**Team Information**

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**Project Milestones**

What is the title of your project? (e.g. Laser-Triggered Music Box) Tic Tac Toe

Provide a one-paragraph description of your project:

A simple two-player game in which the objective for each player is to obtain three consecutive pieces in an either diagonal or straight fashion. The players are to constantly make effort in achieving that and stop the opponent from the same goal.

What will you accomplish for the first milestone?

(Advice here: Pretend that you're designing Lab 8 around your project idea, in keeping with the difficulty level of the previous labs. Try to be specific and detailed in describing the components that you will complete. Don't say that you'll "think about" or "plan" or "design" something. Assume your project can be developed in three independent parts, what you write in the space below should outline the components of the first part. Make sure to describe a full lab's worth of work, including the evidence of your work that you will provide to the TAs to justify getting the full marks for this milestone.)

Create registers to store the id of each grid. For each grid, we will need to have a state, whether it is empty, X or O. A multiplexer would be used to inquire about the state of any desired grid. An asynchronous reset would be implemented to reset the state of each grid to empty. We also would like to read the outcome of the game whenever it is available. Hence in one of always blocks, the output for the outcome of the game is always monitored. To determine the outcome of the game, we would write a decoder corresponding to each state of the game which would output the outcome of the game.

What will you accomplish for the second milestone?

(similar advice as above, but for the second part of your project)

First, we will create the finite state machine, i.e. the control path for this game. So we can control the input of the game. For example, we will implement the keyboard control for the player, when any of the arrow keys get pressed, the game will register its direction and move the cursor to that specific grid. After the position is decided, the player can hit the enter key to register the position of the piece. Finally, we will start working on putting the game into the VGA display, which we will learn how to do that after we finished lab 7.

What will you accomplish for the third milestone?

(don't say "everything" just because this is the final milestone; describe the final components instead, and exactly what the TAs should expect to see)

After finishing the VGA implementation of the game, we will proceed to the final milestone. Which we can add more features to our game. We will add a counter to track the time in-game. Also a scoring system for player one and player two, for the scoring system, an ALU may possibly be used. Moreover, we will implement a computer player so that the game can be done either player vs player or player vs computer.

**Project Motivations**

How does this project relate to material covered in CSC258?

In the project, we will be using the knowledge of multiplexers and the seven segment from lab 2; ALU from lab 3, flip flops and latches are needed to store state value, which is from lab 4, moreover, sequential circuits such as counters, rate dividers and asynchronous reset from lab 5 are used. We also use the FSM from lab 6 to control the data path of the game. Finally, we will output the game by using the VGA signal, which is learned in lab 7.

What's cool about this project (to CSC258 students and non-CSC258 students)?

This project might sound simple to any other programmers. However, the fact that it is written in verilog and fully demonstrated the capabilities of simplest hardwares is quite remarkable. For CSC258 students, this project is solid simply because it would use if not all but most of the knowledge we learn in CSC258. For non-CSC258 students, the design of a fully compatible A.I. player is also quite interesting.

Why does the idea of working on this appeal to you personally?

My inspiration of making a game like Tic Tac Toe is from my passion towards board games or any other games that involve strategy. Ever since I was a child, I have been playing and studying the game of Go and Chess. It is extraordinary that such complications thrive in these simple and elegant games. Making a strategic game, although have already been solved mathematically is entertaining on by itself while still opposing quite a challenge for the designers.