Department of Information Systems and Technologies

CTIS 152 –Algorithms and Data Structure

Spring 2024 - 2025

Lab Guide #4 – Week 3 – 1

OBJECTIVE : Dynamic memory allocation & Structures.
Instructor : Serpil TIN **Assistants** : Berk ÖNDER, Hatice Zehra YILMAZ

The %s operator is one used for reading strings of characters in to character arrays using the scanf function.

Q1. Write a C program that reads words from "**words.txt"**. It reads words into a **dynamically** created **two-dimensional array.** After reading, write all the words to the screen as in the example run.
The maximum number of characters in a word is **10**. (The first line of the file consists of the number of words.)

Write the following functions;

- **readFile** that gets a file pointer and a two-dim character array, to read each word line by line and store them into a two-dim character array.
- **displayWords** that gets a one-dimensional character array and displays the words in this array.
- **displayWordSpecCol** that gets a two-dimensional array as a parameter. Then, it gets a column number from the user and displays the word in that column.

Example Run #1:

```
The number of words in the text file : 6

 WORDS
*******
fapbpcw
aduoioa
bmzrzpl
rizdzpk
irleaee
ceersrr

Enter the column number: 2
admire
```

words.txt

```
6
fapbpcw
aduoioa
bmzrzpl
rizdzpk
irleaee
ceersrr
```

Example Run #2:

```
The number of words in the text file : 6

 WORDS
*******
fapbpcw
aduoioa
bmzrzpl
rizdzpk
irleaee
ceersrr

Enter the column number: 4
border
```

Project Name: LG4_Q1
File Name: Q1.cpp

Q2. Create the structure **`racer_t`** with the following fields.

```
typedef struct {
        char racerName[20];
        char profession[50];
        int championshipyear;
        double bestDuration;
} racer_t;
```

a) Initialize the data with the following values (**Racer Name:** DaleEarnhardt, **Profession:** Nascar, **Championship Year:** 1998, **Best Duration:** 23.14), and then display as shown in the example run.

Example Run:

```
The Nascar Racer information is:
Racer Name       : DaleEarnhardt
Profession       : Nascar
Cahmpionship Year: 1998
Best Duration    : 23.14
```

Project Name: LG4_Q2a
File Name: Q2a.cpp

b) Get the structure data from the user, and then display it as shown in the example run.

Example Run:

```
Enter the information of the racer:
Racer Name  : BillElliott
Profession      : Nascar
Championship Year : 1984
Broadcast Time  : 25.38

The Racer information is:
Racer Name         : BillElliott
Profession         : Nascar
Championship Year  : 1984
Best Duration      : 25.38
```

Project Name: LG4_Q2b
File Name: Q2b.cpp

c) Use Pointer notation for part a.

Example Run:

```
The Nascar Racer information is:
Character Name   : DaleEarnhardt
Profession       : Nascar
Appearance Year  : 1998
Broadcast Time   : 23.14
```

Project Name: LG4_Q2c
File Name: Q2c.cpp

d) Rewrite the program to read the information of the car race drivers from the file **"drivers.txt"** file, store them into an array of structures, and display the number of drivers and their information.
(**Use dynamic memory allocation for the array.** The first line of the file consists of the number of drivers.)

Example Run:

```
There are 3 drivers.

The Car Racer information is:
************************************
Racer Name       : JerryCook
Profession       : Nascar
Appearance Year  : 1978
Broadcast Time   : 19.45
************************************
Racer Name       : ColinMcrrae
Profession       : Rally
Appearance Year  : 1993
Broadcast Time   : 59.10
************************************
Racer Name       : AyrtonSenna
Profession       : Formula
Appearance Year  : 1993
Broadcast Time   : 99.99
************************************
```

drivers.txt

```
3
JerryCook Nascar 1978 19.45
ColinMcrrae Rally 1993 59.10
AyrtonSenna Formula 1993 99.99
```

Project Name: LG4_Q2d
File Name: Q2d.cpp

Q3. Amazon offers special discounts for some products. Discounted products' information (product name, price, discount rate) is kept in the "**amazon.txt"** file.

Write a C program that reads all the product information from the file into a **dynamically** created structure array. The program will display the product information including the discounted price, the saved amount, and the number of products.

(Use **dynamic memory allocation** for the structure array. The first line of the file consists of the number of products.)

Example Run:

```
There are 6 products in the market

 PRODUCT NAME      PRICE      DISCOUNT  DISC. PRICE   SAVED AMOUNT
 ************      *********  ********  ***********   ************
 e-reader           119.99 $       %17      99.59 $       20.40 $
 WifiCamera          39.99 $       %33      26.79 $       13.20 $
 SolarLight          16.99 $       %67       5.61 $       11.38 $
 LedBulb             25.99 $       %62       9.88 $       16.11 $
 CarOrginazer        39.99 $       %74      10.40 $       29.59 $
 FlashLight          19.99 $       %40      11.99 $        8.00 $
```

amazon.txt

```
6
e-reader 119.99 17
WifiCamera 39.99 33
SolarLight 16.99 67
LedBulb 25.99 62
CarOrginazer 39.99 74
FlashLight 19.99 40
```

Project Name: LG4_Q3
File Name: Q3.cpp

Additional Questions

AQ1. Write a C program that reads the swimmers' information from the text file named **"swimmers.txt"** into a **dynamically** created structure array, each line of the file contains a swimmer's **name**, **surname**, **time to complete the lane,** and **medal info**. The program will select the swimmers for the swimming race according to the below criteria.

The criteria are;

- The time to complete the lane must be less than 160 seconds,
- The swimmer must have a medal (Medal info must be Yes).

Then, it will display the number of selected swimmers and their information in the given format, as in the example run.

NOTE: The number of swimmers is located in the first line of the text file.

Project Name: LG4_AQ1
File Name: AQ1.cpp

swimmers.txt

```
12
Martha Randall 165.2 N
Debbie Meyer 187.8 N
Cynthia Woodhead 153.8 Y
Penny Heyns 148.9 Y
Laure Manaudou 175.0 N
Rebecca Soni 199.8 N
Katie Ledecky 210.9 N
Emma McKeon 149.4 Y
Regan Smith 153.3 Y
Natalie Coughlin 172.8 Y
Jenny Thompson 188.1 N
Janet Evans 175.4 Y
```

Example Run:

```
Swimmer Name    Surname    Time to Complete the Lane   Medal Info
************   *********   *************************   **********
Cynthia         Woodhead   153 seconds 8 miliseconds        Y
Penny              Heyns   148 seconds 9 miliseconds        Y
Emma             McKeon    149 seconds 4 miliseconds        Y
Regan              Smith   153 seconds 3 miliseconds        Y

There are 4 swimmers with medals for swimming race.
```

AQ2. Le Piment Rouge Restaurant is open only the workdays (Monday to Friday) and has ***n*** salesmen (between 3 and 10). You will implement a program to do the followings;

- calculate and display the weekly average sale amount of the restaurant,
- display the average sale amount for the salesman who has an average sale amount above the restaurant's average,
- the salesman number, sale amount, and the day (Monday, Tuesday, ...) for the maximum sale amount.

	M	T	W	R	F
S1	152	630	960	510	780
S2	1220	645	428	975	148
S3	260	349	140	590	634
S4	550	829	578	390	120
S5	410	250	360	950	860
	…	…	…	…	…

sales.txt

```
152 630 960 510 780
1220 645 428 975 148
260 349 140 590 634
550 829 578 390 120
410 250 360 950 860
785 1020 785 450 230
458 214 365 780 452
1456 789 1200 532 1678
654 1300 1523 1765 987
1321 145 1789 1444 428
```

Write a C program that reads the sales information from the file **sales.txt** into a **dynamically** created two-dim integer array.
Write the following functions that;

- **`readFromFile:`** reads the sales information from the file into a two-dim array. The function takes the file pointer, two-dim integer array, and the number of salesman as input parameters.
- **`displaySalesInfo:`** displays the sales on the screen. The function takes a two-dim integer array, the number of salesmen as input parameters.
- **`findAvg:`** calculates and returns the weekly average sale amount of the restaurant. The function takes a two-dim integer array, the number of salesmen as input parameters.
- **`findSalesmanAvg:`** calculates and returns the average sale amount of the specified salesman. The function takes a one-dim integer array as the input parameter.
- **`findMaxSale:`** finds and returns the indexes of the salesman number and the day of the week with the maximum sale amount. The function takes a two-dim integer array and the number of salesmen as input parameters.

Project Name: LG4_AQ2
File Name: AQ2.cpp

Example Run#01:

```
Enter the number of employees (3-10): 1
Enter the number of employees (3-10): 15
Enter the number of employees (3-10): 4
      Weekly Sales Report
*******************************
         M    T    W    R    F
S-01:   152  630  960  510  780
S-02:  1220  645  428  975  148
S-03:   260  349  140  590  634
S-04:   550  829  578  390  120

The weekly avg sale amount of the restaurant: 544.40 TL

Salesman info whose sale amount is above the avg:
Salesman No: 1, Avg: 606.40 TL
Salesman No: 2, Avg: 683.20 TL

The Salesman 2 has the max sale amount, 1220 TL, on MONDAY
```

Example Run#02:

```
Enter the number of employees (3-10): 18
Enter the number of employees (3-10): 8
      Weekly Sales Report
*******************************
         M    T    W    R    F
S-01:   152  630  960  510  780
S-02:  1220  645  428  975  148
S-03:   260  349  140  590  634
S-04:   550  829  578  390  120
S-05:   410  250  360  950  860
S-06:   785 1020  785  450  230
S-07:   458  214  365  780  452
S-08:  1456  789 1200  532 1678

The weekly avg sale amount of the restaurant: 622.80 TL

Salesman info whose sale amount is above the avg:
Salesman No: 2, Avg: 683.20 TL
Salesman No: 6, Avg: 654.00 TL
Salesman No: 8, Avg: 1131.00 TL

The Salesman 8 has the max sale amount, 1678 TL, on FRIDAY
```