HEAP

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#include <stdio.h>
#include <iostream>
using namespace std;

struct student
{
    int varsta;
    char* nume;
    float medie;
};

struct heap
{
    student* vect;
    int nrElem;
};

void filtrare(heap h, int index)
{
    int indexMax = index;
    int indexS = 2 * index + 1;
    int indexD = 2 * index + 2;

    if (indexS < h.nrElem && h.vect[indexS].varsta > 
h.vect[indexMax].varsta)
        indexMax = indexS;
    if (indexD < h.nrElem && h.vect[indexD].varsta > 
h.vect[indexMax].varsta)
        indexMax = indexD;

    if (index != indexMax)
    {
        student temp = h.vect[index];
        h.vect[index] = h.vect[indexMax];
        h.vect[indexMax] = temp;

        filtrare(h, indexMax);
    }
}

void inserare(heap* h, student elem)
{
    student* vect1 = (student*)malloc(((*h).nrElem + 1) * 
sizeof(student));
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	for (int i = 0; i < (*h).nrElem; i++)
		vect1[i] = (*h).vect[i];

	(*h).nrElem++;
	free((*h).vect);
	(*h).vect = vect1;

	(*h).vect[(*h).nrElem - 1] = elem;

	for (int i = ((*h).nrElem - 1) / 2; i >= 0; i--)
		filtrare((*h), i);
}

void extragere(heap* h, student* elem)
{
	student* vect1 = (student*)malloc(((*h).nrElem - 1) * 
sizeof(student));

	student temp = (*h).vect[0];
	(*h).vect[0] = (*h).vect[(*h).nrElem - 1];
	(*h).vect[(*h).nrElem - 1] = temp;

	*elem = (*h).vect[(*h).nrElem - 1];

	for (int i = 0; i < (*h).nrElem - 1; i++)
		vect1[i] = (*h).vect[i];

	(*h).nrElem--;
	free((*h).vect);
	(*h).vect = vect1;

	for (int i = ((*h).nrElem - 1) / 2; i >= 0; i--)
		filtrare((*h), i);
}


void afisare(heap h)
{
	printf("\nElementele heap-ului: ");
	for (int i = 0; i < h.nrElem; i++)
		printf("\n%d %s %5.2f", h.vect[i].varsta, h.vect[i].nume, 
h.vect[i].medie);
}

void main()
{
    heap h;

    printf("Nr. elemente: ");
    scanf("%d", &h.nrElem);

    char buffer[20];

    h.vect = (student*)malloc(h.nrElem * sizeof(student));
    for (int i = 0; i < h.nrElem; i++)
    {
        printf("\nElement %d: ", i + 1);
        printf("\nVarsta: ");
        scanf("%d", &h.vect[i].varsta);
        printf("\nNume: ");
        scanf("%s", buffer);
        h.vect[i].nume = (char*)malloc((strlen(buffer) + 1) *
sizeof(char));
        strcpy(h.vect[i].nume, buffer);
        printf("\nMedie: ");
        scanf("%f", &h.vect[i].medie);
    }

    for (int i = (h.nrElem - 1) / 2; i >= 0; i--)
        filtrare(h, i);

    afisare(h);

    student s = { 23, "Marcel", 8.5f };
    inserare(&h, s);
    //inserare(&h, 6);

    afisare(h);

    student elem;
    extragere(&h, &elem);
    printf("\nElement extras are varsta %d", elem.varsta);

    afisare(h);
}
```