1. The game involves two players who control static “paddles” on either end of the 8 x 16 LED display. The paddles are each controlled by a different button. A player needs to press the button within 2 seconds of the ball passing the paddle (If that’s not fair, the time can be reduced or increased after testing). The game can be reset by present a third button after a round has finished. The score goes from 0 to 9 and the first to 9 points wins. The score will be displayed on the 7 – segment display with player 1’s score on the left side and player 2’s score on the right separated by the colon [00:00]. The ball will move at an initial speed of 1 pixel per second and increase by 1 every 2 hits.
2. Based on that description, there are a total of three inputs: 2 for players and 1 to reset. The FSM controller will need a clock generator to make clock signals for the LED display, 7 – segment display, and the ball position tracking. The ball position will be tracked by a 4-bit counter that’s driven by a variable clock generator. Its four bits since the length of the LED display is 16 pixels and the ball only moves horizontally. The variable clock generator will speed up based on how many collisions there have been, thus speeding up the 4-bit counter. It will need to reset to a base value once the round has ended or the game has been reset. The counter will need to output a signal once it gets to 15 so that the game can look for a button press. If it gets one within the window, it will restart the counter and send the ball the opposite direction. If it doesn’t the round ends and the ball is placed on the loser’s side and the round starts when the round loser presses their button. The 7-segment display will need two counters, one for each player. The counter will just need to go up to 9 then output a win signal once that is achieved. The 7-segment display will need a driver that converts the score to BCD and from that to 7-seg. The LED display will also need a driver, but that has been provided. Another counter that might be needed would be to track the number of collisions and output a signal when it reaches 2 so that the variable clock can speed up.

With this established, there will need to be intermediary systems that control what’s displayed on the LED display, control the variable clock, determine when the game is over, register a collision, register when a point is earned, and to reset and initialize the game.