Project 1

<Tic Tac Toe>

Course

CSC-5

Section

40651

Due Date

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Author

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Introduction

Title: Tic Tac Toe

This is the classic game that everyone knows.

In this game, two player is required to line up their Xs or Os in a straight line in a 3x3 grid.

The player who succeed in placing three Xs or Os in a horizontal, vertical or diagonal row will win the game.

For example, Os' player won the game in the picture below.

Although simple in design and execution, it can provides lots of fun. In addition, I also added a win counter to the game for players to record their scores.

Summary

Version 1

Project size: 175 lines

The number of variable: 18

At first, I tried to code this program by using array. However, due to the lack of time and my lack of expertise, using array in this program proved too much for me at this moment. I have tried to implement the two dimensional array that was taught in class, but my effort was futile. It took me more time to debug it than write it.

Therefore, I have resorted to using the conventional way of writing C++ program without the use of any function prototypes and array. Hopefully I'll be able to rewrite the program using array and function prototype in the upcoming project while adding new features.

This project took me two days to write the code, and one day to finish the report.

The flowchart is the painful part, it took me 4 hours to complete it. I even lost my progress during one of the session due to internet acting up. Anyhow, I hope my project can live up to expectations.

Version 2

Project size: 292 lines

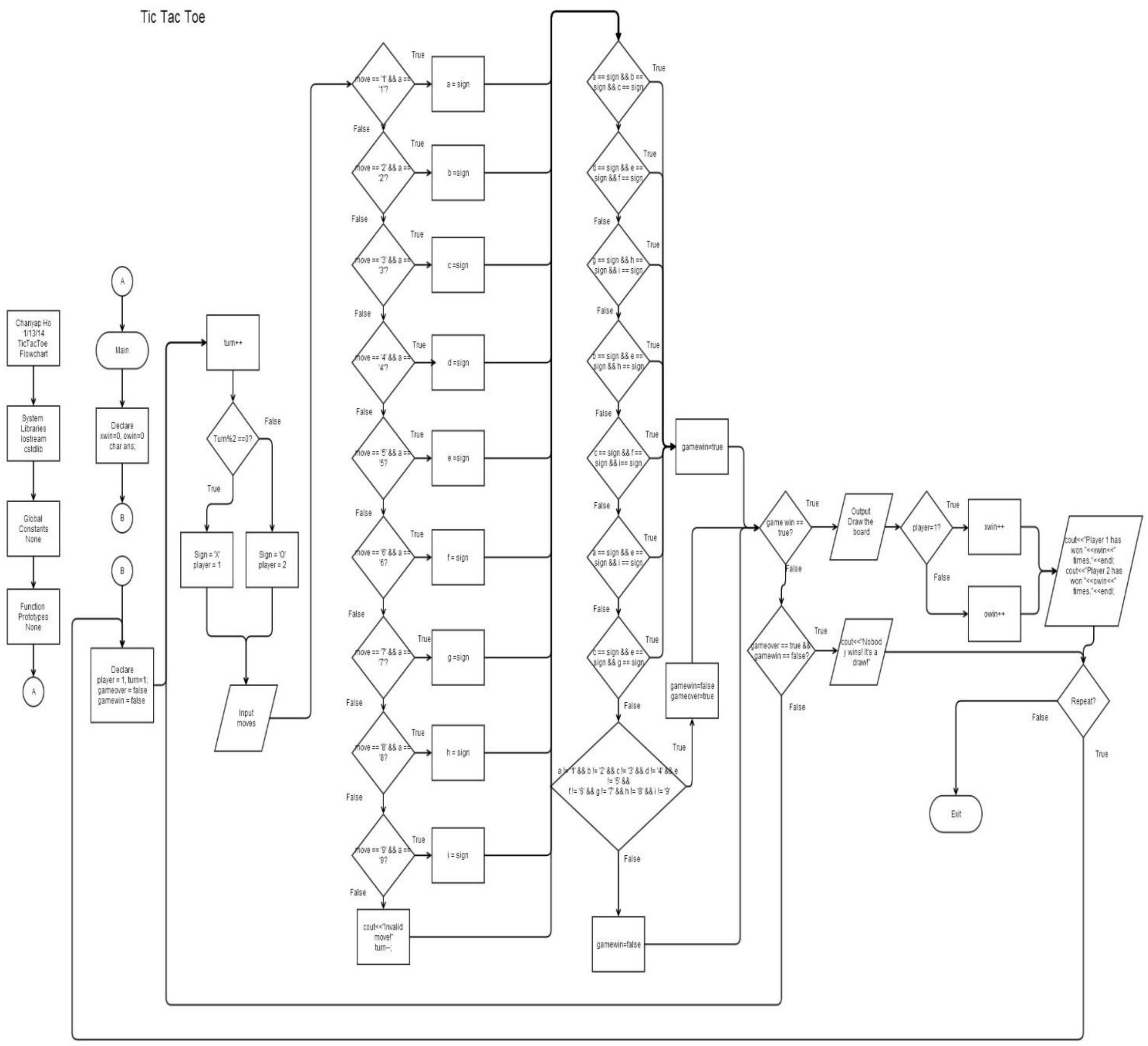
The number of variable: 20

In this version, I have successfully utilized function prototypes and pass by references in my program. I have successfully implemented a two dimensional array in my project. In order to display a larger and more visible grid, I left the code that I used to display the grid in version 1 untouched.

In addition, I also added a function that allows user to read the total win count since the creation of the program from a file.

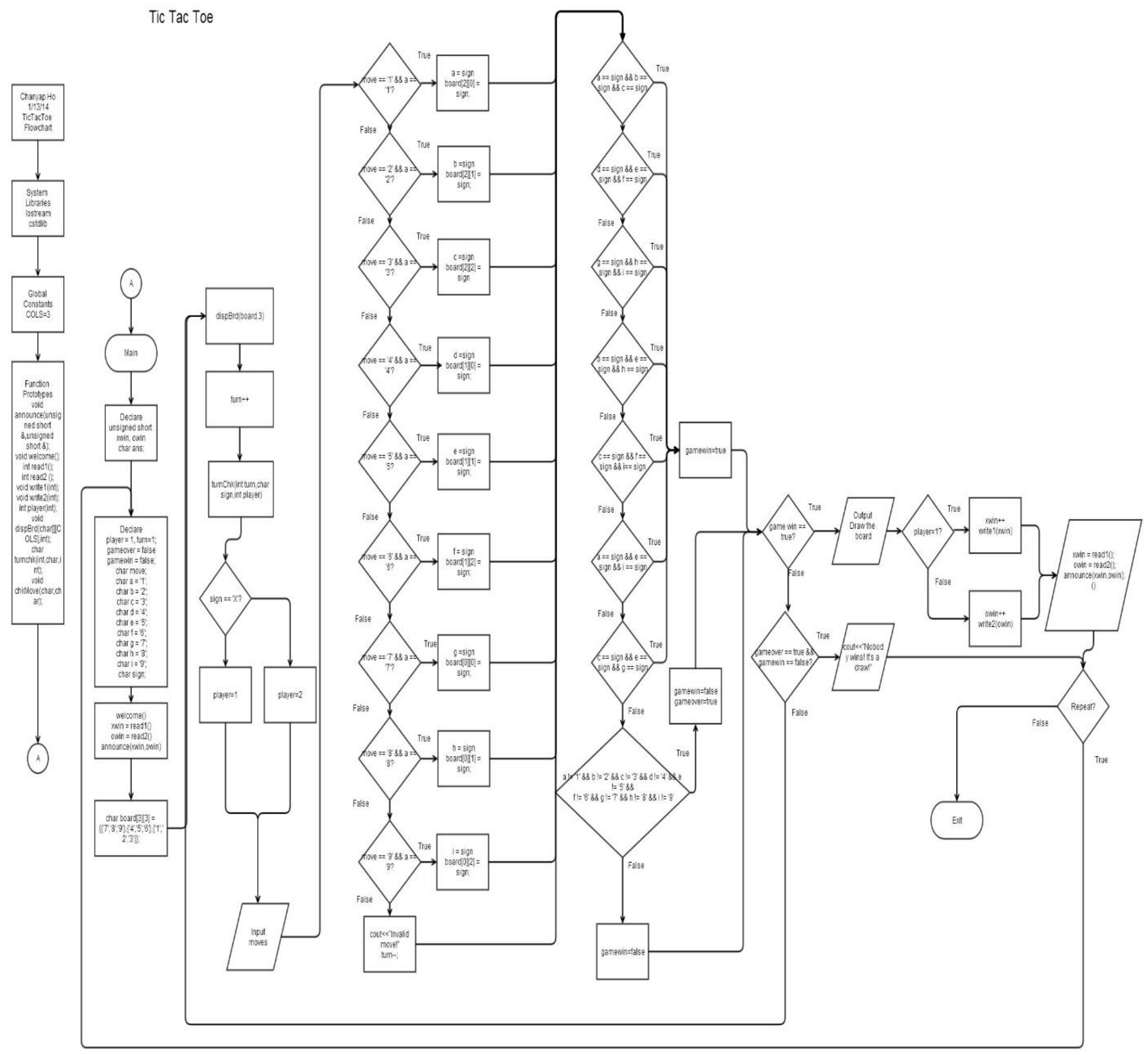
When playing the game, the program will automatically overwrite their win count to the file in the program so that they could keep track their winnings no matter how many times they played

Flow Chart Version 1

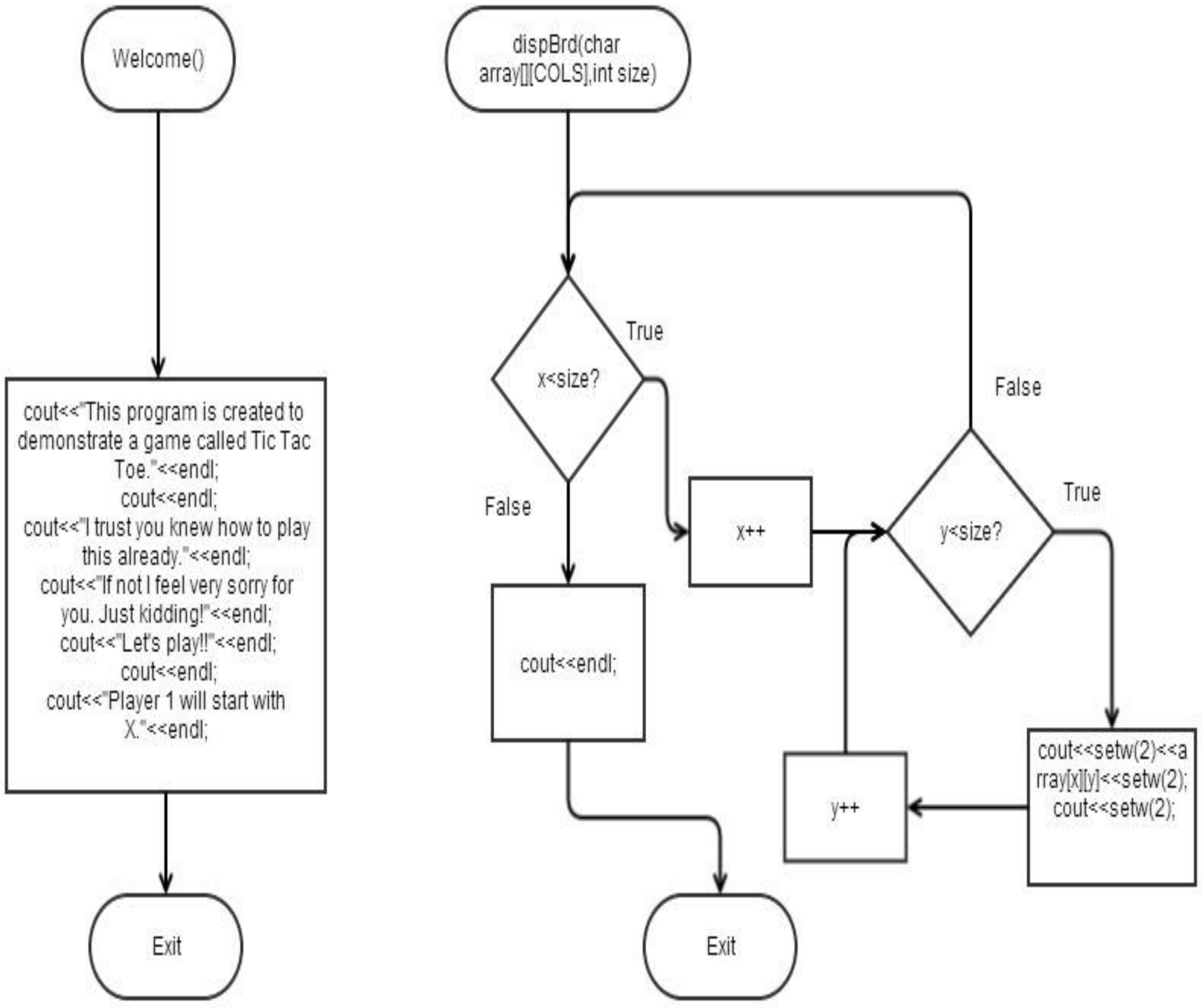

Tic Tac Toe
Chanyap Ho 1/13/14 TicTacToe Flowchart
System Libraries Iostream cstdlib
Global Constants None
Function Prototypes None
A
Main
Declare xwin=0, owin=0 char ans;
B
Declare player = 1, turn=1; gameover = false gamewin = false
turn++
Turn%2 ==0?
True
False
Sign = 'X' player = 1
Sign = 'O' player = 2
Input moves
move == '1' && a == '1'?
a = sign
move == '2' && a == '2'?
b =sign
move == '3' && a == '3'?
c =sign
move == '4' && a == '4'?
d =sign
move == '5' && a == '5'?
e =sign
move == '6' && a == '6'?
f = sign
move == '7' && a == '7'?
g =sign
move == '8' && a == '8'?
h = sign
move == '9' && a == '9'?
i = sign
cout<<"Invalid move!" turn--;
a == sign && b == sign && c == sign
d == sign && e == sign && f == sign
g == sign && h == sign && i == sign
b == sign && e == sign && h == sign
c == sign && f == sign && i== sign
a == sign && e == sign && i == sign
c == sign && e == sign && g == sign
a != '1' && b != '2' && c != '3' && d != '4' && e != '5' && f != '6' && g != '7' && h != '8' && i != '9'
gamewin=true
gamewin=false gameover=true
gamewin=false
game win == true?
Output Draw the board
player=1?
xwin++
owin++
cout<<"Player 1 has won "<<xwin<<" times."<<endl; cout<<"Player 2 has won "<<owin<<" times."<<endl;
gameover == true && gamewin == false?
cout<<"Nobody wins! It's a draw!"
Repeat?
Exit

Since the flowchart is too small to be seen on the report, I have included an original copy in the folder.

Flow Chart Version 2

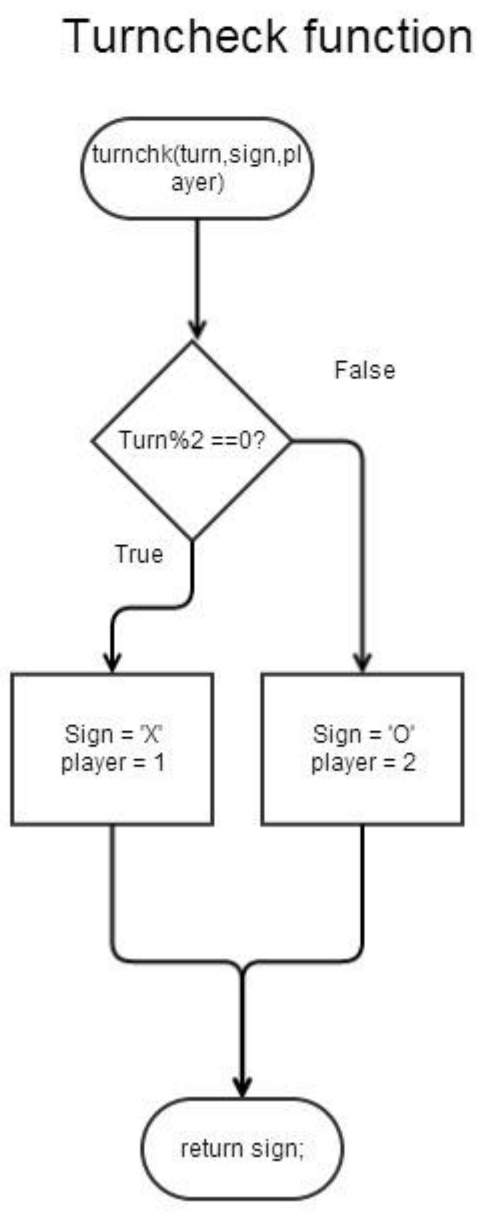

Tic Tac Toe
Chanyap Ho 1/13/14 TicTacToe Flowchart
System Libraries Iostream cstdlib
Global Constants COLS=3
Function Prototypes void announce(unsigned short &,unsigned short &); void welcome(); int read1(); int read2 (); void write1(int); void write2(int); int player(int); void dispBrd(char[][COLS],int); char turnchk(int,char,int); void chkMove(char,char);
A
A
Main
Declare unsigned short xwin, owin char ans;
Declare player = 1, turn=1; gameover = false gamewin = false; char move; char a = '1'; char b = '2'; char c = '3'; char d = '4'; char e = '5'; char f = '6'; char g = '7'; char h = '8'; char i = '9'; char sign;
welcome() xwin = read1() owin = read2() announce(xwin,owin)
char board[3][3] = {{'7','8','9'},{'4','5','6'},{'1','2','3'}};
dispBrd(board,3)
turn++
turnChk(int turn,char sign,int player)
sign == 'X'?
player=1
player=2
Input moves
move == '1' && a == '1'?
a = sign board[2][0] = sign;
move == '2' && a == '2'?
b =sign board[2][1] = sign;
move == '3' && a == '3'?
c =sign board[2][2] = sign
move == '4' && a == '4'?
d =sign board[1][0] = sign;
move == '5' && a == '5'?
e =sign board[1][1] = sign;
move == '6' && a == '6'?
f = sign board[1][2] = sign;
move == '7' && a == '7'?
g =sign board[0][0] = sign;
move == '8' && a == '8'?
h = sign board[0][1] = sign;
move == '9' && a == '9'?
i = sign board[0][2] = sign;
cout<<"Invalid move!" turn--;
True
False
a == sign && b == sign && c == sign
d == sign && e == sign && f == sign
g == sign && h == sign && i == sign
b == sign && e == sign && h == sign
c == sign && f == sign && i== sign
a == sign && e == sign && i == sign
c == sign && e == sign && g == sign
a != '1' && b != '2' && c != '3' && d != '4' && e != '5' && f != '6' && g != '7' && h != '8' && i != '9'
gamewin=true
gamewin=false gameover=true
gamewin=false
game win == true?
gameover == true && gamewin == false?
Output Draw the board
cout<<"Nobody wins! It's a draw!"
player=1?
xwin++ write1(xwin)
owin++ write2(owin)
xwin = read1(); owin = read2(); announce(xwin,owin); ()
Repeat?
Exit

Welcome and displayBoard function


Welcome()
cout<<"This program is created to demonstrate a game called Tic Tac Toe."<<endl;
cout<<endl;
cout<<"I trust you knew how to play this already."<<endl;
cout<<"If not I feel very sorry for you. Just kidding!"<<endl;
cout<<"Let's play!!"<<endl;
cout<<endl;
cout<<"Player 1 will start with X."<<endl;
Exit
dispBrd(char array[][COLS],int size)
x<size?
True
False
x++
y<size?
False
True
cout<<endl;
cout<<setw(2)<<array[x][y]<<setw(2);
cout<<setw(2);
y++
Exit

Welcome function is being used to display the welcome message.

The dispBrd function is being used to draw a 3x3 grid using a 2d array.

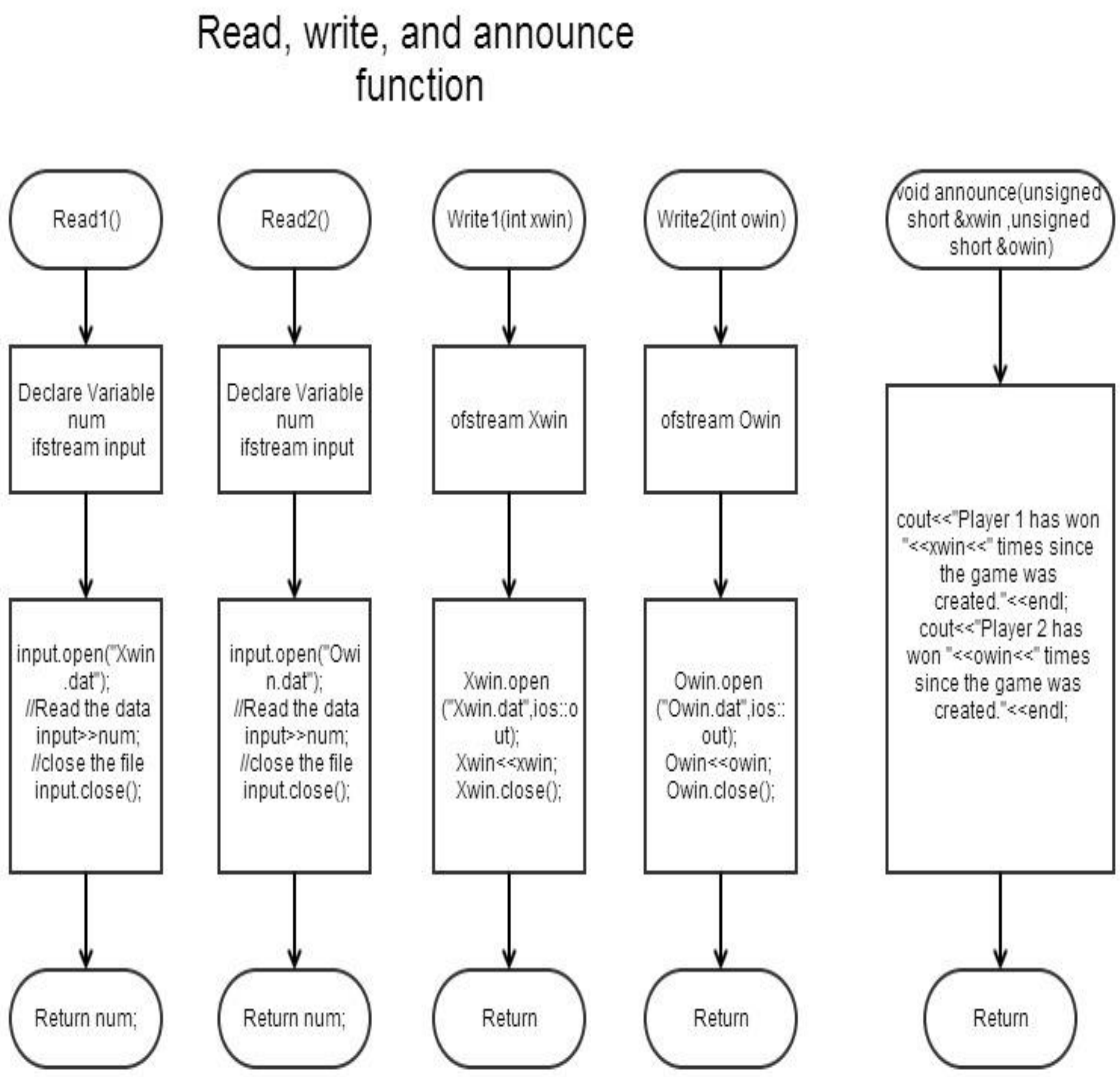


In this turncheck function, turns are being decided by a “if-else” loop.

If turn is even number, then it shall be player 1’s turn.

If turn is odd number, then it shall be player 2’s turn.

The sign are being returned in order to mark the grid.


Read, write, and announce function
Read1()
Declare Variable num ifstream input
input.open("Xwin.dat"); //Read the data input>>num; //close the file input.close();
Return num;
Read2()
Declare Variable num ifstream input
input.open("Owin.dat"); //Read the data input>>num; //close the file input.close();
Return num;
Write1(int xwin)
ofstream Xwin
Xwin.open ("Xwin.dat",ios::out); Xwin<<xwin; Xwin.close();
Return
Write2(int owin)
ofstream Owin
Owin.open ("Owin.dat",ios::out); Owin<<owin; Owin.close();
Return
void announce(unsigned short &xwin ,unsigned short &owin)
cout<<"Player 1 has won "<<xwin<<" times since the game was created."<<endl; cout<<"Player 2 has won "<<owin<<" times since the game was created."<<endl;
Return

In this flowchart, I have 5 functions dedicated to reading, saving and writing data.

Two read function are used to retrieve data from “Xwin.dat” and “Owin.dat.”

Two write function are used to save data to respective data file.

The last announce function is used to report the winnings since the creation of the game.

Pseudocode V1

```
Initialize
Set X's win counter to 0
Set O's win counter to 0

Do
    Set Player to 1
    Set Turn to 1
    Set gameover to false
    Set gamewin to false
    Draw the 3 x 3 grid
    + 1 to Turn
    If the remainder of Turn is 0
        Sign = X
        Player = 1
        Remind player's turn to play
    Else
        Sign = O
        Player = 2
        Remind player's turn to play
    Get input
    //check move's validity
```

```
If move is valid and a is available
    Mark ‘a’ as sign
else If move is valid and b is available
    Mark ‘b’ as sign
Else If move is valid and c is available
    Mark ‘c’ as sign
Else If move is valid and a is available
    Mark ‘d’ as sign
Else If move is valid and e is available
    Mark ‘e’ as sign
Else If move is valid and f is available
    Mark ‘f’ as sign
Else If move is valid and g is available
    Mark ‘g’ as sign
Else If move is valid and h is available
    Mark ‘h’ as sign
Else If move is valid and i is available
    Mark ‘i’ as sign
Else
   Prompt for valid move
  -1 to turn in order to compensate for move taken

//check win condition
```

```
    If a is equivalent to sign and b is equivalent to sign and c is equivalent to sign
        Set gamewin to true
    Else If d is equivalent to sign and e is equivalent to sign and f is equivalent to sign
        Set gamewin to true
    Else If g is equivalent to sign and h is equivalent to sign and i is equivalent to sign
        Set gamewin to true
    Else If a is equivalent to sign and d is equivalent to sign and g is equivalent to sign
        Set gamewin to true
    Else If b is equivalent to sign and e is equivalent to sign and h is equivalent to sign
        Set gamewin to true
    Else If c is equivalent to sign and f is equivalent to sign and i is equivalent to sign
        Set gamewin to true
    Else If a is equivalent to sign and e is equivalent to sign and i is equivalent to sign
        Set gamewin to true
    Else If c is equivalent to sign and e is equivalent to sign and g is equivalent to sign
        Set gamewin to true
    Else If a is not equal to '1' and b is not equal to '2' and c is not equal to '3' and d is   not equal to '4' and e is not equal to '5' and f is not equal
    to '6' and g is not equal to '7' and h is not equal to '8' and i is not equal
    to '9'
        Set gamewin to false
        Set gameover to true
    Else
        Set gamewin to false
    //display result
    If gamewin is true
        Print the placement on the board
        Print the player who won
        If player 1 won
            Add 1 to X’s win counter
        If player 2 won
            Add 1 to O’s win counter
    Else if gameover is true and gamewin is false
        Print the placement on the board
        Print “Nobody wins! It's a draw!"
    Print Player 1 win count
    Print Player 2 win count
    While gameover is false
    Ask for repeat
    Get answer
While answer is yes
```

Exit Program

Pseudocode V2

```
Declare xwin and owin as unsigned short
Declare ans as char data type
Do
    Set Player to 1
    Set Turn to 1
    Set gameover to false
    Set gamewin to false
    Run the welcome function to show welcome message
    Read from xwin.dat
    Read from owin.dat
    Announce the win count so far
    Initialize the game
    Set up the 2d array
    Do
    Draw the 3 x 3 grid using a 2d array function.
    + 1 to Turn
    Run the turncheck function
    Set sign = turncheck function output
    If sign is equivalent to X
        Set player to 1
    Else set player to 2
```

```
Get input
check move’s validity
If move is valid and a is available
    Mark ‘a’ as sign
    Set [2][0] position on gaming board to sign
else If move is valid and b is available
    Mark ‘b’ as sign
    Set [2][1] position on gaming board to sign
Else If move is valid and c is available
    Mark ‘c’ as sign
    Set [2][2] position on gaming board to sign
Else If move is valid and a is available
    Mark ‘d’ as sign
    Set [1][0] position on gaming board to sign
Else If move is valid and e is available
    Mark ‘e’ as sign
    Set [1][1] position on gaming board to sign
Else If move is valid and f is available
    Mark ‘f’ as sign
    Set [1][2] position on gaming board to sign
Else If move is valid and g is available
    Mark ‘g’ as sign
    Set [0][0] position on gaming board to sign
```

```
Else If move is valid and h is available
    Mark 'h' as sign
    Set [0][1] position on gaming board to sign
Else If move is valid and i is available
    Mark 'i' as sign
    Set [0][2] position on gaming board to sign
Else
  Prompt for valid move
  -1 to turn in order to compensate for move taken

Check win condition
If a is equivalent to sign and b is equivalent to sign and c is equivalent to sign
        Set gamewin to true
Else If d is equivalent to sign and e is equivalent to sign and f is equivalent to sign
        Set gamewin to true
Else If g is equivalent to sign and h is equivalent to sign and i is equivalent to sign
        Set gamewin to true
Else If a is equivalent to sign and d is equivalent to sign and g is equivalent to sign
        Set gamewin to true
    Else If b is equivalent to sign and e is equivalent to sign and h is equivalent to sign
        Set gamewin to true
    Else If c is equivalent to sign and f is equivalent to sign and i is equivalent to sign
        Set gamewin to true
    Else If a is equivalent to sign and e is equivalent to sign and i is equivalent to sign
        Set gamewin to true
    Else If c is equivalent to sign and e is equivalent to sign and g is equivalent to sign
        Set gamewin to true
    Else If a is not equal to '1' and b is not equal to '2' and c is not equal to '3' and d is   not equal to '4' and e is not equal to '5' and f is not equal to '6' and g is not equal to '7' and h is not equal to '8' and i is not equal to '9'
        Set gamewin to false
        Set gameover to true
    Else
        Set gamewin to false
    //display result
    If gamewin is true
        Print the placement on the board
        Print the player who won
        If player 1 won
```

```
                Add 1 to X’s win counter
                Write the new win count to xwin.dat
            If player 2 won
                Add 1 to O’s win counter
                Write the new win count to owin.dat
        Else if gameover is true and gamewin is false
            Print the placement on the board
            Print “Nobody wins! It's a draw!"
        Run the read1() function
        Run the read2() function
        Announce the new data
        While gameover is false
        Ask for repeat
        Get answer
    While answer is yes
    Exit Program
```

Variables		
Type	**Variable Name**	**Description**
Unsigned short	Xwin	Win counter for X
	Owin	Win counter for o
	Player	Player
	Turn	Turn
Char	Ans	Answer when asked for repeat
	Sign	A placeholder for X or O
	A	Lower left portion of the board
	B	Lower mid portion of the board
	C	Lower right portion of the board
	D	Left portion of the board
	E	Mid portion of the board
	F	Right portion of the board
	G	Upper left portion of the board
	H	Upper mid portion of the board
	I	Upper right portion of the board
	Board[3][3]	An 3x3 array
	Move	Player input
Boolean	Gameover	Flag to indicate the game is over
	Gamewin	Flag to indicate the game has been won

Int	Size	Size to loop the dispBrd function
	num	The number in the data file

C++ Constructs

Syntax and Keywords	Examples

Type_Name Variables_Names_1, Variables_Names_2	Char ans;
	Char sign;

Variable = Expression	Player = 1, turn =1;
Modulo operator	Turn%2==0;
Type_Name Variables_Names_1 = Expression_for_Value_1, Variables_Names_2 = Expression_for_Value_2	Unsigned short owin=0;
Cin>>Variable_1>>Variable_2	Cin>>move;
Cout<<Variable_1<<Variable_2	Cout<< "Player "<<player<<"'s turn to play"<<endl;
Line Breaks in I/O	Cout<<endl;
(comparison_1) && (comparison_2)	move == '1' && a == '1'

If(Boolean_expression_1)
Statement_1
Else if(Boolean_expression_2)
Statement_2
	if(gamewin == true){
	
	}else if (gameover == true && gamewin == false){
	
	}

Do-While Loop	Do{ }while(ans == 'Y'||ans == 'y')
Increment/Decrement Operator	Turn++; Turn--;
Pass by Reference	Unsigned short &xwin;
Boolean Expression	Bool gameover=false;
Calling a member function	Input.open("Xwin.dat")

Manipulators	Cout<<endl;
Formatting	Ios::out
Type_Name Array_Name[Declared_Size]	Char array[][COLS]
Type_Returned Function_Name(…,Base_Type Array_Name[],…)	void dispBrd(char[][COLS],int);