CPSC 2150 Project Report

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Requirements Analysis

Functional Requirements:

1. As a player, I need to know if I am X's or O's, so that I know if I am going first or not.
2. As a player, I need to know where I can move on the board, so that I can make the best possible next move.
3. As a player, I need to know if it is my turn to make a move, so that I can so that I can place my token on the board.
4. As a player, I want to be able see the board, so that I can see how I am doing
5. As a player, I need to know what spots are taken on the board, so that I don't move there on the board.
6. As a player, I need to know if I won or loss, so that I know when the game is over.
7. As a player, I want to know if I can play again, so that I can restart the game.
8. As a player, I want to be able to see all the moves made so far on the board, so that I can see if I need to play defense or offense.
9. As a player, I need to know if there are no possible moves left on the board, so that I know the game ended in a tie.
10. As a player, I want to see the winning combination that won the game, so that I can see how I won or loss.
11. As a player, I want to know what the columns are listed as, so that I ensure I place my token in the right column.
12. As a player, I need to identify where my tokens are, so that I can spot out the many ways for me to win the game.
13. As a player, I need to the know different combinations in which I can win, so that I know how to play the game.
14. As a player, I want to know how many rows and columns there are, so that I can make a strategy of how I am going win.
15. As a player, I want to know if I can change the rows and columns of the game, so that I can change how many tokens I would need in a row to win the game.
16. As a player, I want to know if I can change my token position after I place it, so that I can change my mistake if I misplace my token.
17. As a player, I want to know If I can change the token names from X and O, so that I can have some customizability in the game.
18. As a player, I want to enter the number of rows and columns that the game board will have, so that I have some control over the game.

19. As a player, I want to be able to see why that I cannot place my token at a certain position, so that I can put it at another valid position.
20. I want to get a winning message when I win the game, so that I feel rewarded after winning.
21. As a player, I can place a marker in a column, so I can claim a space.
22. As a player, if I get 5 in a row horizontally, I will win the game so that I can win the game.
23. As a player, if I get 5 in a row vertically, I will win the game so that I can win the game.
24. As a player, if I get 5 in a row diagonally, I will win the game so that I can win the game.
25. As a player, I can choose to play again, so I can play again.

Non-Functional Requirements

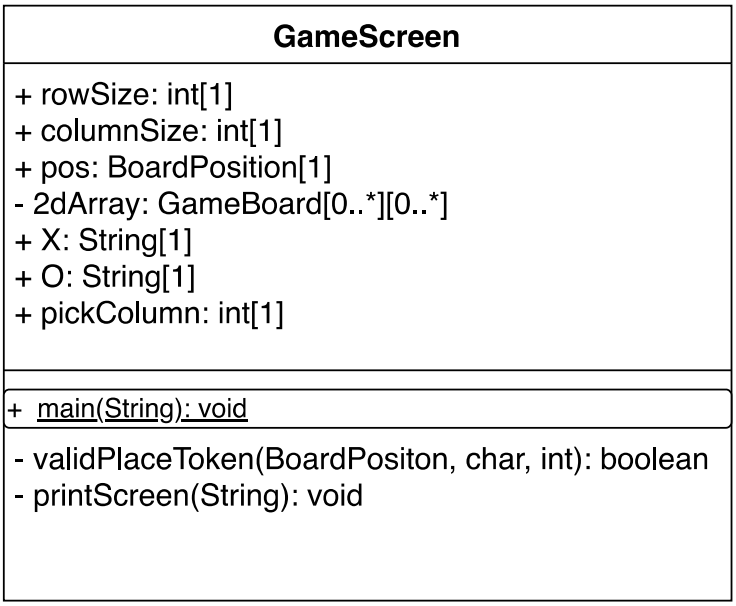
1. The system must be written in Java.
2. The system must be able to gather input from the user.
3. The system must be able to generate a 6 x 9 game board.
4. The system must be able to handle two players.
5. The system must utilize algorithms to decrease run time and increase performance and efficiency.
6. Position 0,0 is at the bottom left of the game board.

Deployment Instructions

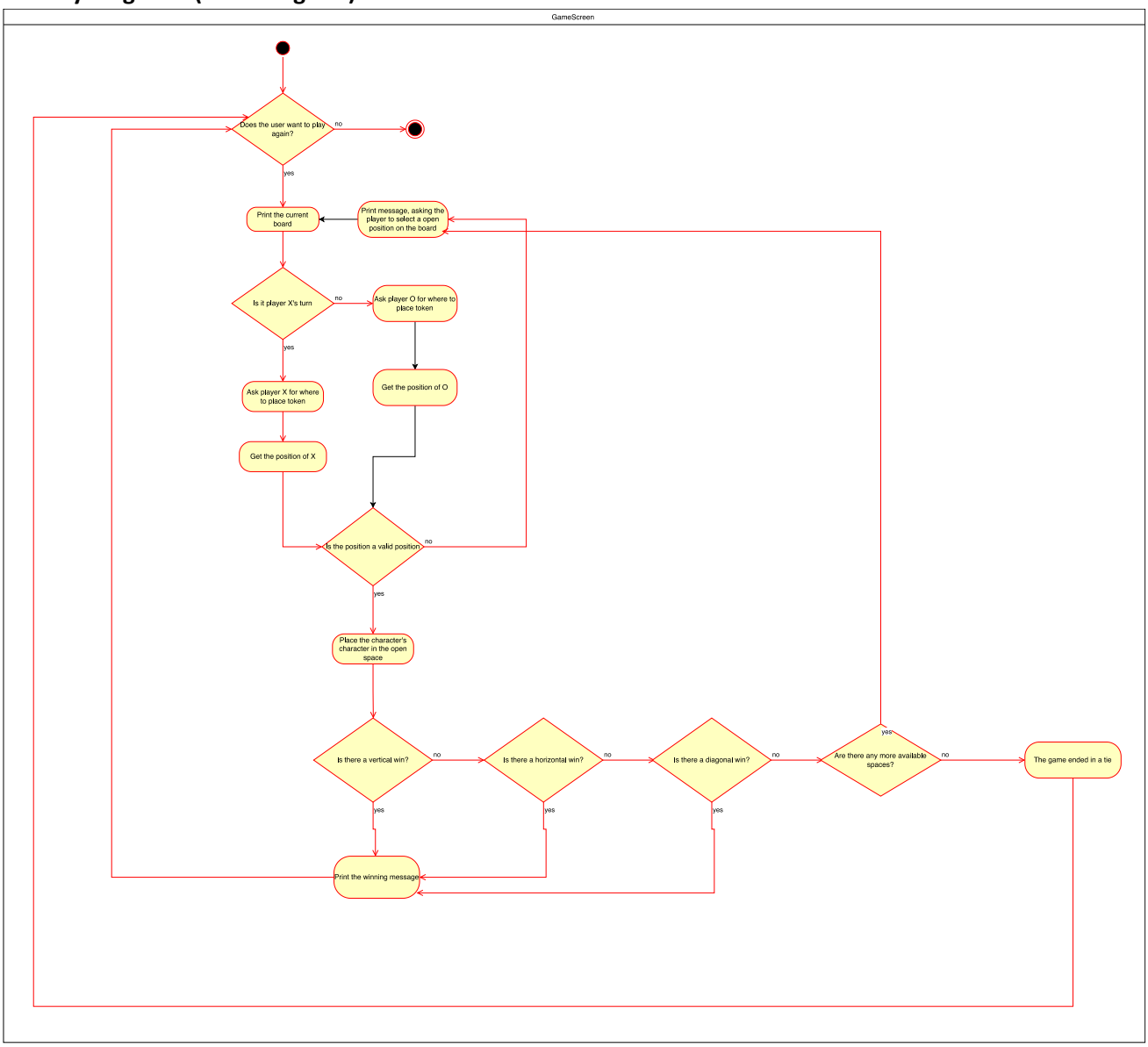
Details in Projects 2-5.

Class 1: GameScreen

Class Diagram:

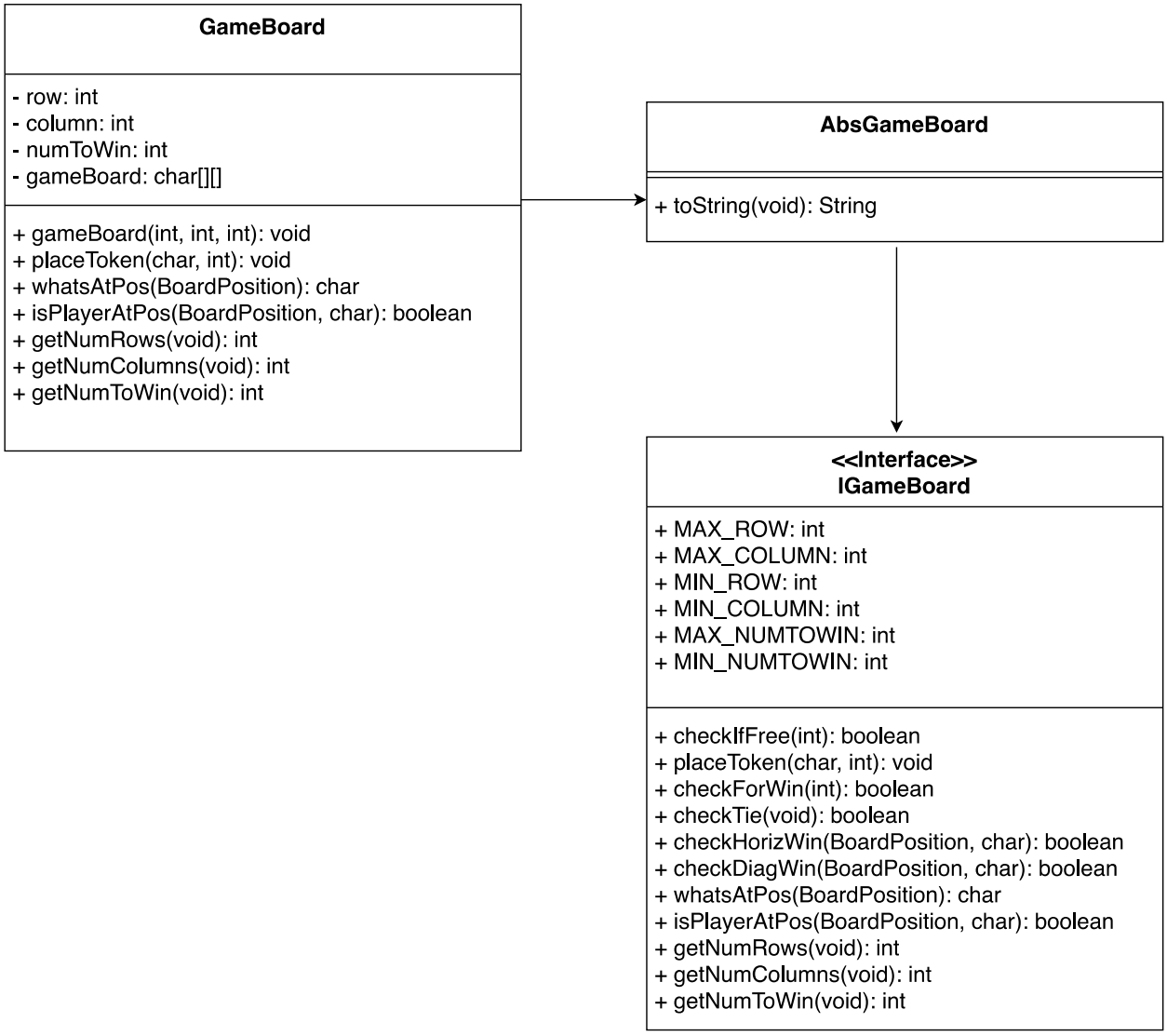


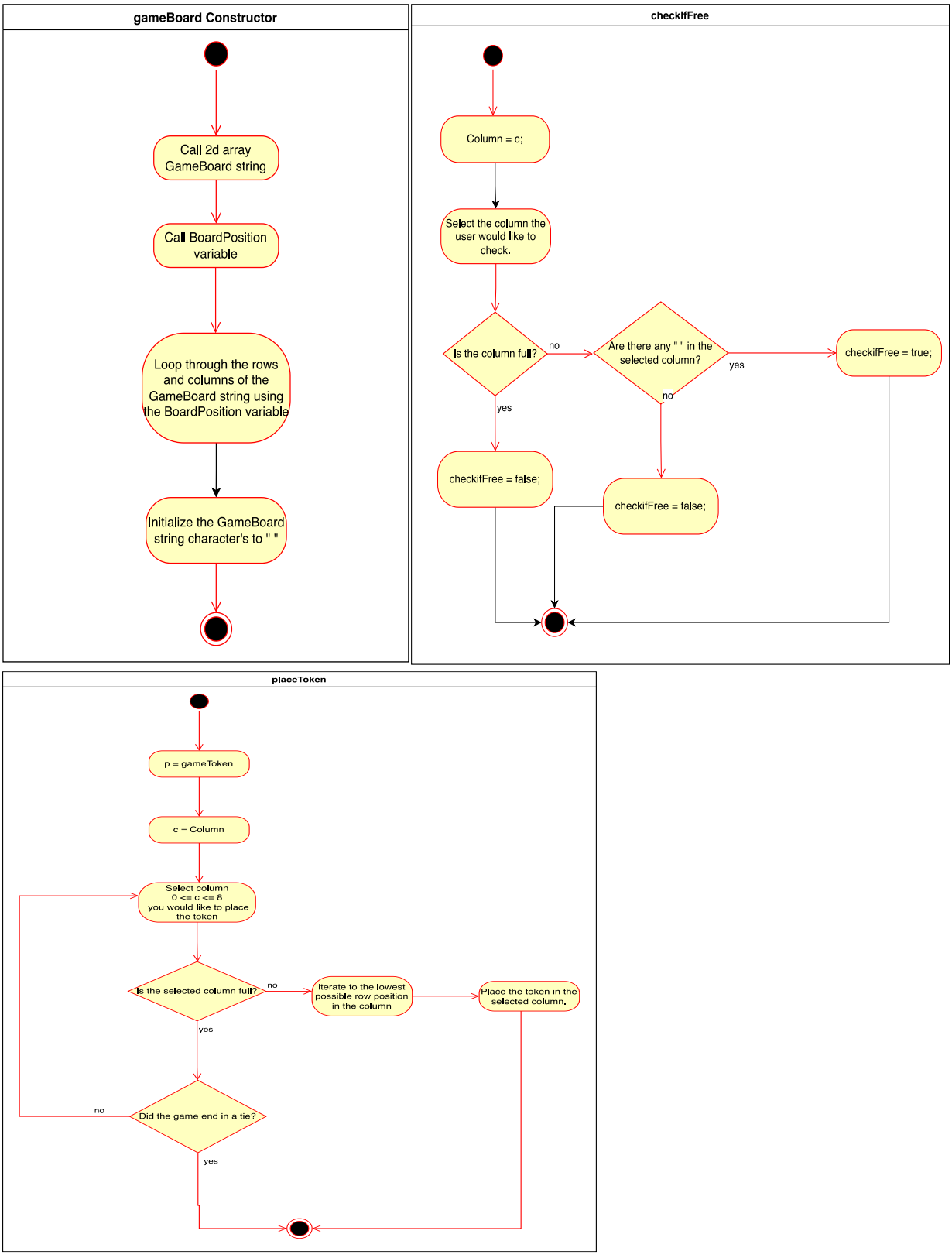
Activity diagrams (UML Diagram)

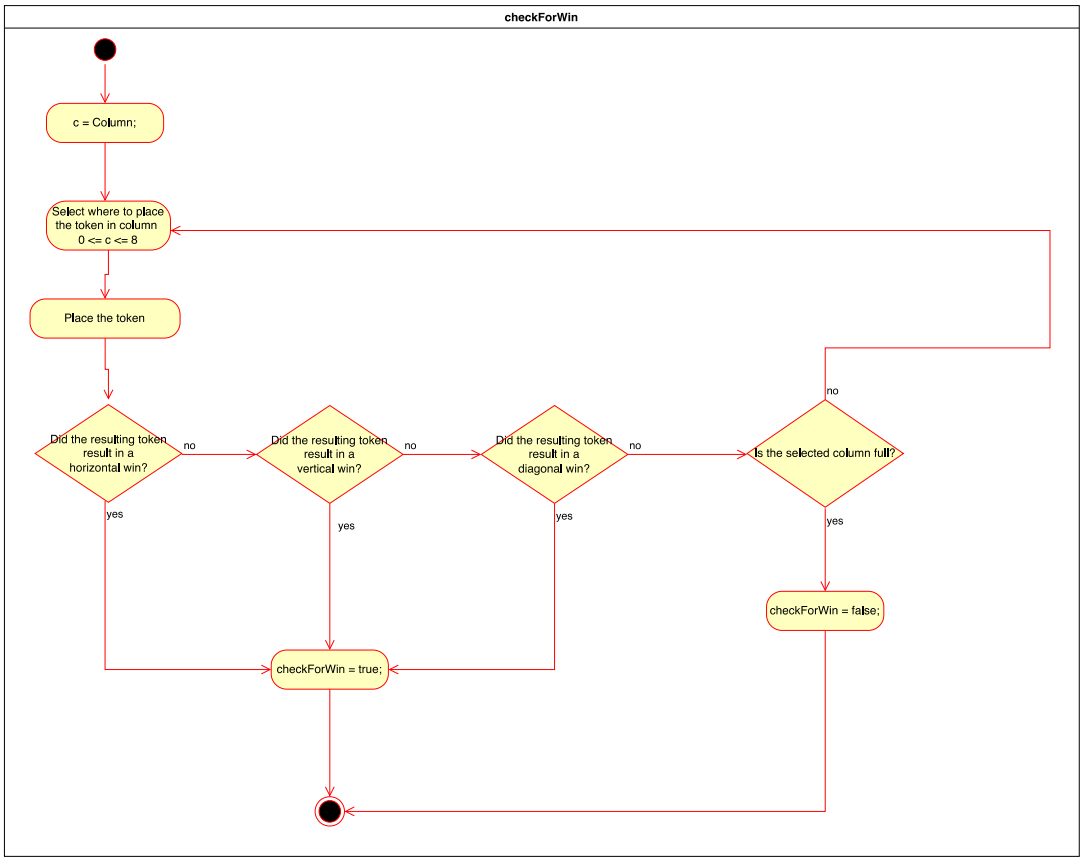


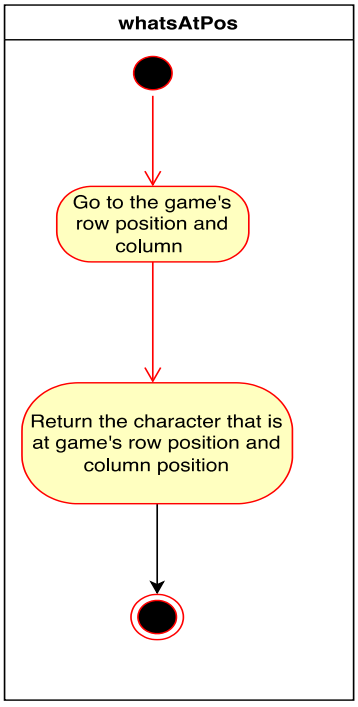
Class 2: GameBoard

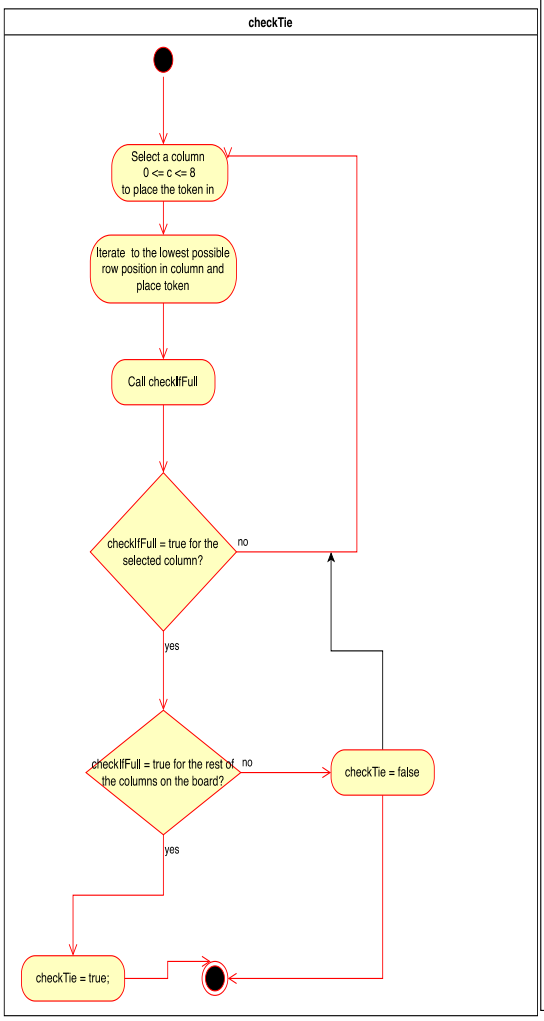
Class diagram:

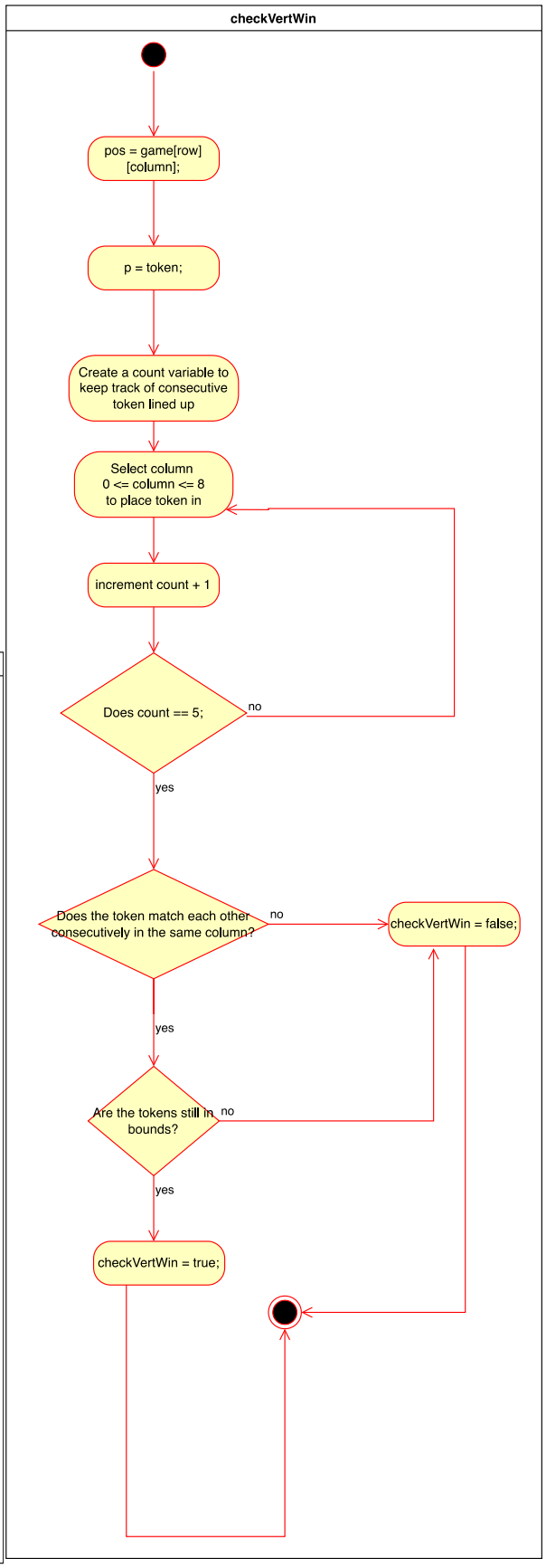


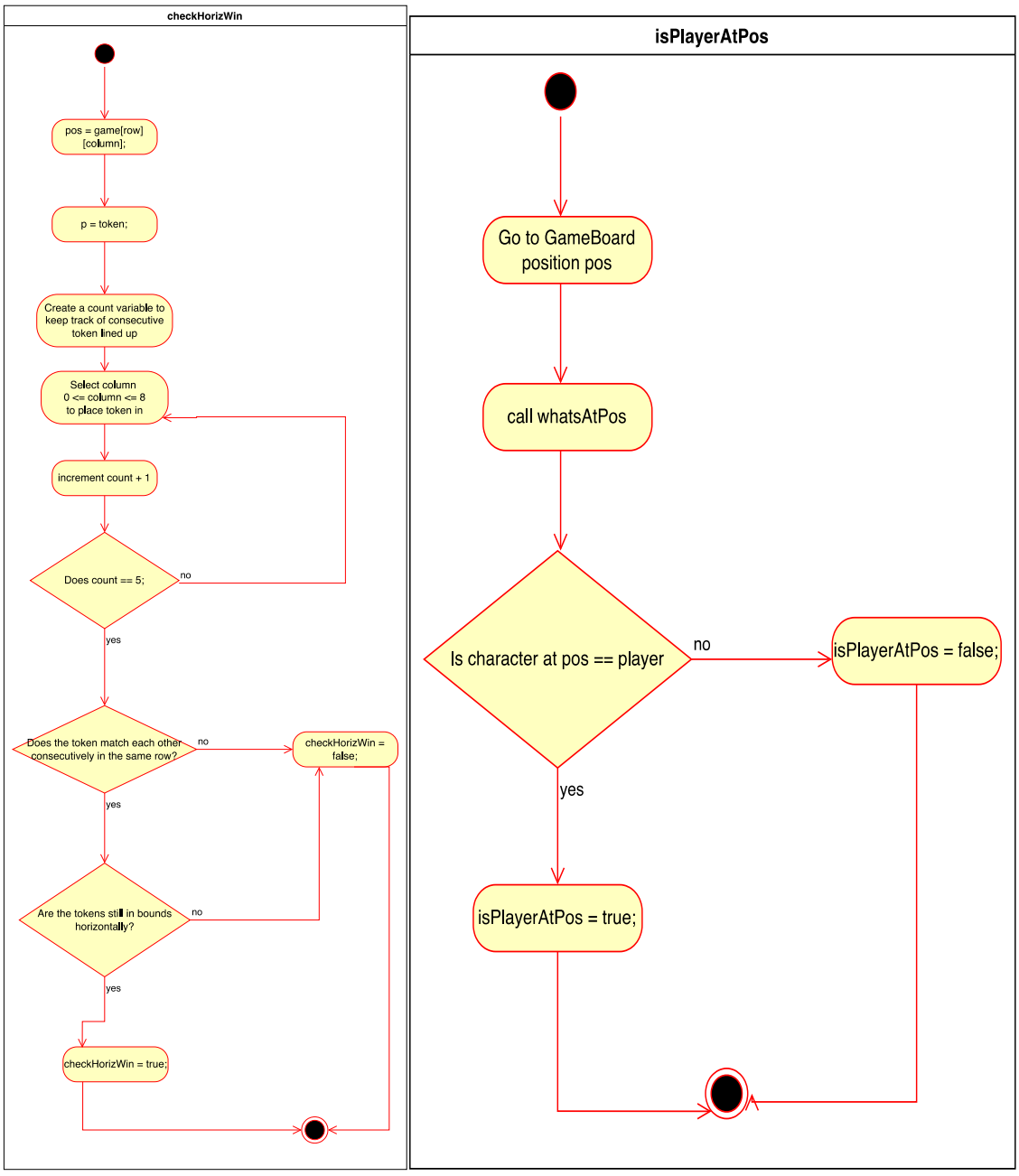

gameBoard Constructor
Call 2d array GameBoard string
Call BoardPosition variable
Loop through the rows and columns of the GameBoard string using the BoardPosition variable
Initialize the GameBoard string character's to " "
checkIfFree
Column = c;
Select the column the user would like to check.
Is the column full?
no
Are there any " " in the selected column?
yes
checkifFree = true;
no
yes
checkifFree = false;
checkifFree = false;
placeToken
p = gameToken
c = Column
Select column 0 <= c <= 8 you would like to place the token
Is the selected column full?
no
iterate to the lowest possible row position in the column
Place the token in the selected column.
yes
no
Did the game end in a tie?
yes

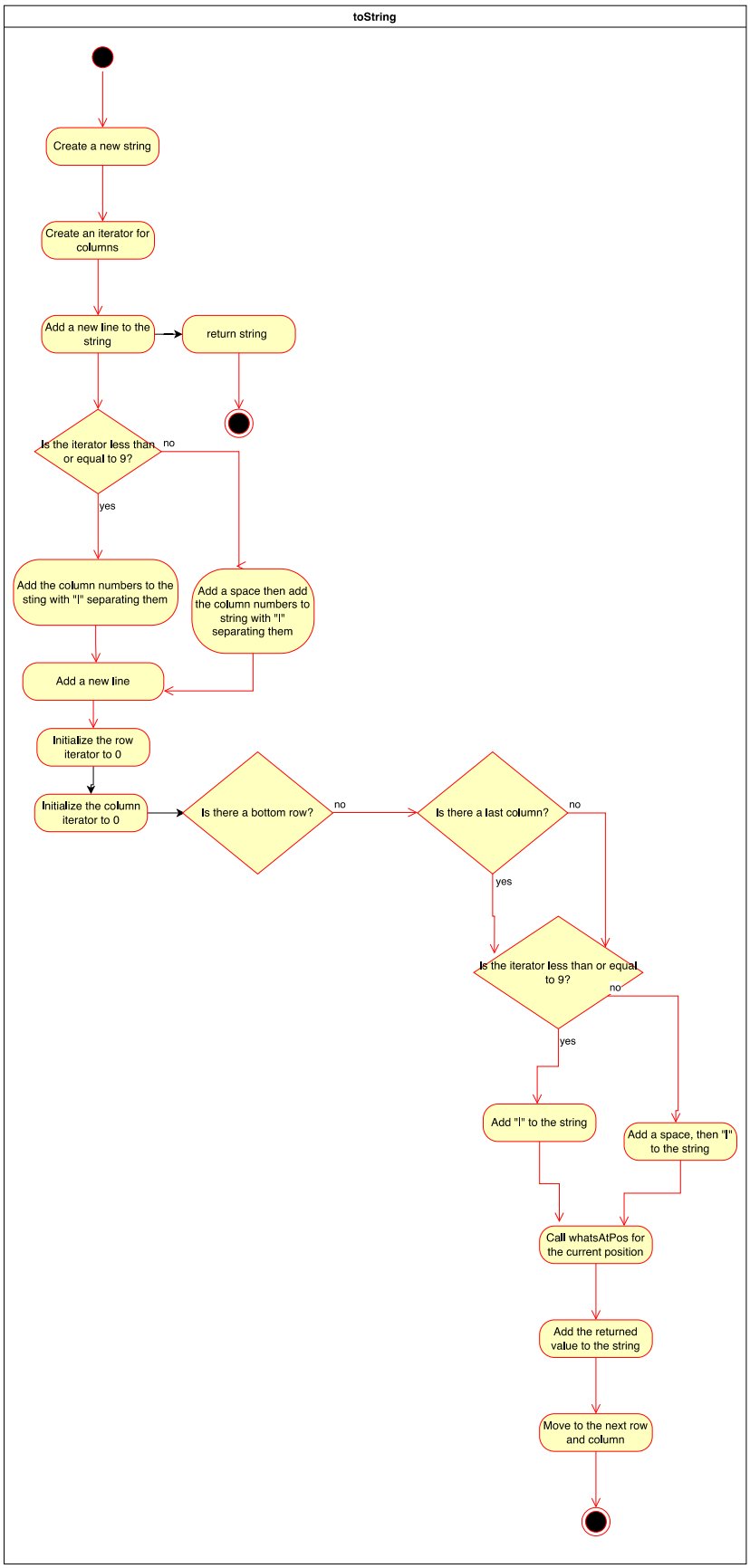

checkForWin
c = Column;
Select where to place the token in column 0 <= c <= 8
Place the token
Did the resulting token result in a horizontal win?
no
yes
Did the resulting token result in a vertical win?
no
yes
Did the resulting token result in a diagonal win?
no
yes
Is the selected column full?
no
yes
checkForWin = false;
checkForWin = true;

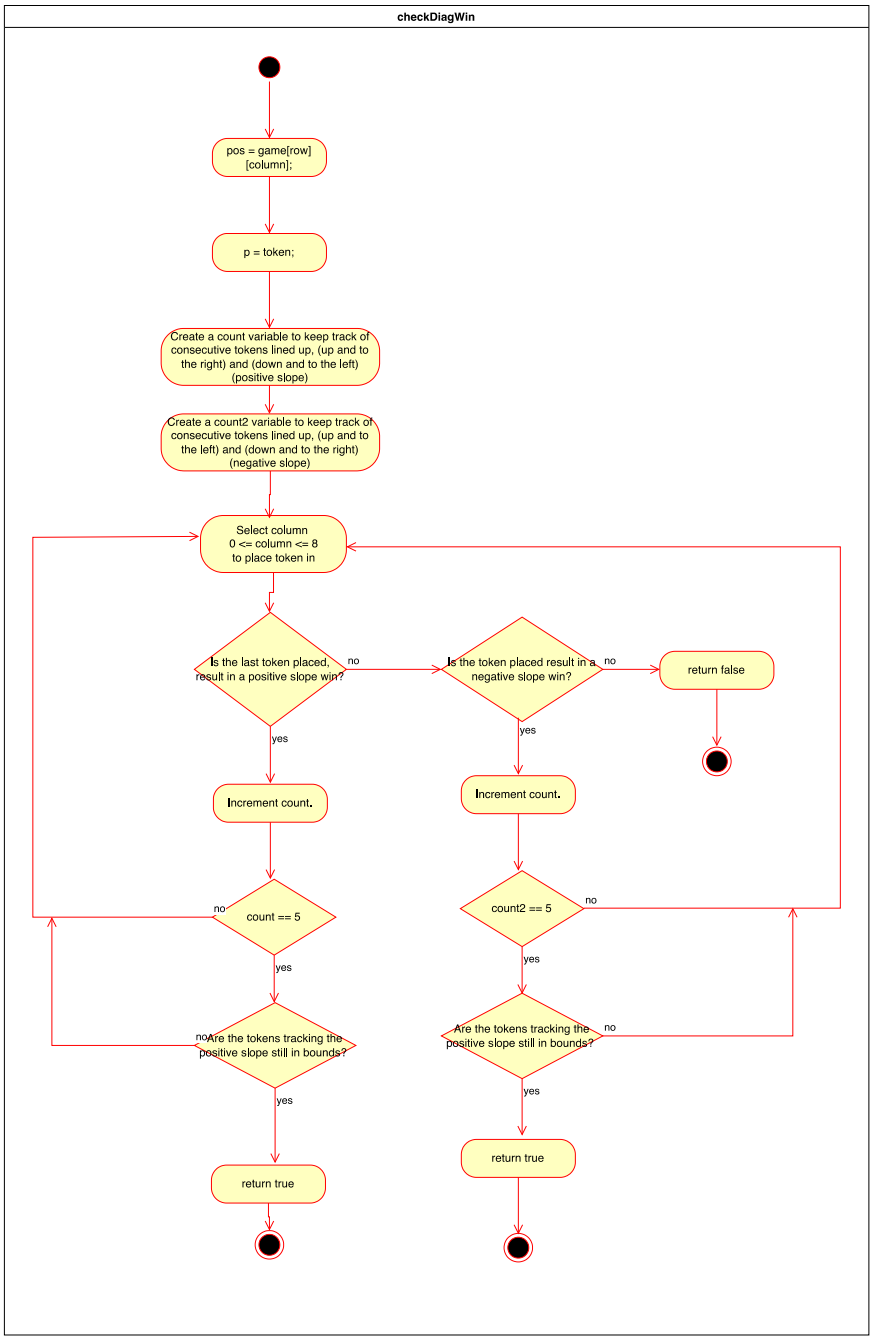

whatsAtPos
Go to the game's row position and column
Return the character that is at game's row position and column position

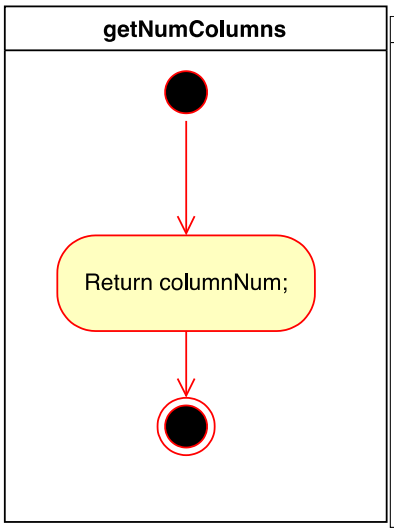

checkTie
Select a column
0 <= c <= 8
to place the token in
Iterate to the lowest possible row position in column and place token
Call checkIfFull
checkIfFull = true for the selected column?
no
yes
checkIfFull = true for the rest of the columns on the board?
no
checkTie = false
yes
checkTie = true;

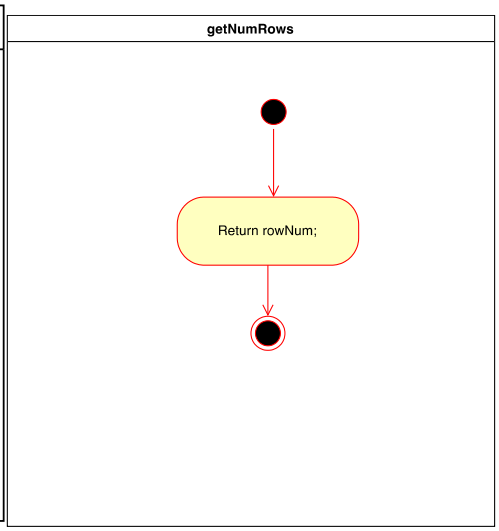

checkVertWin
pos = game[row] [column];
p = token;
Create a count variable to keep track of consecutive token lined up
Select column
0 <= column <= 8
to place token in
increment count + 1
Does count == 5;
no
yes
Does the token match each other consecutively in the same column?
no
checkVertWin = false;
yes
Are the tokens still in bounds?
no
yes
checkVertWin = true;

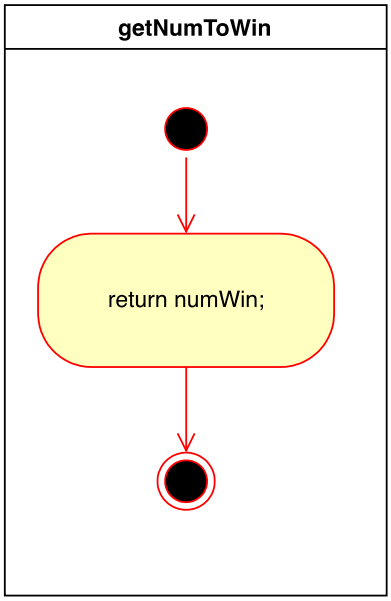

checkHorizWin
pos = game[row][column];
p = token;
Create a count variable to keep track of consecutive token lined up
Select column 0 <= column <= 8 to place token in
increment count + 1
Does count == 5;
no
yes
Does the token match each other consecutively in the same row?
no
checkHorizWin = false;
yes
Are the tokens still in bounds horizontally?
no
yes
checkHorizWin = true;
isPlayerAtPos
Go to GameBoard position pos
call whatsAtPos
Is character at pos == player
no
isPlayerAtPos = false;
yes
isPlayerAtPos = true;


toString
Create a new string
Create an iterator for columns
Add a new line to the string
return string
Is the iterator less than or equal to 9?
no
yes
Add the column numbers to the sting with "|" separating them
Add a space then add the column numbers to string with "|" separating them
Add a new line
Initialize the row iterator to 0
Initialize the column iterator to 0
Is there a bottom row?
no
Is there a last column?
no
yes
Is the iterator less than or equal to 9?
no
yes
Add "|" to the string
Add a space, then "|" to the string
Call whatsAtPos for the current position
Add the returned value to the string
Move to the next row and column


checkDiagWin
pos = game[row][column];
p = token;
Create a count variable to keep track of consecutive tokens lined up, (up and to the right) and (down and to the left) (positive slope)
Create a count2 variable to keep track of consecutive tokens lined up, (up and to the left) and (down and to the right) (negative slope)
Select column 0 <= column <= 8 to place token in
Is the last token placed, result in a positive slope win?
no
yes
Is the token placed result in a negative slope win?
no
return false
yes
Increment count.
Increment count.
count == 5
no
yes
count2 == 5
no
yes
Are the tokens tracking the positive slope still in bounds?
no
yes
Are the tokens tracking the positive slope still in bounds?
no
yes
return true
return true

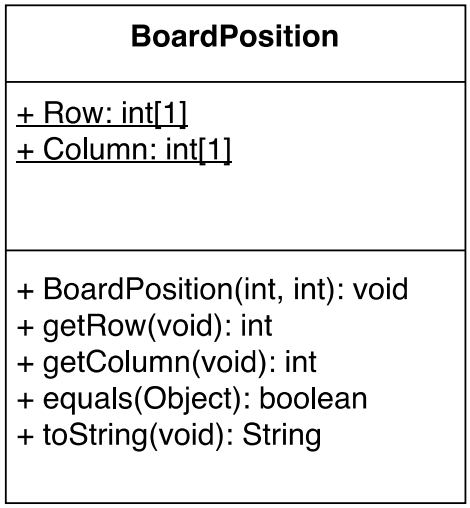

getNumColumns
Return columnNum;


getNumRows
Return rowNum;


getNumToWin
return numWin;

Class 3: BoardPosition

Class diagram:



Test Cases

Details in Project 4.