# Tutorial 02 Tic Tac Toe



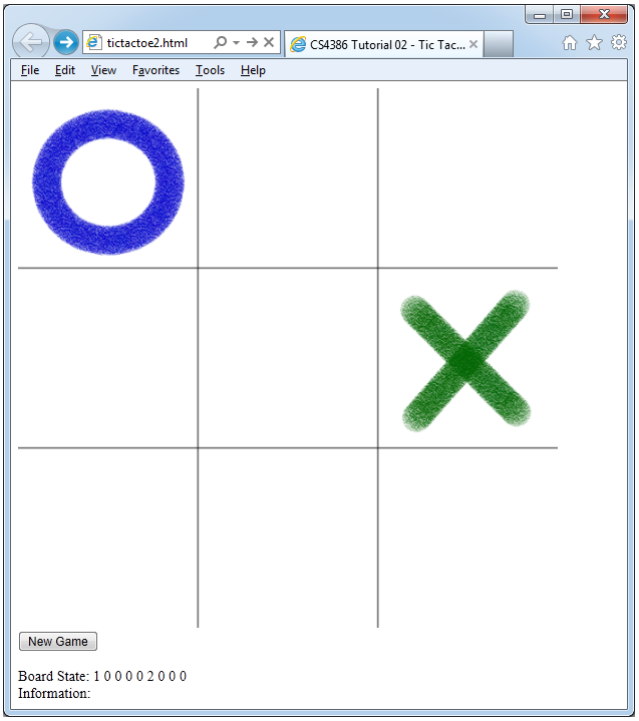
## Introduction

In this tutorial, you will analyze the Tic Tac Toe game.

## Task 1. Get Ready

Download the files `tictactoe2.html` and `ttt.png` from the course website.

Run the html file on a web browser.




The interface seems similar to the one in Tutorial 01. However, with this html, you can click on any occupied or unoccupied cell to change its value 1) from unoccupied to occupied by Player 1; 2) from occupied by Player 1 to occupied by Player 2; and 3) from occupied by Player 2 to unoccupied. Moreover, this html does not check if any player wins or validate the board so it is possible to come up with any combinations of the board states, whether it is from a valid game or not. The resulting values of the board states are shown at the bottom of the page.

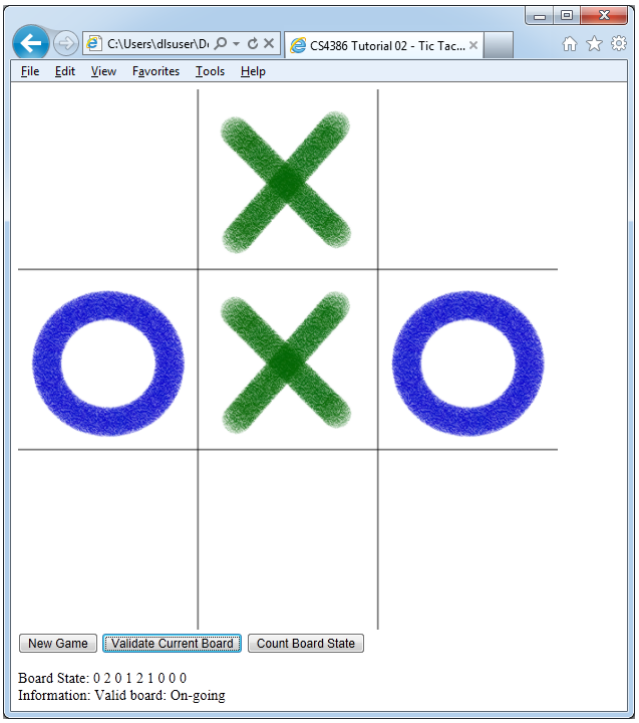
Try the html file on a browser to make sure that you understand how it works.

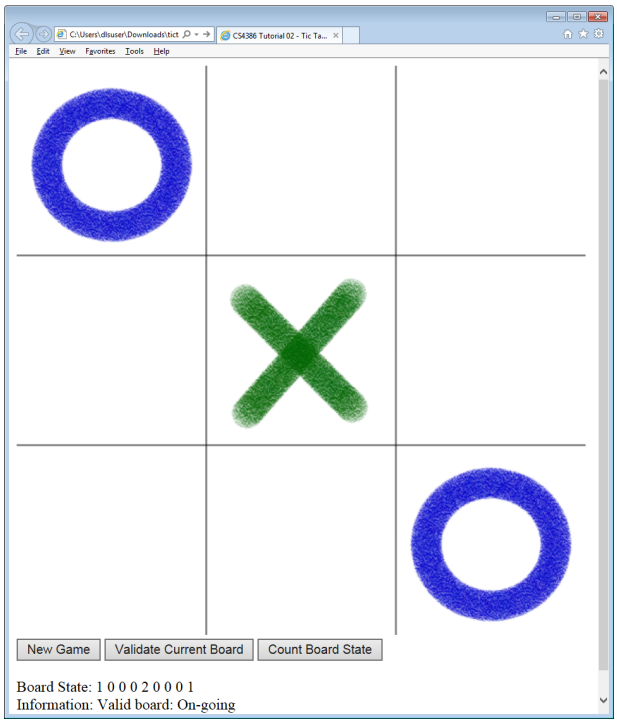
## Task 2. Analyze the Game

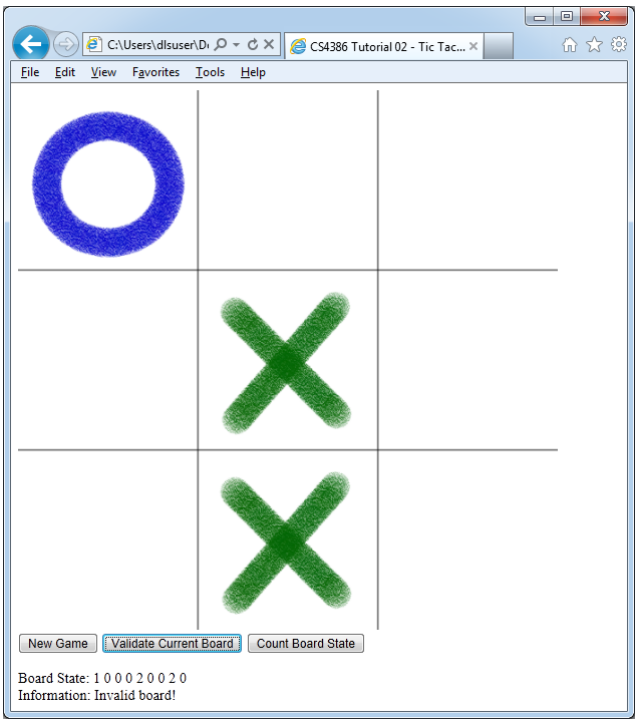
Analyze the Tic Tac Toc game by considering the following questions:

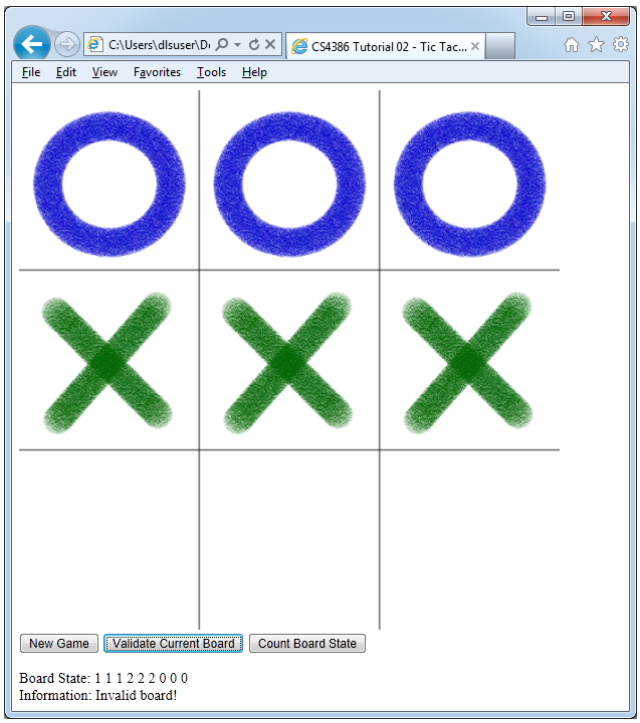
Q1: How many possible boards are there, including all cases from both valid and invalid games. In other words, given that each cell on the board is either unoccupied, occupied by Player 1 or occupied by Player 2, how many different combinations are there? After determining it analytically, write a program to verify your answer.

Q2: Among the possible board states from Q1, how many of these boards can be derived from a valid game? Write a function to check board state of the current board to determine if it is valid or invalid, and show this on the webpage after the text Information. Then iterate over all possible board states and count the valid ones.

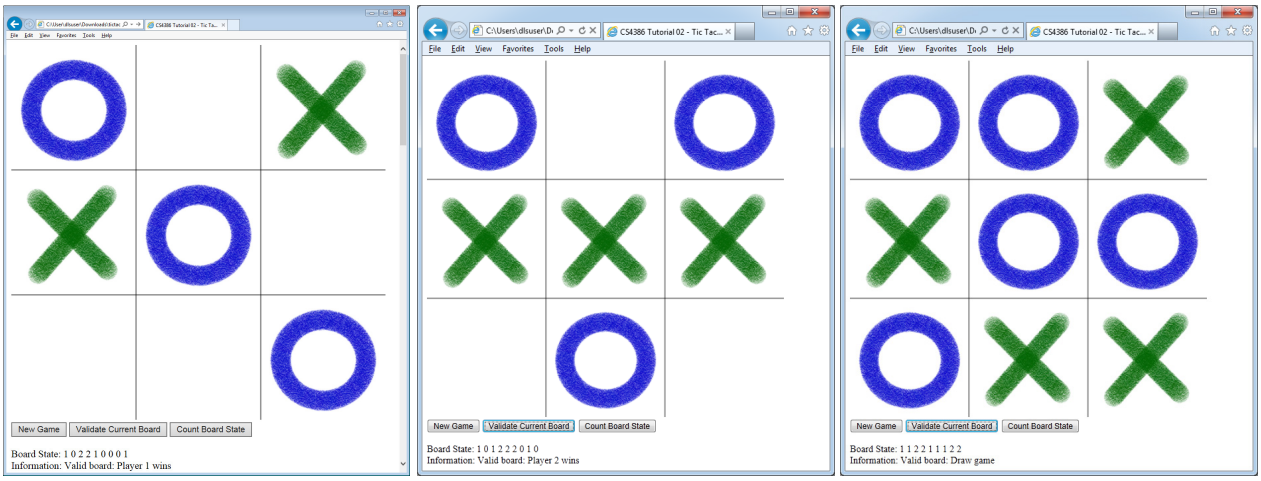


Q3: Among the valid boards from Q2, how many of them correspond to end game? Among the end games, how many boards correspond to winning by Player 1, winning by Player 2, and draw game? Can you guess whether the number of winning boards for Player 1 is more/less/the same as the number of winning boards for Player 2? Can you take a rough guess about how many boards from draw game? Write a program to obtain the answers to the questions.




Q4: Assume that Player 1 and Player 2 take turn to occupy a square until all the 9 squares are occupied. Note that it may result in a valid board or an invalid board. If you count all unique sequences that indicate the order of the occupied squares, how many such sequences are there? Do you expect this number to be larger than, smaller than or equal to the number of possible boards determined in Q1?

## Task 3. Complete the Canvas Quiz

Complete the quiz “Tutorial 02” on the Canvas course page (Assignments > Tutorial 02) by the posted deadline.