates through all the items in the queue from front to rear.

Exercise 4

Consider an `List` class that defines a list data type with the following methods:

```
__init__(self)                  # for instance creation via List()
__iter__(self)                  # returning an instance of Iterator via iter()
```

where `Iterator` is an iterator class of `List` that provides the method:

```
__next__(self)                  # for accessing the next item via next()
```

(a) Define a method `appears(a_list, item, k)` where `k` is an integer and `appears` returns `True` if the item appears at least `k` times in `a_list`. For example, given a list with elements 8, 7, 6, 7, 89, 6, 5, 3, 6, 100, where element 8 is the head, a call to `appears(a_list, 6, 3)` would return `True`, while a call to `appears(a_list, 6, 4)` would return `False`.

IMPORTANT: the implementation should be such that you stop as soon as you know the answer is `True`.

(b) What is the best/worst Big O complexity for a list of N elements? Explain.