

CSC 2110: Program 5

PQSort Using PQAVL

Description: Add a `T* remove()` method to `AVLTree`. This method returns and removes either the smallest or the largest item in the `AVLTree`. To make this determination, you will add a `bool min_or_max` instance variable to `AVLTree`, set when the tree is constructed. This variable is set to true to remove and return the smallest item in the `AVLTree`. Implement this method by calling private methods in `AVLTree`. Your `AVLTree` should be balanced after each call to `remove`.

Your `AVLTree` will also be able to handle items with duplicate search keys if desired. Add two more `bool` instance variables, `allow_duplicates` and `duplicates_on_left`. The `duplicates_on_left` `bool` determines whether to go to the left or the right when a duplicate search key is encountered. Modify `insertItem` to handle duplicate search keys using these two `bool` variables.

PQAVL: The PriorityQueue (PQ) ADT is defined as follows:

- `PQAVL(bool min_or_max, int (*compare_item) (T* item_1, T* item_2))` //constructor
- `~PQAVL()` //destructor
- `bool pqIsEmpty()`
- `void pqInsert(T* item)`
- `T* pqRemove()` //removes and returns the smallest or largest item in the priority queue

Implement the PQ ADT using your `AVLTree` (PQAVL). PQAVL should be templated. Make sure that you test PQAVL with duplicates.

PQSort: Write a PQSort class with the following methods:

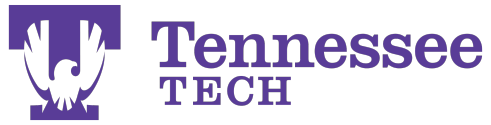
- `static T** pqSort(T** items, int num_items, bool min_or_max, int (*compare_item) (T* one, T* two))` //public method to create and return a new, sorted array in case the original unsorted array must be kept, calls the private method below
- `static void _pqSort(T** items, int num_items, bool min_or_max, int (*compare_item) (T* one, T* two))` //sorts the array using PQAVL

Implement PQSort using PQAVL. Your sort methods should be templated.

PQSortDriver: Thoroughly test your PQSort implementation. Make sure that you test PQSort with duplicates.

Fully document PQAVL and PQSort:

- Preconditions and Postconditions



- Class level comments

Starting Files: Files I provide as a starting point can be found in Program 5 Files in the Common Files section on Piazza