CSC 205 Lab 10 : Linked Lists

Goals

After completing this lab, you should be able to:

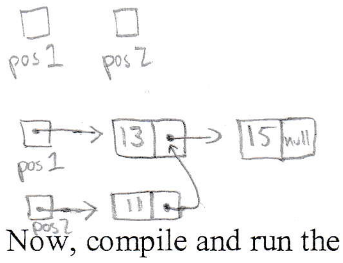
- Understand object references and the advantages of a dynamic linked list over an array.
- Be able to display and count the contents of a linked list.
- Insert a node into a specified position of a linked list.

Lab Startup

Change into your `Labs` directory, and let's create and change into a `Lab10` directory. Now, let's copy over some files by typing : `cp /pub/digh/CSC205/Lab10/* .`

Building and Tracing a Simple Linked List

Take a look at the `Links.java` program in your attached handout. Draw the linked list that would be created by the `main` method.



printList (pos2)

Sysout : 11
13
15

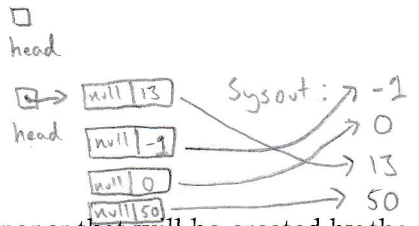
Now, compile and run the `Links` program and check to see if your list prints out in the manner that you would expect given a head pointer to the front of your list.

Writing Simple Methods for Processing Linked Lists

Add a recursive method named `count` to your `Links` program that can be used to count and return the number of nodes pointed to by a head pointer. Your method will have one parameter, the pointer `head`.

Add an iterative method named `findMax` to your `Links` program that returns the largest value in a linked list pointed to by a head pointer. Your method will have one parameter, the pointer `head`. You should not be concerned about the data type of the elements stored in your nodes. Use the `Comparable` interface appropriately in your method.

Include method calls in `main` to test both of your new methods.



Building an Ordered Linked List

Draw the linked list on a separate sheet of paper that will be created by the `main` method in your `Links2` program shown on your handout. Trace through the `insert` method very carefully and show your `prev` and `curr` pointers. Notice that very powerful `for` loop with an <u>empty</u> body that uses multiple initial conditions, dual boolean conditions, and multiple increments. Using the comma in this manner is perfectly legal in Java `for` loops.

Compile and test the `Links2` program to test your results when you're done.

Searching an Ordered Linked List

Take a look at the `Search` program in your current directory. You need to add two methods to this program so that it will successfully read in 0 or more integers from the keyboard, insert each of them into a sorted linked list, and then allow the user to search for a key from your list.

First off, in `buildList`, you will need to declare a local head pointer and flush it to `null`. Next, use the `Scanner` class to read in one or more tokens from the keyboard.

You're now ready to continue reading in tokens until the end of file is reached. To simulate end of file from the keyboard, you'll use Control-D. Each token that is a number should be inserted into the linked list using the `insert` method. Be sure you assign the result of this method to `head` each time in case your new item was added to the beginning of your linked list or your list was initially empty.

Finally, complete the `search` method that takes the `head` pointer and a `key` value, and returns `true` or `false` indicating whether your `key` value is present in your list. You may use iteration or recursion.

Test your program using the sample run below where user input is shown in boldface.

<u>Sample Run</u>

```
Please input 0 or more values at keyboard
12 4
-1 5 3
0
2
Now printing list
-1 0 2 3 4 5 12
What key in list are you searching for? 15
Your key was not found.
```