

Programming assignment 3: Doubly-linked lists

Bonus 5% for a correct implementation that has no unnecessary repetition of code

Make the class **DLL** which uses a doubly-linked list to implement the following operations:

- **__str__(self) - (5%)**
 - Returns string with all the items in the list with a single space between them
- **__len__(self) - (5%)**
 - Returns the number of items in the list
- **insert(value) - (5%)**
 - Inserts an item with that value *in front of* the node at the current position
 - *The new node is now in the current position*
- **remove() - (5%)**
 - Removes the node at the current position if there is one (otherwise does nothing)
 - *The node behind the removed node is now in the current position*
- **get_value() - (5%)**
 - Returns the value of the item at the current position in the list (**None** if not item)
- **move_to_next() - (5%)**
 - Moves the current position one item closer to the tail/trailer
 - *Do nothing if at end*
- **move_to_prev() - (5%)**
 - Moves the current position one item closer to the head/header
 - *Do nothing if at beginning*
- **move_to_pos(position) - (5%)**
 - Moves the current position to item #position in the list
 - *The first actual data item is #0*
 - *Do nothing if position not between beginning and end (including both)*
- **clear() - (10%)**
 - Clears all nodes from the list
- **get_first_node() - (5%)**
 - Returns the first **Node** of the list
 - *The headers next pointer should be pointing to this node*
 - *Returns the node, not the value inside it*
 - If list is empty, return **None**
- **get_last_node() - (5%)**
 - Returns the last **Node** of the list
 - *The tailers prev pointer should be pointing to this node*
 - *Returns the node, not the value inside it*
 - If list is empty, return **None**

- ***partition(low, high) - (20%)***
 - Takes in two nodes from the list as a parameter
 - You can fetch these nodes with **get_first_node** and **get_last_node**
 - Uses **low** as a **pivot**
 - Loops from low to high and moves all nodes smaller than low so they are ahead(left side) of the low node.
 - Example:
 - List before partition: 10 7 7 14 10 15 1 8 2 4 13 7 11 8 8 13
 - Low is 10 which is also a pivot
 - High is 13
 - List after partition: 7 7 1 8 2 4 7 8 8 **10** 14 10 15 13 11 13
 - Note: The list is not sorted but all elements left of 10 are smaller then 10 and all elements right of 10 are bigger(or equal)
 - *The order of elements above and below pivot doesn't matter, only that they are on the correct side of the pivot*
 - After partitioning **current** position should point towards the pivot
 - Partition will only be tested with valid low and high nodes
- ***sort() - (20%)***
 - Order the items in the list with any method that uses only your DLL structure
 - *No moving everything to another structure, sorting and then moving back!*
 - After sorting reset the *current* position to the beginning of the list
 - **5% Bonus for implementing sort using quicksort**
 - **Partition** comes in handy when implementing quicksort