Fundamentals of Structured Programming

Lecture 5

Problem Solving

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DropBox folder link

https://www.dropbox.com/sh/85vnrgkfqgrzhwn/AABdwKLJZqZs26a7u-y0AFwia?dl=0

Quote of the Day!

Class Accumulative Project: Employees Salary for Companies

Class Accumulative Project: Employees Salary for Companies

Tasks 1, 2, 3 (DONE☺)

TASK 4 (NEW* BONUS):

- **Re-design** your program to create your own data type representing necessary information of employees **(using 2 struct: Emp, Company).**
- **Re-implement Task 3** with your new created struct by declaring an Array of 10 employees- make the suitable changes.
- **Code**

Problem Solving

Contents

Sorting Algorithms

https://visualgo.net/en/sorting

Selection Sort

1. Sorting an Array using Selection Sort

1. Sorting an Array using Selection Sort

Selection sort works as follows:

- Find the minimum/maximum value in the array and swap it with the first element in the array. This puts the smallest/largest element in its correct place.
- Then, find the minimum/maximum value in the remaining elements (excluding the first one) and swap it with the second element.
- This is repeated until no more swaps are needed.

1. Sorting an Array using Selection Sort

https://commons.wikimedia.org/wiki/File:Selsort_de_0.gif

1. Sorting an Array using Selection Sort

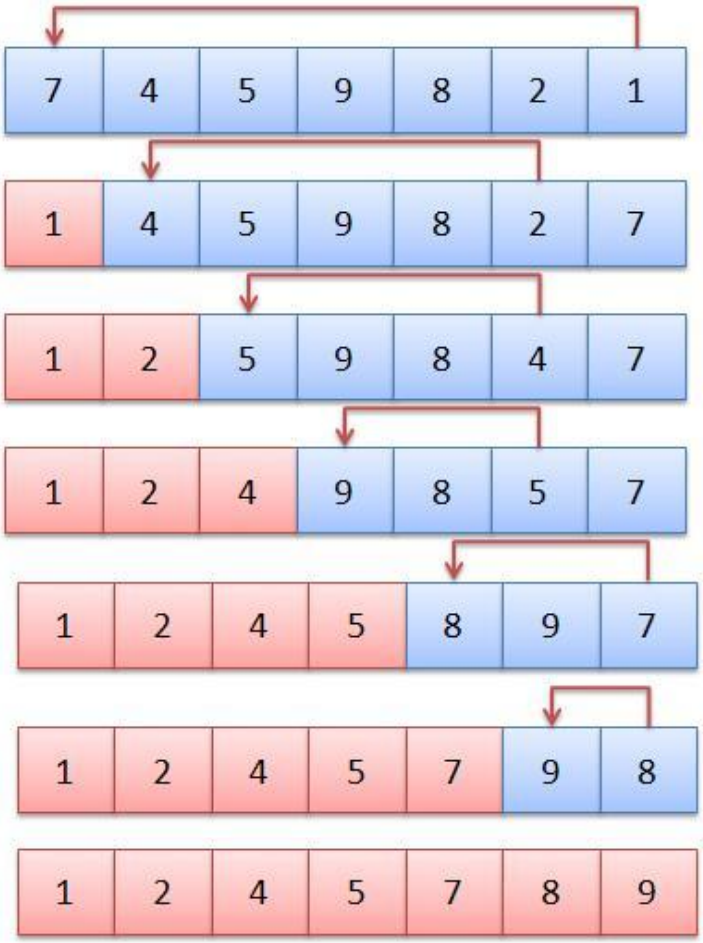
Selection Sort Algorithm (PseudoCode)

```
REPEAT(numOfElements - 1) times
   SET the first unsorted element as the minimum
   FOR each of the unsorted elements
       IF element < currentMinimum
       THEN set element as new minimum
      ENDIF
   ENDFOR
    SWAP minimum with first unsorted position
ENDREPEAT
```

1. Sorting an Array using Selection Sort

Example 1:

Write a program that reads a 1D array from the user and displays it sorted in an ascending order using ***selection sort*** algorithm.

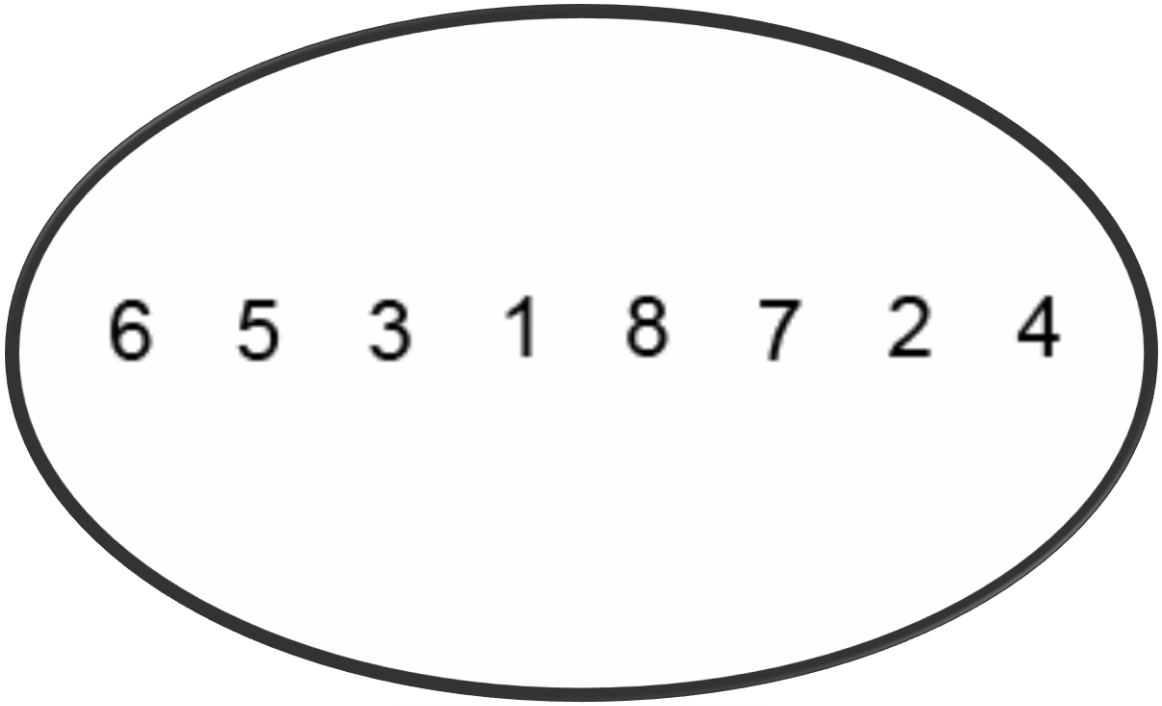


Code

Bubble Sort

https://visualgo.net/en/sorting

2. Sorting an Array using Bubble Sort



2. Sorting an Array using Bubble Sort

Bubble sort works as follows:

- Compare every **two** adjacent elements in the array.
- Then, find the minimum/maximum value of them and swap if needed with the second element.
- This is repeated until no more swaps are needed.

2. Sorting an Array using Bubble Sort

BUBBLE SORT ALGORITHM (PSEUDOCODE)

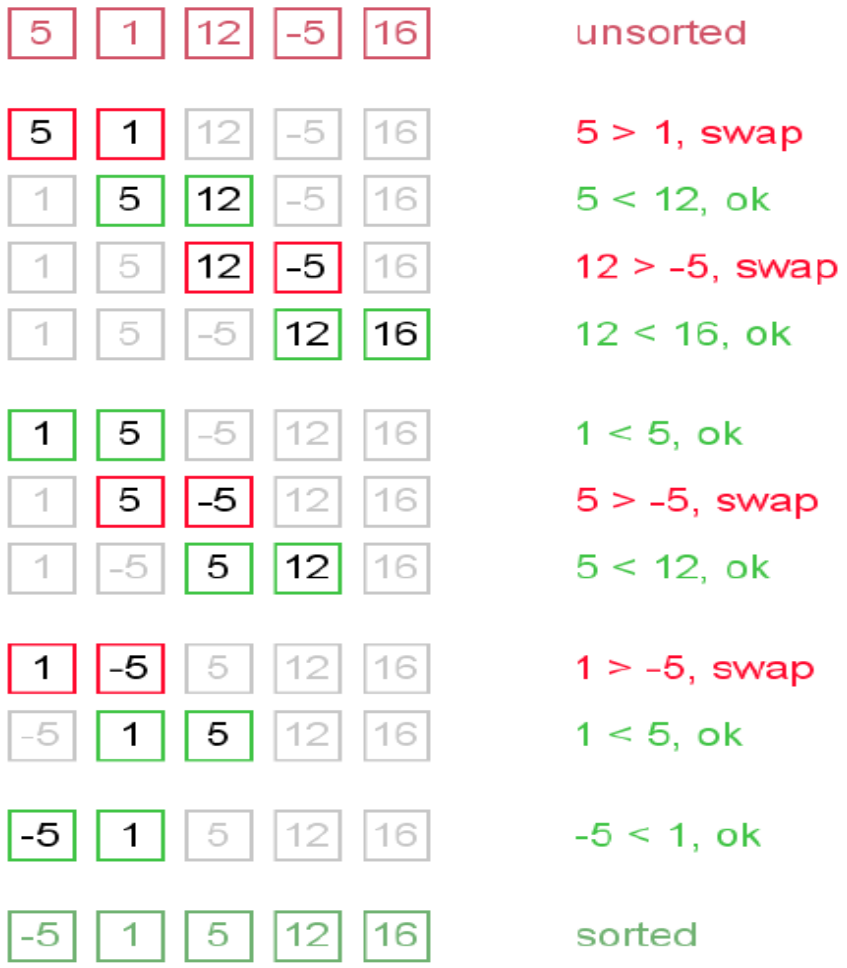
```
do
   swapped = false
 for i = 1 to indexOfLastUnsortedElement-1
     if leftElement > rightElement
       swap(leftElement, rightElement)
       swapped = true
     ENDIF
 ENDFOR
while swapped
ENDDO
```

2. Sorting an Array using Bubble Sort

Example2: (Bonus☺)

Write a program that reads a 1D array from the user and displays it sorted in an ascending order using ***Bubble Sort*** algorithm.

Code



Can We Sort in other ways?

For more information Refer to :
https://mathbits.com/MathBits/CompSci/Arrays/Sorting.htm


TIME
for a
BREAK!

3. Struct within another struct

Example 3:

Write a program that represents a **distance** in the form of a structure containing ***meters***, and ***centimeters***.

Add another data structure to store the dimensions of a **room** (its ***length*** and ***width***), taking into account that width and length are distance.

You are required to take dimensions of a room and then output its **area** in square meters. CODE

```
Enter room name: living
Enter living length in m cm:3 50
Enter living width in m cm:2 50
Area : 8.75 square meters.
Press any key to continue . . .
```

OVER THINING:

Can you describe the dimensions of an apartment by describing different rooms dimensions? And calculate the total area ?

(HOME EXERCISE)

4. Array of Structs

Example 4 (**BONUS):

An on-the-run maintenance company offers car fixes and promises relatively fast service.

Each **car** is registered by the following: ***model, plate number, problems type, service time, and cost.***

Problem type is either **1 (simple), 2 (moderate), or 3 (severe).**

A car can be registered for up to **five problems**.

Expected service time depends on the problems type.

Problems require *30 minutes*, *2 hours, or 5 hours*, **respectively**.

Services cost **$50 per hour.**

You are required to write a program to register up to **ten** cars, and estimate the total service time and cost for each car. CODE

Finally identify the plate number of the car that will leave the service company first.

(CHALLENGE: USE SORTING ALGORITHM TO DETECT 1st CAR)

4. Array of Structs


```
Enter Car # 2 info:
model  PlateNo nProblems to be fixed (Max 5):
mazda
1
2
Problem # 1 type (1:simple, 2: moderate, 3:severe):
3
Problem # 2 type (1:simple, 2: moderate, 3:severe):
2
Enter Car # 3 info:
model  PlateNo nProblems to be fixed (Max 5):
bmw 6778 1
Problem # 1 type (1:simple, 2: moderate, 3:severe):
3
Model    Plate No         Time     Cost
hyundai  1234             7.5      375$
mazda    1                7        350$
bmw      6778             5        250$
```

We owe an Apology to

- **<u>The following students were mixed up:</u>**
- **Mahmoud Sayed Afifi → Accept our apology ☺**

(mahmoudkotb912@gmail.com)

- **Mahmoud Afifi → WANTED!**

(mahmoudafifi973@gmail.com)

TASK 3

- **Best Scorers..Thank you☺**
- **General (G1):**

1. **Ziad Ali Ibrahim**
2. **Abd El-Rahman Refaat Mohamed**
3. **Farah Ahmed Mohamed**

TASK 3

- **Best Scorers…Thank you☺**
- **Software Engineering Department :**

1. **Shehab Khaled**
2. **Ahmed Salama**
3. **Beshoy Vector**

TASK 3

- **Best Scorers ..Thank You☺**
- **Bio-Informatics Department:**

1. **Mazen Khaled**
2. **Nada Hesham**
3. **Zeinab Ahmed**

TASK 3

- **Best Scorers..Thank You ☺**
- **General (G2):**

1. Waleed Ehab

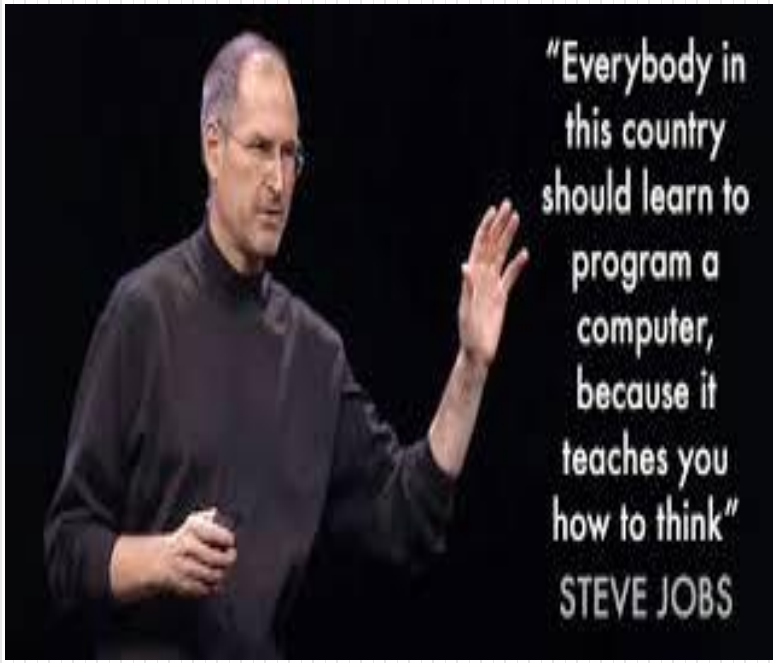
2. Mohamed Hany

3. Hadeer Mahdy

Wanted List

- **<u>The following students should meet me after the Lecture URGENTLY:</u>**
- **IRENE ASHRAF**
- **PAULA ATEF**

Structured Programming Projects (Open DropBox Folder ☺)



WORK
HARD
DREAM
BIG.

Projects Updated Regulations

1. **Teams:**
   1) **General Group** : 4-6 members/team (a mix of G1 and G2 is allowed)

      Credit Hours Program Group: 3-4 members/team (allowed to be of the same department but of different sections)

   2) Each member **must** participate in the Project.

   3) Assign **Team Leader** (responsible for assigning tasks among the group, communicate with the mentor TA, …etc)

2. **Registration Process:**

(The form will be announced next lecture and will be open for registration from Friday 9/3 at 3 :00 PM till Sunday 11/3 11:59 pm)

1) **Choose ideas sort them with your priorities from the listed Projects for your group(General Projects.pdf, BIOSW Projects.pdf).**

2) **REGISTER ONLY ONCE!**

3) Your name should be a member **in ONLY ONE TEAM** or else you will be removed from all teams.

3) Write the **ARABIC** name and **SEAT Number** for each member.

4) Provide a **valid email** for the team leader (check it regularly for any updates)

5) ~~**After registration ends, you will be assigned 1 of the 3 chosen ideas and will be informed a week later(maybe via email).**~~

5) Each Project will be removed after completing the required number of subscribed teams ☺

Projects Regulations

3. External Ideas:

Having your own idea is **MOST WELCOMED, follow those steps:**

1. **Write** a proposal for your idea(using the **template** in the dropbox).
2. **Discuss it** with me (maybe approved and maybe refused).
3. **Sign** your proposal by me for approval (or else it will not be considered) before Wednesday 7/3/2018, contact me to set an appointment)
4. **Register** also in the same form but by choosing the option of **"Other Project", you will need to give it a name.**

Projects Regulations

4. Mentoring:

A schedule will be announced after assigning the projects having the mentor TA of each project and his/her available support timing.

5. Projects Delivery:

1. **All team members must attend project delivery discussion.**
2. **The week before practical exam (most probably).**
3. **A schedule will be announced.**
4. **In the discussion get all the code (make a backup in different resources like flash memories or CDs and get it with you).**
5. **Submitting Project design and documentation (short one,3-5 pages) is an asset.**
6. **BEST Projects will be AWARDED ☺**
7. **LAZY MEMBERS WILL BE PUNISHED! ☹**
8. **COPIES WILL BE PENALIZED! ☹**


Thank You