Name:Abdelrahman Mohamed Mohamed abdelmotlb   ID:20010851

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Programming project report

Description: the application includes main menu for starting contain four required options

In start game: 2 choices for playing game2x2 or game 5x5 then choosing vs computer or 2 players the game loop include grid in top left of screen change with lines The information updates after every play in the top right of screen. After each game, If the winner is between top scorers, The list will change. Vs computer game: AI chooses the most suitable line to play and tries to avoid bad lines.

In load game: the user chooses saved file to continue an uncompleted game from three files available.

In top scorers: this item in the menu displays the top scorers played in the game.

Features: start menu, vs menu and the size of game menu used to choose the required choice by up and down arrows of keyboard.

Design overview: we used menu for every mode when you select any mode the the selection will be red

, Information of the game like number of moves, time, …etc. is displayed in the top right and the grid in the top left, when a player plays a line the line will be colored with the player's color and if he wins a box the box will be colored and inside the box his character will be engraved, the player inputs row1,row2,col1,col2 one by one and under each other, and at any time of play he can make undo by pressing 2, redo by pressing 3, save by pressing 4.

Assumptions:

1- if a player entered a name with space, the saved name is the part of name that is before first space.

2-the history of undoes and redoes will not be saved and loaded.

Flow chart and pseudo code: in "Flowcharts_and_Pesudocode" folder in the project.

GitHub repo: *https://github.com/zazlo/Dots_and_Boxes.git*

User Manual: when you start a game, choose game 2x2 or 5x5 then choosing vs computer or 2 players

After selecting required choices, for starting game and time enter your names and enter 1 and then enter row1 ,row2,col1,col2 of desired line. After entering the inputs, the line

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coloured by red if player1 and coloured by blue if player2. if you close a box, your score

Increase by one and increase by two if you close two boxes. In addition that, the box

you close will be coloured by your colour. Before every played line, choose the desired

choice from four [1]continue [2]undo [3]redo [4]save game….you can return to first line

played or redo to Played game. You and your competitor continue until the grid is filled

and the game Ended with winner and loser or draw in score.

Data structure: we used [1]struct for storing name , score in game loop ,number of moves

 [2]some arrays: grid for storing the grid.

      Score_4 and score_4_name for checking completed boxes continuously

      Undo : two dimensional array for storing each played line

Important functions used:[1]scan_valid_integer.. used to make the user enter a valid integer

 [2]game_loop_vs_player ..used with parameter size for generalizing for any size

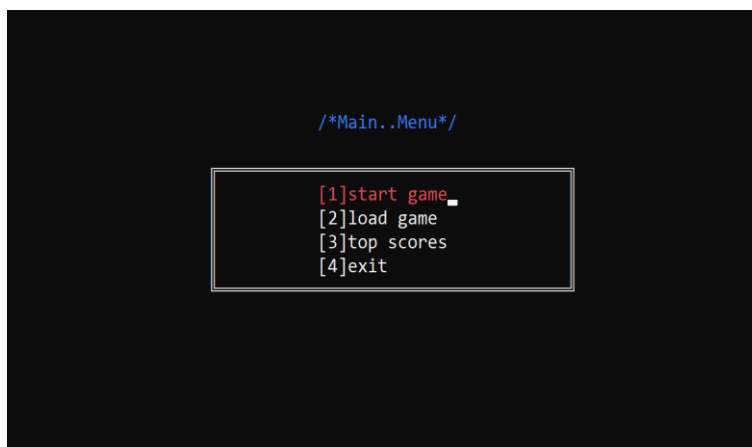[3]computer.. used to make the AI choose the most suitable line to play.

[4]gotoxy..used to go to any line desired in console.

Headers:[1] game_loop_and_AI..store prototypes of game loop functions and fn of computer.

[2]save_load_top_scores..store prototypes of all functions of saving and loading and scores.

[3]menu..store functions of main list , vs list , size list , colours.

Start menu:

Level menu:

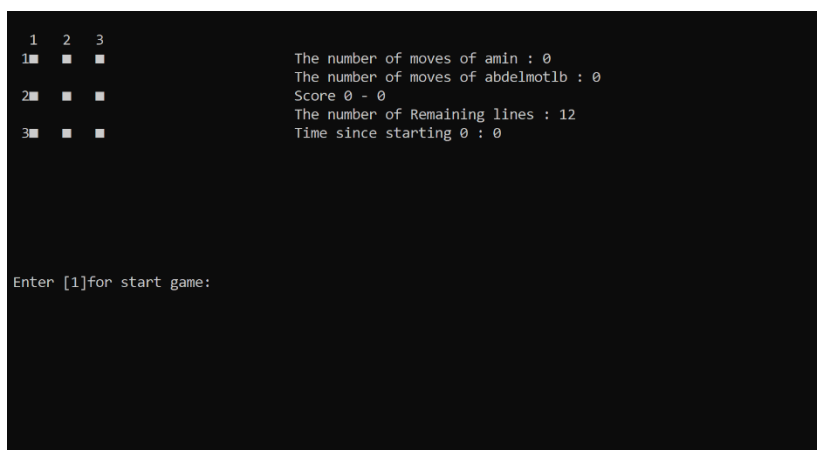Name:Abdelrahman Mohamed Mohamed abdelmotlb   ID:20010851
Name:Mohamed Elsayed Amin   ID:20011502

```
                    /*level..Menu*/

            [1]Beginner mode(2x2)_
            [2]Expert mode(5x5)
```

Vs menu:

```
                /*vs..Menu*/u*/

            [1]Vs Computer
            [2]Vs Player
```

Game start:

```
  1   2   3
1■    ■   ■                      The number of moves of amin : 0
                                The number of moves of abdelmotlb : 0
2■    ■   ■                      Score 0 - 0
                                The number of Remaining lines : 12
3■    ■   ■                      Time since starting 0 : 0




Enter [1]for start game:
```

Play row1 , row2 , col1 , col2:

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```
  1   2   3
1■   ■   ■                    The number of moves of amin : 0
                             The number of moves of abdelmotlb : 0
2■   ■   ■                    Score 0 - 0
                             The number of Remaining lines : 12
3■   ■   ■                    Time since starting 0 : 0




 amin's Turn :
Enter R1 R2 C1 C2 :

 Enter row 1:_
```

```
  1   2   3
1■   ■   ■                    The number of moves of amin : 0
                             The number of moves of abdelmotlb : 0
2■   ■   ■                    Score 0 - 0
                             The number of Remaining lines : 12
3■   ■   ■                    Time since starting 0 : 0




 amin's Turn :
Enter R1 R2 C1 C2 :

 Enter row 2:2_
```

```
  1   2   3
1■   ■   ■                    The number of moves of amin : 0
                             The number of moves of abdelmotlb : 0
2■   ■   ■                    Score 0 - 0
                             The number of Remaining lines : 12
3■   ■   ■                    Time since starting 0 : 0




 amin's Turn :
Enter R1 R2 C1 C2 :


 Enter col 1:2_
```

Name:Abdelrahman Mohamed Mohamed abdelmotlb   ID:20010851

Name:Mohamed Elsayed Amin   ID:20011502

```
   1   2   3
1■    ■   ■                    The number of moves of amin : 0
                              The number of moves of abdelmotlb : 0
2■    ■   ■                    Score 0 - 0
                              The number of Remaining lines : 12
3■    ■   ■                    Time since starting 0 : 0




amin's Turn :
Enter R1 R2 C1 C2 :



Enter col 2:2
```

b

```
   1   2   3
1■    ■   ■                    The number of moves of amin : 1
 |                            The number of moves of abdelmotlb : 0
2■    ■   ■                    Score 0 - 0
                              The number of Remaining lines : 11
3■    ■   ■                    Time since starting 0 : 19




for continue[1]....undo[2]....redo[3]....save game[4]:
```

Playing some roles:

```
   1   2   3
1■━━━━■━━━■                   The number of moves of amin : 4
 |  B  |                      The number of moves of abdelmotlb : 4
2■    ■   ■                   Score 1 - 1
 |  A  |                      The number of Remaining lines : 4
3■━━■   ■                     Time since starting 1 : 30




for continue [1]....undo[2]....redo[3]....save game[4] :_
```

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Entering undo for some times:


```
   1  2  3
1■━━━■  ■              The number of moves of amin : 1
 ┃                     The number of moves of abdelmotlb : 1
2■  ■  ■              Score 0 - 0
                       The number of Remaining lines : 10
3■  ■  ■              Time since starting 1 : 30




for continue [1]....undo[2]....redo[3]....save game[4] :_
```

Entering some redos:


```
   1    2    3
1■━━━■━━━■              The number of moves of amin : 4
 ┃┃ B ┃┃               The number of moves of abdelmotlb : 4
2■━━━■   ■             Score 1 - 1
 ┃┃ A ┃┃               The number of Remaining lines : 4
3■━━━■   ■             Time since starting 1 : 30




for continue [1]....undo[2]....redo[3]....save game[4] :_
```

Playing complete game:

Name:Abdelrahman Mohamed Mohamed abdelmotlb   ID:20010851
Name:Mohamed Elsayed Amin   ID:20011502

```
 1   2   3
1■   ■   ■        The number of moves of amin : 6
  |B |B|          The number of moves of abdelmotlb : 6
2■   ■   ■        Score 2 - 2
  |A |A|          The number of Remaining lines : 0
3■   ■   ■        Time since starting 4 : 10




 amin's Turn :
Enter R1 R2 C1 C2 :




 There are no winner the game is draw
 Enter [1]main menu..[2]topscorers:
```

After entering 1 for main menu & 2 for top scorers:

```
                        /*Main..Menu*/

              ┌──────────────────────────────┐
              │        [1]start game         │
              │        [2]load game          │
              │        [3]top scores         │
              │        [4]exit               │
              └──────────────────────────────┘
```

```
[1] mohamed           with score : 4
[2] k             with score : 3
[3] null          with score : 0
[4] null          with score : 0
[5] null          with score : 0
[6] null          with score : 0
[7] null          with score : 0
[8] null          with score : 0
[9] null          with score : 0
[10] null          with score : 0
Enter 1 for the main menu:
```

For saving in a game:

Name:Abdelrahman Mohamed Mohamed abdelmotlb   ID:20010851
Name:Mohamed Elsayed Amin   ID:20011502

```
  1    2    3
1■════■    ■              The number of moves of amin : 2
   ║ B ║                  The number of moves of abdelmotlb : 2
2■════■    ■              Score 0 - 1
                          The number of Remaining lines : 8
3■    ■    ■              Time since starting 4 : 36




for continue[1]....undo[2]....redo[3]....save game[4]:4
```

```
  1    2    3
1■════■    ■              The number of moves of amin : 2
   ║ B ║                  The number of moves of abdelmotlb : 2
2■════■    ■              Score 0 - 1
                          The number of Remaining lines : 8
3■    ■    ■              Time since starting 6 : 17




Enter [1]first file ....[2]second file....[3]third file :1
```

For loading the game:

```
              /*loading*/



Enter [1]load first file....[2]load second file....[3]load third file :1_
```

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```
   1   2   3
1■━━━■   ■              The number of moves of amin : 2
  ‖ B ‖                 The number of moves of abdelmotlb : 2
2■━━━■   ■              Score 0 - 1
                        The number of Remaining lines : 8
3■   ■   ■



 abdelmotlb's Turn :
Enter R1 R2 C1 C2 :

 Enter row 1:
```

For top scorers:

```
                    /*Main..Menu*/

              ┌─────────────────────────┐
              │   [1]start game         │
              │   [2]load game          │
              │   [3]top scores▪        │
              │   [4]exit               │
              └─────────────────────────┘
```

Different games:

Name:Abdelrahman Mohamed Mohamed abdelmotlb   ID:20010851

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```
  1   2   3
1■===■===■
  | B | B |
2■===■===■
  | B | B |
3■===■===■

                    The number of moves of amin : 5
                    The number of moves of abdelmotlb : 7
                    Score 0 - 4
                    The number of Remaining lines : 0
                    Time since starting 1 : 58




 abdelmotlb's Turn :
Enter R1 R2 C1 C2 :




 The winner is : abdelmotlb
 Enter [1]main menu..[2]topscorers:
```

```
[1] mohamed           with score : 4
[2] abdelmotlb           with score : 4
[3] k              with score : 3
[4] null             with score : 0
[5] null             with score : 0
[6] null             with score : 0
[7] null             with score : 0
[8] null             with score : 0
[9] null             with score : 0
[10] null             with score : 0
Enter 1 for the main menu:_
```

Game 5x5:


```
  1   2   3   4   5   6
1■===■===■===■   ■   ■
  || B |
2■===■   ■   ■   ■   ■
  || A |
3■===■   ■===■   ■===■
  || A || A || B |
4■===■
  ||
5■   ■   ■===■===■
  ||       || A || B || B |
6■===■===■   ■   ■

                    The number of moves of ahmed : 18
                    The number of moves of abdo : 18
                    Score 4 - 4
                    The number of Remaining lines : 24
                    Time since starting 5 : 29


 ahmed's Turn :
Enter R1 R2 C1 C2 :

 Enter row 1:
```

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Game vs computer 2x2:

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Vs computer 5x5:

References used:

[1] https://www.youtube.com/watch?v=_3VdROJmaJk&list=PLVp0hvzMSQHTlz2CNlbhq-

   For colors, gotoxy and menus.

[2] https://www.programiz.com/c-programming/c-goto-statement

   For goto label function.

[3] https://www.youtube.com/watch?v=lyQp8SnN8CA

   For header guard.

[4] https://www.tutorialspoint.com/c_standard_library/c_function_clock.htm

   For timer used in game.

[5] https://www.programiz.com/c-programming/c-file-input-output

   For dealing with files.

[6] https://www.youtube.com/watch?v=jnbv1RGDBdQ

   For header files.