EECS 560 Lab 07: Binary Heap

Objective

- Get familiar with basic binary heap implementation with C++.

Specification of the ADT

1. Implement a binary heap class `MyBinaryHeap<ComparableType>`. We assume larger numbers have higher priorities. The class should be implemented with `MyVector`.
2. Implement `bool verifyHeapProperty(void)` to determine whether the heap satisfies heap property. Return TRUE if yes, and FALSE if no.
3. Implement `void increaseKey(const size_t p, const unsigned int d)` to increase the priority of the pth element (as in the array) by d, and restructure the heap to ensure heap property.
4. Implement `void decreaseKey(const size_t p, const unsigned int d)` to decrease the priority of the pth element (as in the array) by d, and restructure the heap to ensure heap property. If the priority is lower than d, set the priority to 0.
5. Implement `MyBinaryHeap& merge(MyBinaryHeap<ComparableType> && rhs)` to merge `rhs` with the current heap. The merged heap should satisfy heap property. Your implementation should run in linear time w.r.t the total size of the two heaps being merged.

Testing and Grading

We will test your implementation using the tester main function posted online. The posted input and output examples should be used for a testing purpose, while we will use another set of inputs for grading. Your code will be compiled under Ubuntu 20.04 LTS using g++ version 9.3.0 (default) with C++11 standard.

Your final score will be the determined by the success percentage of your program when fed with many random inputs. Note that if your code does not compile (together with our tester main function), you will receive 0. Therefore, it is very important that you ensure your implementation can be successfully compiled before submission.

Submission and Deadline

Please submit your implementation as two .h files, with names "MyVector_[YourKUID].h" (the same as your Lab 01 submission) and "MyBinaryHeap_[YourKUID].h". For example, if my KU ID is c123z456, my submission will be three files named "MyVector_c124z456.h" and "MyBinaryHeap_c124z456.h". Submissions that do not comply with the naming specification will not be graded. All submission will go through Blackboard. The deadline is Nov 4th, 2022 11:59PM.