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Computer Science 230: Introductory Systems Programming - SPRING I 2023

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Course Project Report

Introduction

My task was to develop a program containing the 5-option menu that runs until the user decides to exit and enter the 5th option. This menu should give the user the opportunity to interact with files, primarily extracting information from the .csv file about the top scorers of the football World Cup Qatar 2022 and performing different opportunities to manipulate these statistics. For each user input, the program must check the correctness of the entered data. If the user entered something incorrectly, the program should warn about this and ask the user to enter the data again. The code should be well commented and clearly organized, give clear instructions to the user throughout the work and do not waste time or memory using.

Description

As was mentioned before, the whole program is a do while loop that keeps the menu working.

Inside this loop is the switch case method, which runs different parts of the code for different utilities, depending on the menu item selected by the user. At the start of a program, the user can see the greeting and the menu with the valuable options.

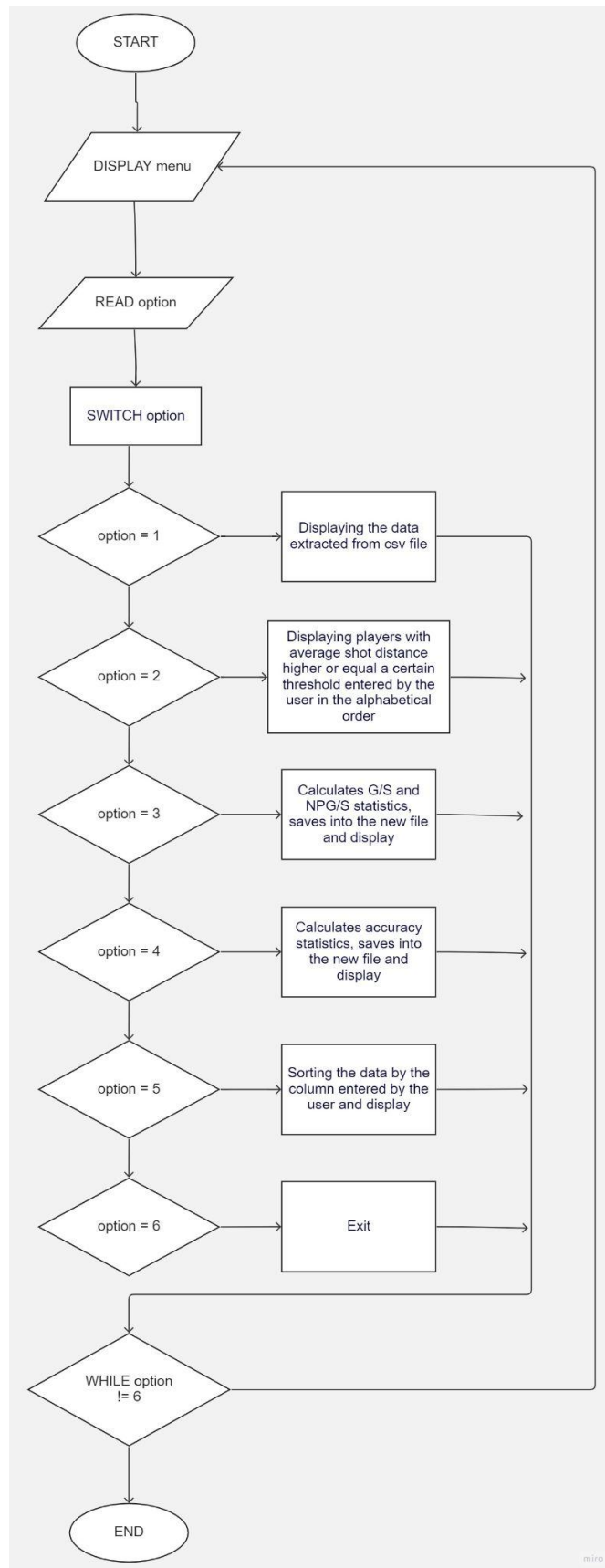
```
=====
USER MENU: TOP SCORER STATISTICS FROM THE FOOTBALL WORLD CUP 2023
=====
1. Read & display stats for the top goal scorers (from file top_scorers_Qatar2023.csv)
2. Display shooters with an average distance past a threshold, in alphabetical order
3. Calculate G/S and NPG/S, save into new file along with the original stats, display
4. Calculate accuracy (shots on target / shots), save into new file along with the original stats, display
5. Sort by a field indicated by the user
6. Exit the program

Please select an option :
```

Picture 1 - Start of the program and main menu

After the input of the menu item, the program performs the corresponding tasks and calls the extra code snippet (functions) to make the work done. After that, the program waits for the user to press any key and then returns to the main menu and asks the user for another selection.

The top-level flowchart for the whole program is presented below:



Picture 2 - Flowchart

1 Case: Read & display stats for the top goal scorers (from file top_scorers_Qatar2023.csv)

This option extracts the data from the file and displays it on the screen.

```
Please select an option : 1

-----
Displaying world cup 2023 top scorers statistics from the file:

  PLAYER | TEAM | AGE | GLS | GLS PNLTS | SHOTS | SHOTS TRGT | AVG DIST
Mbappe_Kylian | FRA | 23 | 8 | 2 | 29 | 11 | 17.1
Messi_Lionel | ARG | 35 | 7 | 4 | 27 | 13 | 21
Alvarez_Julio | ARG | 22 | 4 | 0 | 11 | 8 | 12.2
Giroud_Olivier | FRA | 36 | 4 | 0 | 16 | 6 | 11
Saka_Bukayo | ENG | 21 | 3 | 0 | 7 | 5 | 14.9
Gakpo_Cody | NED | 23 | 3 | 0 | 5 | 3 | 19.9
Valencia_Enner | ECU | 33 | 3 | 1 | 8 | 3 | 18.9
Ramos_Goncalo | POR | 21 | 3 | 0 | 7 | 5 | 11.3
Rashford_Marcus | ENG | 25 | 3 | 0 | 11 | 6 | 16.6
Richarlison | BRA | 25 | 3 | 0 | 8 | 4 | 12.1
Morata_Alvaro | SPA | 30 | 3 | 0 | 8 | 5 | 10.3

P.S. Open terminal in the full screen and unzoom for better image.

GLS - GOALS; GLS PNLTS - GOALS FROM PENALTY; SHOTS TRGT - SHOTS ON TARGET; AVG DIST - AVG SHOT DISTANCE; G/S - GOALS/SHOT; NPG/S - NON-PENALTY-GOALS/SHOT, ACC - accuracy

Press any key to continue . . .
```

Picture 3 - First option

2 Case: Display shooters with an average distance past a threshold, in alphabetical order

This option asks for the threshold for an average shot distance to display everything equal or above in alphabetical order. It uses the sort function to sort by ascending name.

```
Please select an option : 2

-----
Displaying football players with average shot distance above or equals to entered threshold in alphabetical order

Enter the threshold of average shot distance:
15

The players who meet the given criteria are:

  PLAYER | TEAM | AGE | GLS | GLS PNLTS | SHOTS | SHOTS TRGT | AVG DIST
Gakpo_Cody | NED | 23 | 3 | 0 | 5 | 3 | 19.9
Mbappe_Kylian | FRA | 23 | 8 | 2 | 29 | 11 | 17.1
Messi_Lionel | ARG | 35 | 7 | 4 | 27 | 13 | 21
Rashford_Marcus | ENG | 25 | 3 | 0 | 11 | 6 | 16.6
Valencia_Enner | ECU | 33 | 3 | 1 | 8 | 3 | 18.9

P.S. Open terminal in the full screen and unzoom for better image.

GLS - GOALS; GLS PNLTS - GOALS FROM PENALTY; SHOTS TRGT - SHOTS ON TARGET; AVG DIST - AVG SHOT DISTANCE; G/S - GOALS/SHOT; NPG/S - NON-PENALTY-GOALS/SHOT, ACC - accuracy

Press any key to continue . . .
```

Picture 3 - Second option

3 Case: Calculate G/S and NPG/S, save into new file along with the original stats, display

This option calculates two additional metrics goals/shots and non-penalty-goals/shots and saves it in the new file with the original stats.

```
Please select an option : 3

-----
Calculates G/S and NPG/S and displays the table

  PLAYER | TEAM | AGE | GLS | GLS PNLTS | SHOTS | SHOTS TRGT | AVG DIST | G/S RATE | NPG/S RATE
Alvarez_Julio | ARG | 22 | 4 | 0 | 11 | 8 | 12.2 | 0.36 | 0.36
Gakpo_Cody | NED | 23 | 3 | 0 | 5 | 3 | 19.9 | 0.6 | 0.6
Giroud_Olivier | FRA | 36 | 4 | 0 | 16 | 6 | 11 | 0.25 | 0.25
Mbappe_Kylian | FRA | 23 | 8 | 2 | 29 | 11 | 17.1 | 0.28 | 0.21
Messi_Lionel | ARG | 35 | 7 | 4 | 27 | 13 | 21 | 0.26 | 0.11
Morata_Alvaro | SPA | 30 | 3 | 0 | 8 | 5 | 10.3 | 0.38 | 0.38
Ramos_Goncalo | POR | 21 | 3 | 0 | 7 | 5 | 11.3 | 0.43 | 0.43
Rashford_Marcus | ENG | 25 | 3 | 0 | 11 | 6 | 16.6 | 0.27 | 0.27
Richarlison | BRA | 25 | 3 | 0 | 8 | 4 | 12.1 | 0.38 | 0.38
Saka_Bukayo | ENG | 21 | 3 | 0 | 7 | 5 | 14.9 | 0.43 | 0.43
Valencia_Enner | ECU | 33 | 3 | 1 | 8 | 3 | 18.9 | 0.38 | 0.25

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File saltykov_qatar2023_stats.txt is updated successfully!
```

Picture 4 - Third option

4 Case: Calculate accuracy (shots on target / shots), save into new file along with the original stats, display

This option calculates additional metric accuracy and saves it in the new file with the original stats.

```
Please select an option : 3

-----
Calculates G/S and NPG/S and displays the table

  PLAYER | TEAM | AGE | GLS | GLS PNLTS | SHOTS | SHOTS TRGT | AVG DIST | G/S RATE | NPG/S RATE
Alvarez_Julio | ARG | 22 | 4 | 0 | 11 | 8 | 12.2 | 0.36 | 0.36
Gakpo_Cody | NED | 23 | 3 | 0 | 5 | 3 | 19.9 | 0.6 | 0.6
Giroud_Olivier | FRA | 36 | 4 | 0 | 16 | 6 | 11 | 0.25 | 0.25
Mbappe_Kylian | FRA | 23 | 8 | 2 | 29 | 11 | 17.1 | 0.28 | 0.21
Messi_Lionel | ARG | 35 | 7 | 4 | 27 | 13 | 21 | 0.26 | 0.11
Morata_Alvaro | SPA | 30 | 3 | 0 | 8 | 5 | 10.3 | 0.38 | 0.38
Ramos_Goncalo | POR | 21 | 3 | 0 | 7 | 5 | 11.3 | 0.43 | 0.43
Rashford_Marcus | ENG | 25 | 3 | 0 | 11 | 6 | 16.6 | 0.27 | 0.27
Richarlison | BRA | 25 | 3 | 0 | 8 | 4 | 12.1 | 0.38 | 0.38
Saka_Bukayo | ENG | 21 | 3 | 0 | 7 | 5 | 14.9 | 0.43 | 0.43
Valencia_Enner | ECU | 33 | 3 | 1 | 8 | 3 | 18.9 | 0.38 | 0.25

P.S. Open terminal in the full screen and unzoom for better image.

GLS - GOALS; GLS PNLTS - GOALS FROM PENALTY; SHOTS TRGT - SHOTS ON TARGET; AVG DIST - AVG SHOT DISTANCE; G/S - GOALS/SHOT; NPG/S - NON-PENALTY-GOALS/SHOT, ACC - accuracy

File saltykov_qatar2023_stats.txt is updated successfully!
Press any key to continue . . .
```

Picture 5 - Fourth option

5 Case: Sort by a field indicated by the user

This option asks for the column and order to sort by. It is not accessible until previous two options are performed.

```
Please select an option : 4

-----
Calculates accuracy and displays the table

  PLAYER | TEAM | AGE | GLS | GLS PNLTS | SHOTS | SHOTS TRGT | AVG DIST | G/S RATE | NPG/S RATE | ACC
Alvarez_Julio | ARG | 22 | 4 | 0 | 11 | 8 | 12.2 | 0.36 | 0.36 | 72.7%
Gakpo_Cody | NED | 23 | 3 | 0 | 5 | 3 | 19.9 | 0.6 | 0.6 | 60%
Giroud_Olivier | FRA | 36 | 4 | 0 | 16 | 6 | 11 | 0.25 | 0.25 | 37.5%
Mbappe_Kylian | FRA | 23 | 8 | 2 | 29 | 11 | 17.1 | 0.28 | 0.21 | 37.9%
Messi_Lionel | ARG | 35 | 7 | 4 | 27 | 13 | 21 | 0.26 | 0.11 | 48.1%
Morata_Alvaro | SPA | 30 | 3 | 0 | 8 | 5 | 10.3 | 0.38 | 0.38 | 62.5%
Ramos_Goncalo | POR | 21 | 3 | 0 | 7 | 5 | 11.3 | 0.43 | 0.43 | 71.4%
Rashford_Marcus | ENG | 25 | 3 | 0 | 11 | 6 | 16.6 | 0.27 | 0.27 | 54.5%
Richarlison | BRA | 25 | 3 | 0 | 8 | 4 | 12.1 | 0.38 | 0.38 | 50%
Saka_Bukayo | ENG | 21 | 3 | 0 | 7 | 5 | 14.9 | 0.43 | 0.43 | 71.4%
Valencia_Enner | ECU | 33 | 3 | 1 | 8 | 3 | 18.9 | 0.38 | 0.25 | 37.5%

P.S. Open terminal in the full screen and unzoom for better image.

GLS - GOALS; GLS PNLTS - GOALS FROM PENALTY; SHOTS TRGT - SHOTS ON TARGET; AVG DIST - AVG SHOT DISTANCE; G/S - GOALS/SHOT; NPG/S - NON-PENALTY-GOALS/SHOT, ACC - accuracy

File saltykov_qatar2023_stats.txt is updated successfully!

Press any key to continue . . .

Press any key to continue . . . |
```

Picture 6 - Fifth option

6 Case: Exit

This option ends the program.

```
Please select an option : 6

You selected option 6.

It's time to say goodbye then...

Bye!

-----

Process exited after 2856 seconds with return value 0
Press any key to continue . . .
```

Picture 7 - End of the program

Conclusion

In addition to learning more about the programming language C++ in general, I have acquired knowledge about different useful tools and possibilities of the language like file manipulation, data types transfer and different approaches to the memory organization. One of the most challenging aspects of the project was the proper use of structs and classes, as well as proper saving data in the file and printing it in the terminal. Additionally, the parsing information from the .csv file was hard because of the delimiter that should be extracted from the line. The most time consuming part was projecting all indeed functions and making them work under any condition and parameters. Nevertheless, the work could have been made easier and more efficient with the use of tuples as it gives the opportunity to use indexes as in arrays.

Lastly, I have known much more about the game of football, about the metrics and main figures, which have largely expanded my knowledge about this sport.

References

- 1) https://www.tutorialspoint.com/football/football_how_to_play.htm
- 2) <https://stackoverflow.com/>
- 3) <https://www.geeksforgeeks.org/>
- 4) <https://miro.com/app/dashboard/>