**Data Structure\_2071035 Lee Somin**

**Technical Report – decrease\_increase\_key.cpp**

*Theorical Explanation of Functions in ‘decrease\_increase\_key.cpp’*

**#define SWAP**

This definition executes swap operation between two data x and y, and use t for the temporary space.

**#define HEAPSIZE**

This definition represents the number of elements in the heap.

**※ The heap starts from index 1, not 0.**

**print\_heap**

Inputs: int\* A

Return: non

This function prints out the heap stored in array displayed in levels. Since the heap starts from 1, it iteratively prints out the element in array from 1 to end. Since there are 2^n elements in a level, the function changes line at (2^n)-1th element.

**Decrease\_key\_min\_heap**

Inputs: int\* A, int i, int key

Return: non

This function is for decreasing the value of the key in heap array’s ‘int i’ th element to ‘int key’. If the key is smaller than the original key value, the function prints error message and returns. Since the heap is min heap, when key is decreased, the key value may be smaller than its ancestors. So, the function compares the value with its parent and if the key value of the parent is larger, the two nodes of the heap is swapped and i is updated to the index of swapped location. This iterates until the key changed is no more smaller than its parent.

**Increase\_key\_min\_heap**

Inputs: int\* A, int I, int key

Return: non

This function is for increasing the value of the key in heap array’s ‘int i’ th element to ‘int key’. If the key is bigger than the original key value, the function prints error message and returns. Since the heap is min heap, when key is increased, the key value may be bigger than its children. If the key value of the node is bigger than its child, the function swaps the two value's location. Unlike the decrease key, the swapped child can be bigger than its original sibling, which is child after swap. So, the function calls itself recursively for the swapped value. In this step, ‘A[i]--' is used since the function prints error is the value to change is equal to the original key. This sequence is executed iteratively until the heap qualifies the minheap property.

**main**

In main function, the input heap is initialized. Then it prints the original heap and calls Decrease\_key\_min\_heap() and Increase\_key\_min\_heap() and prints its results.

**Result:**

텍스트, 전자기기, 스크린샷, 디스플레이이(가) 표시된 사진

자동 생성된 설명