Experiment No 2:

HEAP SORT

## *Source Code:*

#include <iostream>

#include <fstream>

#include <limits.h>

#include <cstring>

using namespace std;

class HeapSort{

private:

long int a[11000];

public:

void readInput(int n, int type){

char s[16];

switch (type){

case 0: strcpy(s, "input.txt"); break;

case 1: strcpy(s, "input-asc.txt"); break;

case 2: strcpy(s, "input-desc.txt"); break;

case 3: strcpy(s, "input-equal.txt"); break;

}

ifstream fin(s);

for (int i=0; i<n; i++)

fin >> a[i];

fin.close();

}

void writeOutput(int n){

ofstream fout("output.txt");

for (int i=0; i<n; i++)

fout << a[n-1-i] << "\t";

fout.close();

}

void maxHeapify(int heapsize, int i, int &count)

{

count++;

int left, right, max;

left = 2\*i + 1;

right = 2\*i + 2;

if(left<=heapsize && a[left]>a[i])

{

max = left;

}

else

{

max = i;

}

if(right<=heapsize && a[right]>a[max])

{

max = right;

}

if(max!=i)

{

swap(a[i],a[max]);

maxHeapify(heapsize, max, count);

}

}

void buildMaxHeap(int heapsize, int &count)

{

for(int i=(heapsize+1)/2;i>=0;i--)

{

maxHeapify(heapsize, i, count);

}

}

int heapSort(int n)

{

int count = 0;

int heapsize = n-1;

buildMaxHeap(heapsize, count);

for(int i=n-1;i>=1;i--)

{

swap(a[0],a[i]);

heapsize--;

maxHeapify(heapsize, 0, count);

}

return count;

}

};

int main(){

HeapSort s;

int ch;

int len[7] = {10, 50, 100, 500, 1000, 5000, 10000};

do {

cout << "1. Heap Sort , 2.Exit " << endl;

cout << "Enter your option: ";

cin >> ch;

if (ch != 1 && ch==2)

break;

cout << "For Random Input: " << endl;

for (int i=0; i<7; i++){

int count = 0;

int n = len[i];

s.readInput(n, 0);

switch (ch){

case 1: count = s.heapSort(n-1);

break;

}

s.writeOutput(n);

cout << "Input size: " << n << "\t" << "No. of Comparisons: " << count << endl;

}

cout << endl << "For ascending order input: " << endl;

for (int i=0; i<7; i++){

int count = 0;

int n = len[i];

s.readInput(n, 1);

switch (ch){

case 1: count = s.heapSort(n-1);

break;

}

// s.writeOutput(n);

cout << "Input size: " << n << "\t" << "No. of Comparisons: " << count << endl;

}

cout << endl << "For descending order input: " << endl;

for (int i=0; i<7; i++){

int count = 0;

int n = len[i];

s.readInput(n, 2);

switch (ch){

case 1: count = s.heapSort(n-1);

break;

}

// s.writeOutput(n);

cout << "Input size: " << n << "\t" << "No. of Comparisons: " << count << endl;

}

cout << endl << "For all elements are same input: " << endl;

for (int i=0; i<7; i++){

int count = 0;

int n = len[i];

s.readInput(n, 3);

switch (ch){

case 1: count = s.heapSort(n-1);

break;

}

// s.writeOutput(n);

cout << "Input size: " << n << "\t" << "No. of Comparisons: " << count << endl;

}

}

while (ch < 5);

return 0;

}

## *Analysis:*

