University of Craiova, Faculty of Automation,
Computers and Electronics

Title homework: Investment

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Contents

1 Problems statement

Suppose you are an investment agent and you have capital of value C. There are n offers available for investment to choose from. For each offer i there are ai available shares of value vi, which can bring you an estimated profit pi for each share acquired. You are required to determine the investment that can bring you the maximum estimated return. Two different algorithms will be implemented.

1.1 Proposed algorithms

1.1.1 Bubble Sort

```c
// A function to implement bubble sort
void bubbleSort(int arr[], int n)
{
    int i, j;
    for (i = 0; i < n-1; i++)

        // Last i elements are already in place
        for (j = 0; j < n-i-1; j++)
            if (arr[j] > arr[j+1])
                swap(&arr[j], &arr[j+1]);
}
```

1.1.2 Swap

```c
void swap(int *xp, int *yp)
{
    int temp = *xp;
    *xp = *yp;
    *yp = temp;
}
```

1.1.3   Insertion Sort

```
Insertion-sort(a)
   for i = 1 to n
       key ← a [i]
        j ← i - 1
       while j > = 0 and a[j] > key
           a[j+1] ← a[j]
           j ← j - 1
       End while
   a[j+1] ← key
End for
```

1.2   Indication

We need to understand the following things about our problem:

—In order to reach the maximum profit, it is necessary to sort all our options down by profit;

— We must also calculate the shares by multiplying the shares a[i] by the value v[i] it has;

— We must be careful that the value obtained by calculating the cost is not our cost that we already have;

— And let's not forget that we don't need to buy all the shares presented, but only a part of them if we have the necessary cost.

2   App Scheme.
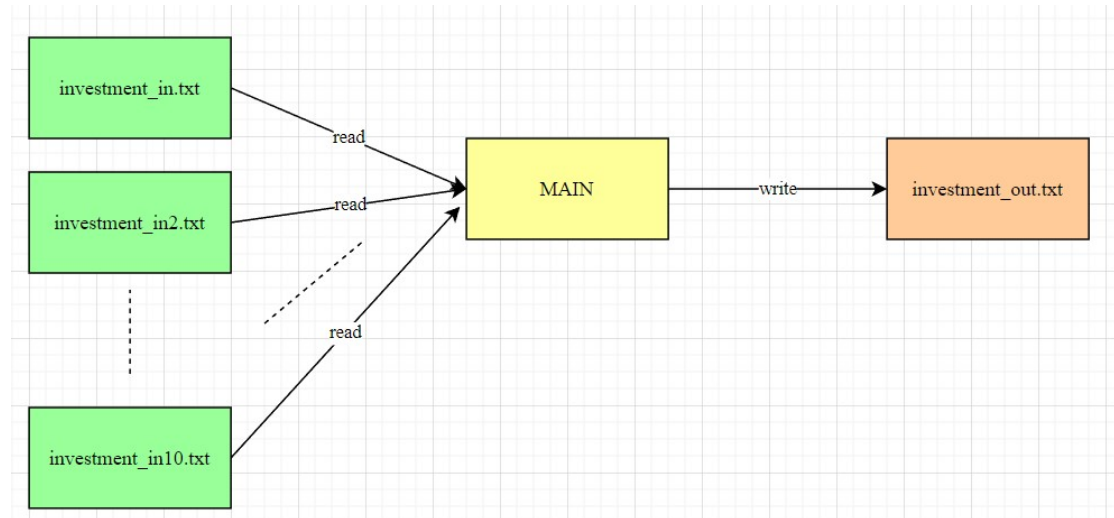
2.0.1   main.c

main.c este fisierul de plecare al aplicației
    In Main :

- C - our capital of value

- n - number of offers

- a[i] - available shares

- v[i]- value of the available shares

- p[i] - estimated profit per share

2.0.2   investment in.txt

investment in.txt the file where we will read our variables

- the first line is our cost

- the second line is the number of offers

- the following lines represent their share number, values and profits in that order

2.0.3   investment out.txt

investment out.txt this file will show the results of our compilations in the following order:

- first line will display your Capital value

- second line will display the number of offers

- For each shares will be displayed the number available shares , Each shares value and Each shares profit:

- your Sorting Time

- Sorting profits, value and shares

- the cost that we still have for first part of app

- the profit that we win in the first part

- the cost that we still have after the first part of app

- the Final profit

3   Understanding the App

After sorting according to profit, in the first part of the application, with the help of a forum to browse each offer we check if we buy the shares, we get the money, as long as our vote is higher than 0 and higher than the result of multiplying the shares by their value, then we continue to buy.

In the second part of the application, if our cost is still higher than 0, but we can't buy all the shares, then we check if we can buy the shares partially. in the end, they will show us the cost remaining after the first part and the profit earned, followed by the results that went through the second part of our application

4   Result

We will read 2 sets of data for each sort algorithm to see the diferences

```
50
10
5 3 4
2 3 4
2 6 3
2 3 8
9 7 4
8 7 4
4 11 9
7 5 90
6 7 9
23 4 1
```

S

```
1    100
2    20
3    5 3 4
4    2 3 4
5    2 6 3
6    2 3 8
7    9 7 4
8    8 7 4
9    4 11 9
10   7 5 90
11   6 7 9
12   23 4 1
13   5 99 4
14   2 3 4
15   2 6 3
16   2 3 8
17   9 7 55
18   8 7 4
19   4 11 99
20   7 5 90
21   6 7 9
22   23 4 1
```

4.1   For Bubble Sort

```
   your Capital value:  50
   the number of offers: 10
Enter the number available shares: 5
Each shares have the value : 3
Each shares have the profit :  4
Enter the number available shares: 2
Each shares have the value : 3
Each shares have the profit :  4
Enter the number available shares: 2
Each shares have the value : 6
Each shares have the profit :  3
Enter the number available shares: 2
Each shares have the value : 3
Each shares have the profit :  8
Enter the number available shares: 9
Each shares have the value : 7
Each shares have the profit :  4
Enter the number available shares: 8
Each shares have the value : 7
Each shares have the profit :  4
Enter the number available shares: 4
Each shares have the value : 11
Each shares have the profit :  9
Enter the number available shares: 7
Each shares have the value : 5
Each shares have the profit :  90
Enter the number available shares: 6
Each shares have the value : 7
Each shares have the profit :  9
Enter the number available shares: 23
Each shares have the value : 4
Each shares have the profit :  1
Bubble Sorting Time: 223.000000
number available shares:   7  4  6  2  5  2  9  8  2  23
value of the shares:   5  11  7  3  3  3  7  7  6  4
profit of the shares:   90  9  9  8  4  4  4  4  3  1
We still have  15  money
First profit is  630
We still have  1  money
Final profit is  647
```

```
   your Capital value:  100
   the number of offers: 20
Enter the number available shares: 5
Each shares have the value : 3
Each shares have the profit :  4
Enter the number available shares: 2
Each shares have the value : 3
Each shares have the profit :  4
Enter the number available shares: 2
Each shares have the value : 6
Each shares have the profit :  3
Enter the number available shares: 2
Each shares have the value : 3
Each shares have the profit :  8
Enter the number available shares: 9
Each shares have the value : 7
Each shares have the profit :  4
Enter the number available shares: 8
Each shares have the value : 7
Each shares have the profit :  4
Enter the number available shares: 4
Each shares have the value : 11
Each shares have the profit :  9
Enter the number available shares: 7
Each shares have the value : 5
Each shares have the profit :  90
Enter the number available shares: 6
Each shares have the value : 7
Each shares have the profit :  9
Enter the number available shares: 23
Each shares have the value : 4
Each shares have the profit :  1
Enter the number available shares: 5
Each shares have the value : 99
Each shares have the profit :  4
Enter the number available shares: 2
Each shares have the value : 3
Each shares have the profit :  4
Enter the number available shares: 2
Each shares have the value : 6
Each shares have the profit :  3
Enter the number available shares: 2
Each shares have the value : 3
Each shares have the profit :  8
Enter the number available shares: 9
Each shares have the value : 7
Each shares have the profit :  55
Enter the number available shares: 8
Each shares have the value : 7
Each shares have the profit :  4
Enter the number available shares: 4
Each shares have the value : 11
Each shares have the profit :  99
Enter the number available shares: 7
Each shares have the value : 5
Each shares have the profit :  90
Enter the number available shares: 6
Each shares have the value : 7
Each shares have the profit :  9
Enter the number available shares: 23
Each shares have the value : 4
Each shares have the profit :  1
Bubble Sorting Time: 144.000000
number available shares:   4  7  7  9  4  6  6  2  2  5  2  9  8  5  2  8  2  2  23  23
value of the shares:      11  5  5  7  11  7  7  3  3  3  3  7  7  99  3  7  6  6  4  4
profit of the shares:     99  90  90  55  9  9  9  8  8  4  4  4  4  4  4  4  3  3  1  1
We still have  21  money
First profit is  1026
We still have  0  money
Final profit is  1312
```

4.2   For Insertion Sort

```
   your Capital vaule:  50
   the number of offers: 10
 Enter the number available shares: 5
 Each shares have the value : 3
 Each shares have the profit :  4
 Enter the number available shares: 2
 Each shares have the value : 3
 Each shares have the profit :  4
 Enter the number available shares: 2
 Each shares have the value : 6
 Each shares have the profit :  3
 Enter the number available shares: 2
 Each shares have the value : 3
 Each shares have the profit :  8
 Enter the number available shares: 9
 Each shares have the value : 7
 Each shares have the profit :  4
 Enter the number available shares: 8
 Each shares have the value : 7
 Each shares have the profit :  4
 Enter the number available shares: 4
 Each shares have the value : 11
 Each shares have the profit :  9
 Enter the number available shares: 7
 Each shares have the value : 5
 Each shares have the profit :  90
 Enter the number available shares: 6
 Each shares have the value : 7
 Each shares have the profit :  9
 Enter the number available shares: 23
 Each shares have the value : 4
 Each shares have the profit :  1
 Insertion Sorting Time: 201.000000
 number available shares:   5  5  5  5  5  2  2  2  2  23
value of the shares:    3  3  3  3  3  3  6  6  6  4
profit of the shares:   90  9  9  8  4  4  4  4  3  1
 We still have  5   money
 First profit is  540
 We still have  2   money
 Final profit is  548
```

```
1
2      your Capital vaule:  100
3      the number of offers: 20
4    Enter the number available shares: 5
5    Each shares have the value : 3
6    Each shares have the profit :   4
7    Enter the number available shares: 2
8    Each shares have the value : 3
9    Each shares have the profit :   4
10   Enter the number available shares: 2
11   Each shares have the value : 6
12   Each shares have the profit :   3
13   Enter the number available shares: 2
14   Each shares have the value : 3
15   Each shares have the profit :   8
16   Enter the number available shares: 9
17   Each shares have the value : 7
18   Each shares have the profit :   4
19   Enter the number available shares: 8
20   Each shares have the value : 7
21   Each shares have the profit :   4
22   Enter the number available shares: 4
23   Each shares have the value : 11
24   Each shares have the profit :   9
25   Enter the number available shares: 7
26   Each shares have the value : 5
27   Each shares have the profit :   90
28   Enter the number available shares: 6
29   Each shares have the value : 7
30   Each shares have the profit :   9
31   Enter the number available shares: 23
32   Each shares have the value : 4
33   Each shares have the profit :   1
34   Enter the number available shares: 5
35   Each shares have the value : 99
36   Each shares have the profit :   4
37   Enter the number available shares: 2
38   Each shares have the value : 3
39   Each shares have the profit :   4
40   Enter the number available shares: 2
41   Each shares have the value : 6
42   Each shares have the profit :   3
43   Enter the number available shares: 2
44   Each shares have the value : 3
45   Each shares have the profit :   8
46   Enter the number available shares: 9
47   Each shares have the value : 7
48   Each shares have the profit :   55
49   Enter the number available shares: 8
50   Each shares have the value : 7
51   Each shares have the profit :   4
52   Enter the number available shares: 4
53   Each shares have the value : 11
54   Each shares have the profit :   99
55   Enter the number available shares: 7
56   Each shares have the value : 5
57   Each shares have the profit :   90
58   Enter the number available shares: 6
59   Each shares have the value : 7
60   Each shares have the profit :   9
61   Enter the number available shares: 23
62   Each shares have the value : 4
63   Each shares have the profit :   1
64   Insertion Sorting Time: 100.000000
65   number available shares:   5  5  5   5  5  5  5  5  5  5  2  2  2  2  2  2  2  23  23  23
66   value of the shares:   3  3  3  3  3  3  3  3  3  3  3  6  6  6  6  6  6  4  4  4
67   profit of the shares:   99  90  90  55  9  9  9  8  8  4  4  4  4  4  4  4  3  3  1  1
68   We still have  10  money
69   First profit is  1760
70   We still have  1  money
71   Final profit is  1787
```

In the results you can see that the time is sorted, although the number or dates of offers are the same.

As we can see, the bubble sorting algorithm is more efficient than the insertion sort algorithm

5   References

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