

Objective: To gain experience implementing linked data structures by implementing a cursor-based list using doubly-linked nodes.

To start the homework: Download and extract the file hw3.zip from

<http://www.cs.uni.edu/~fienu/cs1520s17/homework/>

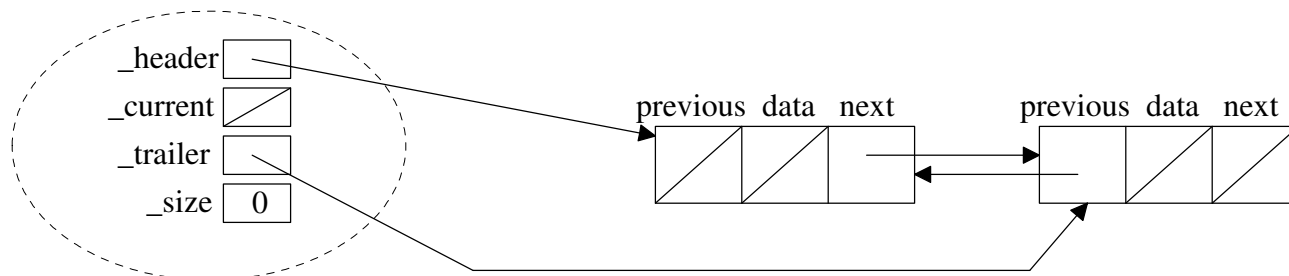
The hw3.zip file contains:

- the Node class (in the node.py module) and the Node2Way class (in the node2way.py module)
- the skeleton CursorBasedList class (in the cursor_based_list.py module) which you will complete
- the cursorBasedListTester.py file that you can use to interactively test your CursorBasedList class.

Recall that in a **cursor-base list** a *cursor* (indicating the *current item*) can be moved around the list with the cursor being used to identify the region in the list to be manipulated. We will insert and removing items relative to the current item. A *current item* must always be defined as long as the list is not empty.

| Cursor-based operations | Description of operation |
|-------------------------|---|
| L.getCurrent() | Precondition: the list is not empty. Returns the current item without removing it or changing the current position. |
| L.hasNext() | Precondition: the list is not empty. Returns True if the current item has a next item; otherwise return False. |
| L.next() | Precondition: hasNext returns True. Postcondition: The current item has moved right one item |
| L.hasPrevious() | Precondition: the list is not empty. Returns True if the current item has a previous item; otherwise return False. |
| L.previous() | Precondition: hasPrevious returns True. Postcondition: The current item has moved left one item |
| L.first() | Precondition: the list is not empty. Makes the first item the current item. |
| L.last() | Precondition: the list is not empty. Makes the last item the current item. |
| L.insertAfter(item) | Inserts item after the current item, or as the only item if the list is empty. The new item is the current item. |
| L.insertBefore(item) | Inserts item before the current item, or as the only item if the list is empty. The new item is the current item. |
| L.replace(newValue) | Precondition: the list is not empty. Replaces the current item by the newValue. |
| L.remove() | Precondition: the list is not empty. Removes and returns the current item. Making the next item the current item if one exists; otherwise the tail item in the list is the current item unless the list is now empty. |

The cursor_based_list.py file contains a skeleton CursorBasedList class. You **MUST** use a doubly-linked list implementation with a *header* node and a *trailer* node. **All “real” list items will be inserted between the header and trailer nodes to reduce the number of “special cases”** (e.g., inserting first item in an empty list, deleting the last item from the list, etc.). An empty list looks like:



Use the provided cursorBasedListTester.py program to test your list.

Submit all necessary files (cursor_based_list.py, node.py, node2way.py etc.) as a single zipped file (called hw3.zip) electronically at : https://www.cs.uni.edu/~schafer/submit/which_course.cgi

EXTRA CREDIT PART: You are to write a simple text-editor program that utilizes your `CursorBasedList` class. **Each node in the list will hold a single line of the text file.** When done editing, the data contained in the nodes is written to a text file. NOTE: You should NOT need to modify your `CursorBasedList` class only create a `CursorBasedList` object and use its methods.

STRONG HINT: You might want to start with the `cursorBasedListTester.py` program as a rough starting point for your text-editor program.

Your text-editor program should present a menu of options that allows the user to:

- enter a filename of a text (.txt) file to edit. Your program should then insert each line from the text file into a cursor-based list. (i.e., one line of the file per node in the list)
- create a new text (.txt) file to edit. Your program should create an empty cursor-based list.
- navigate and display the first line, i.e., the first line should be the current line
- navigate and display the last line, i.e., the last line should be the current line
- navigate and display the next line, i.e., the next line should become the current line. If there is no next line, tell the user and don't change the current line
- navigate and display the previous line
- insert a new line before the current line
- insert a new line after the current line
- delete the current line and have the line following become the current line. If there is no following line, the current line should be the last line.
- replace the current line with a new line
- save the current list back to a text file

Warning: When you load a text file into your list nodes, you can leave the '\n' characters on the end of each line of text. However, remember to add a '\n' character to end of inserted lines or replacement lines.

Implement AND fully test your text-editor program. Part of your extra credit will be determined by how **robust** your text-editor runs (i.e., does not crash) and how **user-friendly/intuitive** your program is to use. You are required to submit a brief User's manual on how to use your text-editor.

For even more extra credit, your program may provide do one or more of the following additional text-editor functionality:

- Find word and Find next occurrence
- Replace a specified word/string on the current line by another word/string
- Copy and Paste a line, etc.

Be sure to include these additional features in your User's manual.