CS 2420-001 Algorithms and Data Structures

Spring Semester, 2014

Assignment 6: Heaps

Due Date: Wednesday, Mar. 26, 2014 (at the beginning of CS 2420 class)

(**Note:** This assignment has only one programming exercise. Please submit **ONLY** your source files to Canvas.)

1. Suppose we have a heap stored in an array H with index beginning from 1, as discussed in class. You are asked to write procedures to support the following operations.

   (a) $insert(x)$: insert a new key x into H.

   (b) $deleteMin()$: remove the smallest key from H and return the above smallest key.

   (c) $buildHeap()$: build the heap.

   (d) $percolateDown(i)$: as discussed in class, in both $deleteMin()$ and $buildHeap()$ functions, you will need to call the procedure $percolateDown(i)$.

   On Canvas, go to the following directory: homework/hw6/question1. There are a starter cpp file "hw6_Q1.cpp" and an input file "hw6_Q1_input.txt".

   The program first defines an array A and use the elements of A to build a heap by passing A to the class constructor; the class constructor will call the procedure $buildHeap()$ to build the heap. Then, the program reads the input file. Each line of the input file is either "insert x" or "deleteMin". The program reads the input file line by line and perform the operations accordingly. Afterwards, the heap will be printed out (to both an output file and the concole). Finally, the program call a procedure $heapSort()$ to sort all keys in the heap in descending order and print them out. I already finished the $heapSort()$ procedure, in the same way as discussed in class.

   Your task is to complete the above four procedures.

   To help you check whether your program runs correctly, a file "Wang_hw6_Q1_output.txt", which contains the correct output, is in the same directory. For your convenience, all above files are included in a zip file.

Total Points: 60