Algorithm Analysis Homework 1

Due by 3/20(Fri.) through HISNET

* Grading policy

  Remember that correctness is an important criterion, but by no means the whole story. Grades on program will be based on:

  1. Correct behavior on typical input: 70%
  2. Adherence to specification: 5%
  3. Correct behavior on extreme or unusual situations &reasonable recovery from unusual or incorrect inputs.: 20%
  4. Readability ~ comments, Mnemonics identifier, clear program structure.: 5%
  5. Quality of output: Not this time
  6. Efficiency ~ Avoidance of unnecessarily inefficient algorithms or constructs. However, efficiency should never be pursued at the expense of clarity.: Not this time

Write a program that implements max-priority queue. (You should use heap data structure, otherwise you will not get any point for this homework. Also element index should begin from 1, not 0.) Each element has two fields – name and key value. Name consists of English alphabet. In this homework you don't need to check validity of name. We assume user always enter name correctly. Key value is an integer ranged between 1 and 10. When your program starts, it repeatedly presents menu until user enters 'Q'.

Following is description of each menu.

I: When this menu is chosen, program asks user name of element and key value, then inserts element into queue.

D: When this menu is chosen, program removes and displays name and key value of element with largest key.

R: When this menu is chosen, program displays name and key value of element with largest key.

K: When this menu is chosen, program asks index and new key value of element, increases key value of the element, and place the element in proper position.

P: When this menu is chosen, program displays all elements in queue.

Q: When this menu is chosen, program gets terminated.

example)

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********** MENU **********
I : Insert new element into queue.
D : Delete element with largest key from queue.
R : Retrieve element with largest key from queue.
K : Increase key of element in queue.
P : Print out all elements in queue.
Q : Quit

Choose menu: I
Enter name of element: cat
Enter key value of element: 5
New element [cat, 5] is inserted.


********** MENU **********
I : Insert new element into queue.
D : Delete element with largest key from queue.
R : Retrieve element with largest key from queue.
K : Increase key of element in queue.
P : Print out all elements in queue.
Q : Quit

Choose menu: I
Enter name of element: dog
Enter key value of element: 9
New element [dog, 9] is inserted.

********** MENU **********
I : Insert new element into queue.
D : Delete element with largest key from queue.
R : Retrieve element with largest key from queue.
K : Increase key of element in queue.
P : Print out all elements in queue.
Q : Quit

Choose menu: I
Enter name of element: horse
Enter key value of element: 7
New element [horse, 7] is inserted.

********** MENU **********
I : Insert new element into queue.
D : Delete element with largest key from queue.
R : Retrieve element with largest key from queue.
K : Increase key of element in queue.
P : Print out all elements in queue.
Q : Quit

Choose menu: P
[dog, 9] [cat, 5] [horse, 7]

********** MENU **********
I : Insert new element into queue.
D : Delete element with largest key from queue.
R : Retrieve element with largest key from queue.
K : Increase key of element in queue.
P : Print out all elements in queue.
Q : Quit

Choose menu: D
[dog, 9] is deleted.
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********** MENU **********
I : Insert new element into queue.
D : Delete element with largest key from queue.
R : Retrieve element with largest key from queue.
K : Increase key of element in queue.
P : Print out all elements in queue.
Q : Quit

Choose menu: P
[horse, 7] [cat, 5]

********** MENU **********
I : Insert new element into queue.
D : Delete element with largest key from queue.
R : Retrieve element with largest key from queue.
K : Increase key of element in queue.
P : Print out all elements in queue.
Q : Quit

Choose menu: I
Enter name of element: frog
Enter key value of element: 3
New element [frog, 3] is inserted.

********** MENU **********
I : Insert new element into queue.
D : Delete element with largest key from queue.
R : Retrieve element with largest key from queue.
K : Increase key of element in queue.
P : Print out all elements in queue.
Q : Quit

Choose menu: K
Enter index of element: 3
Enter new key value: 8

********** MENU **********
I : Insert new element into queue.
D : Delete element with largest key from queue.
R : Retrieve element with largest key from queue.
K : Increase key of element in queue.
P : Print out all elements in queue.
Q : Quit

Choose menu: R
[frog, 8]

********** MENU **********
I : Insert new element into queue.
D : Delete element with largest key from queue.
R : Retrieve element with largest key from queue.
K : Increase key of element in queue.
P : Print out all elements in queue.
Q : Quit

Choose menu: Q
Thank you. Bye!
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* Remember that homework will be graded on more complex situations.