

NAME: JAMES WASHINGTON

COURSE: DATA STRUCTURES

DUE DATE: 1/24/20

PROFESSOR: DR. NG

Program Design

Creates an instance of the ticTacToe class

- Initializes the array (board) that contains the markers for the board

- Initializes the arrays (p1Stats & p2Stats) that contains the player statistics

- Initializes a bool variable (turn) used to keep swap turns during the game

- Initializes two string variables (p1 & p2) that hold the marker for each player

Calls the startGame method of the ticTacToe instance

- Initializes variable (playAgain) to prompt the user if they want to play again

- Initializes variable (firstGame) to keep track if the game played is the first

- Initializes variables (winner & loser) to hold who is the winner and loser

- Initializes variable (isTie) to tell if the game ended in a tie

- Initializes variable (whoStarts) to keep track of who starts in the case of a tie

- If the game is the first game

 - Calls the outputHeader method to print out the game's header

 - Calls the getNames method to get the names of the users

 - Calls the whoseFirst method to prompt the users for who goes first

- While the user wants to keep playing

 - Sets loser variable to a black space

 - Calls the outputBoard method to output the gameboard

 - For loop where the actual game is played

 - Calls the makeMove method with turn as a parameter

 - Prompts the user to make their move

 - Changes a board array element based on the input to the marker

 - Calls the outputBoard method to print the gameboard

 - Calls the isWin method to check if someone won the game

 - If there is a win

 - Change the appropriate elements in board to all caps

 - Increment the player stats accordingly

 - Return the player won

 - If someone won

 - Output who won

 - Initialize the loser variable

 - Calls the outputBoard method

 - Break loop

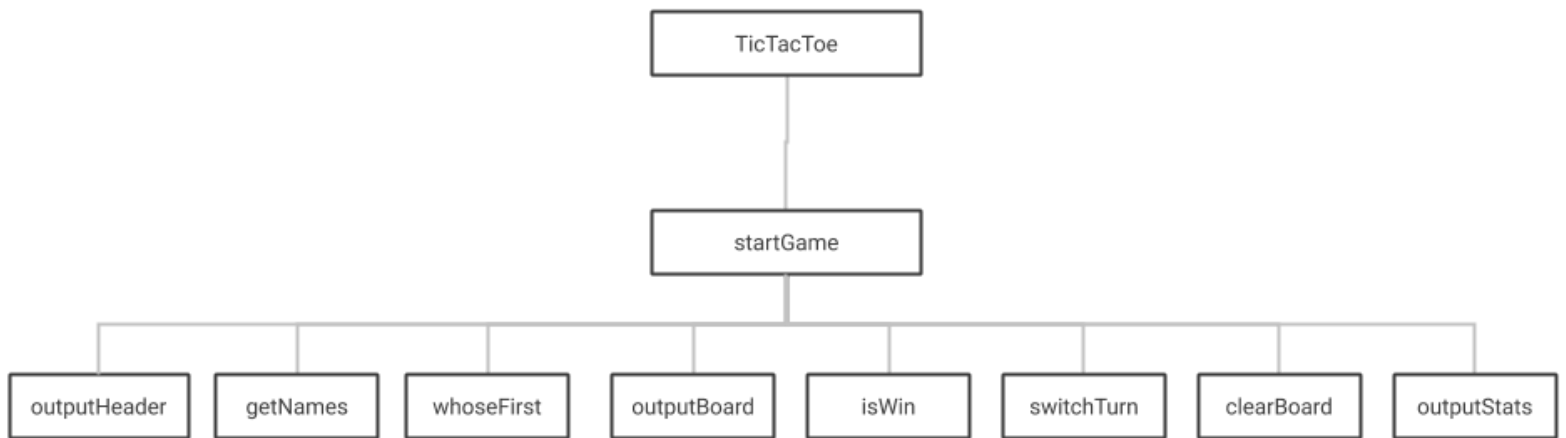
 - If the loop is on its 9th iteration (which means the games a tie)

 - Increment player stats accordingly

Output the games a tie
Calls the outputBoard method
Initializes isTie to true

 Calls the switchTurn method to switch the players turn
Calls the clearBoard method which resets the gameboard
If the game was a tie
 The first turn is given to the person that didn't start after the last tie
 The variable turn is set to !whoStarts
 The variable whoStarts is set to turn
 The variable isTie is set back to false
If player one was the loser
 The variable turn is set to true so they start the next game
Otherwise, the variable turn is set to false so player 2 starts the next game
Calls the outputStats method to print out the stats for each player
Prompts the user if they want to play another game

Hierarchical Diagrams/ Structure Charts



Procedure Specification

constructor ticTacToe()

Initializes objects needed for the game
Includes the board, player stats, turn, and marker

void getNames()

Gets the first and last name of the users
Appends the first and last names
Store everything in a private variable

bool whoseFirst()

Prompts the user to choose who starts the first game
Changes the turn variable accordingly and returns it

bool

void outputBoard()

Outputs the game board

string isWin()

Checks to see if there someone has won the game
Updates player stats
Capitalizes the win configuration
Returns the marker of the player who won
If there isn't a win it returns an empty string

string

void makeMove(bool turn)

turn

Prompts the user to make a move
Updates the board accordingly

`void switchTurn()`

Switches whose turn it is

`void clearBoard()`

Resets the game board array

`void outputStats()`

Outputs the game statistics for both players

`void outputHeader`

Outputs a header for the users at the beginning of the game

`void gameStart()`

Starts the tictactoe game
Keeps playing the game till the user stops

Program Listing

main.cpp

```
1  /******  
2  *   AN EXTENDED TIC TAC TOE PROGRAM BY JAMES WASHINGTON   *  
3  *                                                         *  
4  *****/  
5  
6  #include <iostream>  
7  #include <string>  
8  #include "ticTacToe.h"  
9  using namespace std;  
10  
11 int main()  
12 {  
13     ticTacToe game;  
14     game.startGame();  
15 }
```

Program Testing

```
Player 1, Enter your first and last name >> James Washington
Player 2, Enter your first and last name >> Fuechai Vang

James: x
Fuechai: o

Choose who will go first (1 or 2) >> 2

Game Start!
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 4 | 5 | 6 |
+---+---+---+
| 7 | 8 | 9 |
+---+---+---+

Fuechai(o), Make Your Move >> 5

+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 4 | o | 6 |
+---+---+---+
| 7 | 8 | 9 |
+---+---+---+

James(x), Make Your Move >> 1
```

```
+---+---+---+
| x | 2 | 3 |
+---+---+---+
| 4 | o | 6 |
+---+---+---+
| 7 | 8 | 9 |
+---+---+---+

Fuechai(o), Make Your Move >> 3

+---+---+---+
| x | 2 | o |
+---+---+---+
| 4 | o | 6 |
+---+---+---+
| 7 | 8 | 9 |
+---+---+---+

James(x), Make Your Move >> 4

+---+---+---+
| x | 2 | o |
+---+---+---+
| x | o | 6 |
+---+---+---+
| 7 | 8 | 9 |
+---+---+---+
```



```

Fuechai(o), Make Your Move >> 7

+---+---+---+
| x | 2 | o |
+---+---+---+
| x | o | 6 |
+---+---+---+
| o | 8 | 9 |
+---+---+---+

Fuechai Wins!
+---+---+---+
| x | 2 | 0 |
+---+---+---+
| x | 0 | 6 |
+---+---+---+
| 0 | 8 | 9 |
+---+---+---+

*****Player Stats*****

James Washington
| Wins: 0 | Losses: 1 | Draws: 0 |

Fuechai Vang
| Wins: 1 | Losses: 0 | Draws: 0 |

Continue? (y/n) >>

```

**Played the first game to ensure the game works properly,
and the stats are updated correctly**

```

Continue? (y/n) >> y

Game Start!
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 4 | 5 | 6 |
+---+---+---+
| 7 | 8 | 9 |
+---+---+---+

James(x), Make Your Move >> 5

+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 4 | x | 6 |
+---+---+---+
| 7 | 8 | 9 |
+---+---+---+

Fuechai(o), Make Your Move >> 6

+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 4 | x | o |
+---+---+---+
| 7 | 8 | 9 |
+---+---+---+

```

Started another game to show that the loser starts the next game

```
James(x), Make Your Move >> 3
```

```
+---+---+---+
| 1 | 2 | x |
+---+---+---+
| 4 | x | o |
+---+---+---+
| 7 | 8 | 9 |
+---+---+---+
```

```
Fuechai(o), Make Your Move >> 9
```

```
+---+---+---+
| 1 | 2 | x |
+---+---+---+
| 4 | x | o |
+---+---+---+
| 7 | 8 | o |
+---+---+---+
```

```
James(x), Make Your Move >> 1
```

```
+---+---+---+
| x | 2 | x |
+---+---+---+
| 4 | x | o |
+---+---+---+
| 7 | 8 | o |
+---+---+---+
```

```
Fuechai(o), Make Your Move >> 2
```

```
+---+---+---+
| x | o | x |
+---+---+---+
| 4 | x | o |
+---+---+---+
| 7 | 8 | o |
+---+---+---+
```

```
James(x), Make Your Move >> 7
```

```
+---+---+---+
| x | o | x |
+---+---+---+
| 4 | x | o |
+---+---+---+
| x | 8 | o |
+---+---+---+
```

```
James Wins!
```

```
+---+---+---+
| x | o | X |
+---+---+---+
| 4 | X | o |
+---+---+---+
| X | 8 | o |
+---+---+---+
```

```
*****Player Stats*****  
  
James Washington  
| Wins: 1 | Losses: 1 | Draws: 0 |  
  
Fuechai Vang  
| Wins: 1 | Losses: 1 | Draws: 0 |  
  
Continue? (y/n) >>
```

Let player one win the next game to show the stats update correctly

```
It's a Tie!  
  
+---+---+---+  
| o | x | o |  
+---+---+---+  
| o | x | x |  
+---+---+---+  
| x | o | o |  
+---+---+---+  
  
*****Player Stats*****  
  
James Washington  
| Wins: 1 | Losses: 1 | Draws: 1 |  
  
Fuechai Vang  
| Wins: 1 | Losses: 1 | Draws: 1 |
```

Plays another game to get a tie to show the stats updates correctly and to start making sure whoever starts the next game is correct

```

It's a Tie!

+---+---+---+
| o | x | o |
+---+---+---+
| o | x | x |
+---+---+---+
| x | o | o |
+---+---+---+

*****Player Stats*****

James Washington
| Wins: 1 | Losses: 1 | Draws: 1 |

Fuechai Vang
| Wins: 1 | Losses: 1 | Draws: 1 |

Continue? (y/n) >> y

Game Start!
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 4 | 5 | 6 |
+---+---+---+
| 7 | 8 | 9 |
+---+---+---+

Fuechai(o), Make Your Move >>

```

Notice how Fuechai started this game

```

Fuechai Wins!
+---+---+---+
| 0 | x | x |
+---+---+---+
| 0 | x | o |
+---+---+---+
| 0 | o | x |
+---+---+---+

*****Player Stats*****

James Washington
| Wins: 1 | Losses: 2 | Draws: 1 |

Fuechai Vang
| Wins: 2 | Losses: 1 | Draws: 1 |

Continue? (y/n) >> y

Game Start!
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 4 | 5 | 6 |
+---+---+---+
| 7 | 8 | 9 |
+---+---+---+

James(x), Make Your Move >>

```

Played another game and let one player win to show that the turns are working correctly

```
It's a Tie!

+---+---+---+
| x | x | o |
+---+---+---+
| o | o | x |
+---+---+---+
| x | o | x |
+---+---+---+

*****Player Stats*****

James Washington
| Wins: 1 | Losses: 2 | Draws: 2 |

Fuechai Vang
| Wins: 2 | Losses: 1 | Draws: 2 |

Continue? (y/n) >> y

Game Start!
+---+---+---+
| 1 | 2 | 3 |
+---+---+---+
| 4 | 5 | 6 |
+---+---+---+
| 7 | 8 | 9 |
+---+---+---+

James(x), Make Your Move >>
```

Played another game and got a tie to show that the person who starts the next game is correct