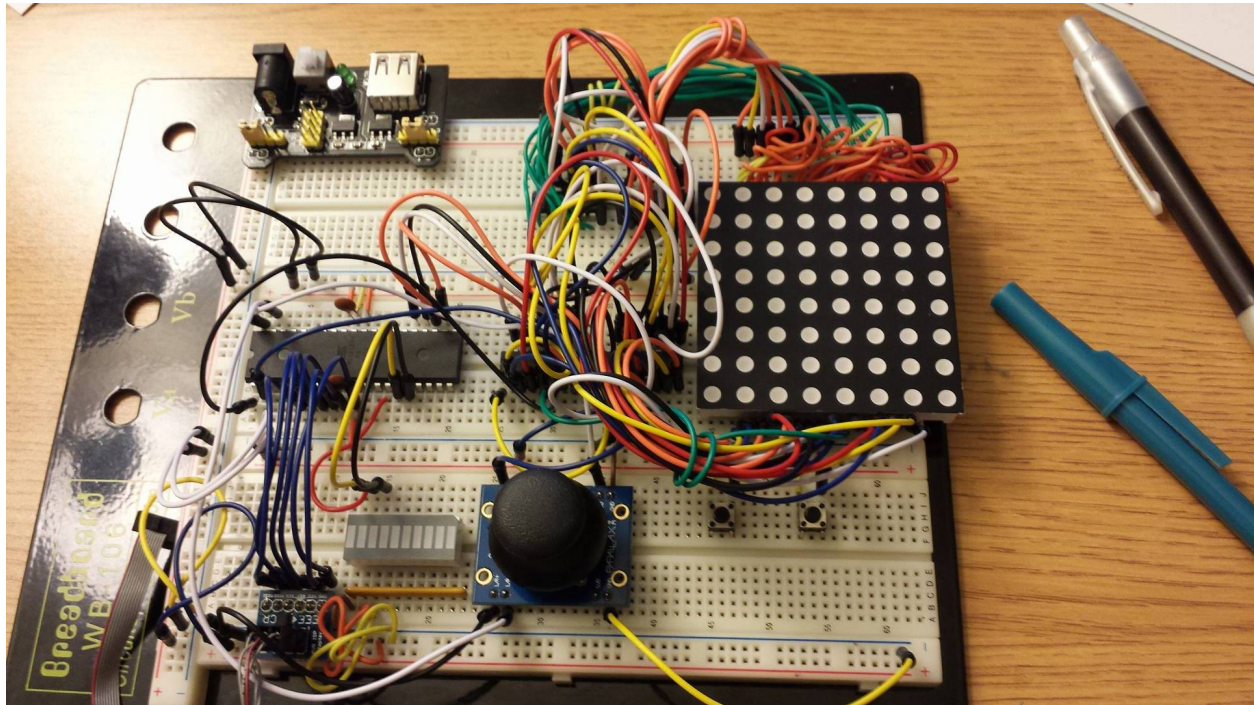


Custom Lab Project Report

Se Hoon Bang

Wiring Picture:

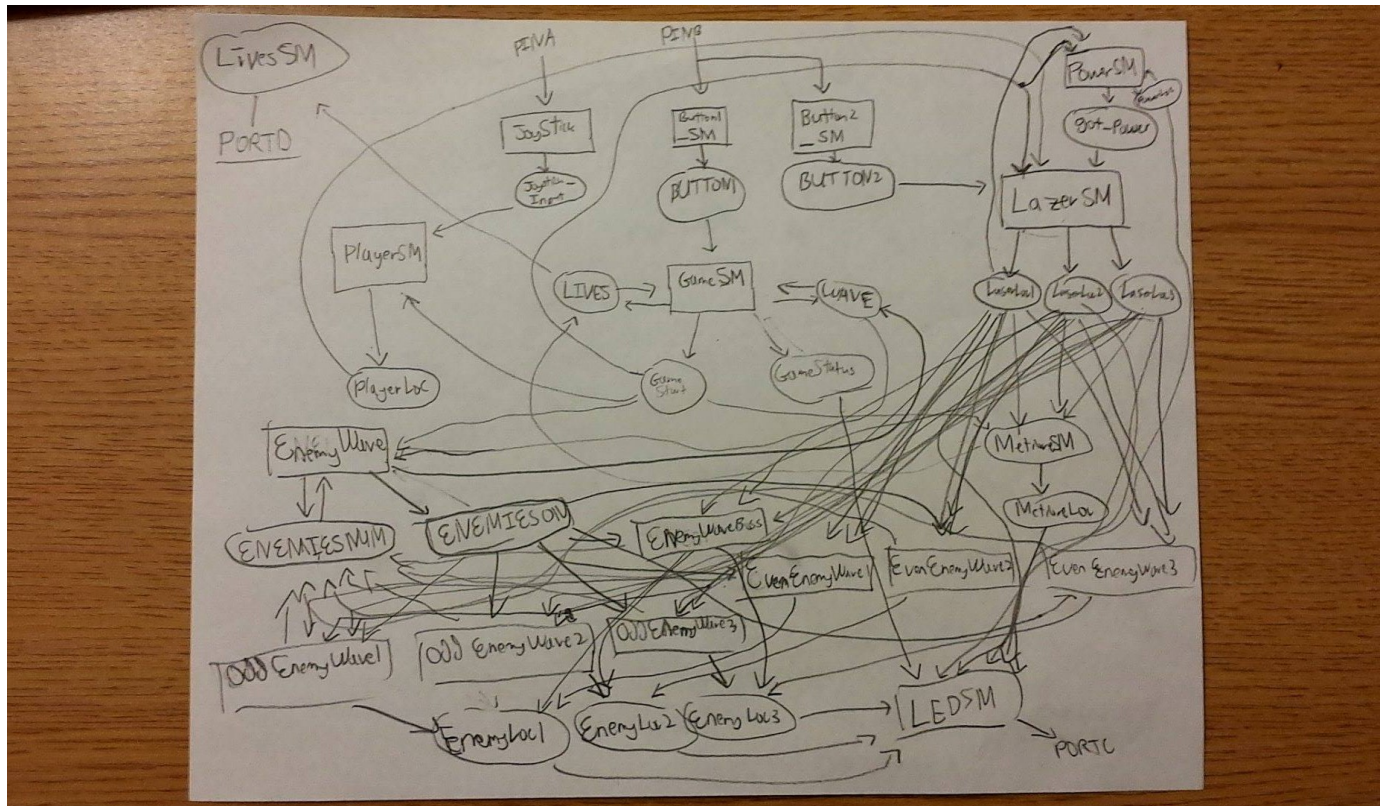


Wiring Description:

1. JoyStick
 1. L/R+ and U/D+ wired to power
 2. U/D to A0
 3. L/R to A1
 4. GND on both sides to ground
2. Button 1
 1. Top pin to ground
 2. Bottom pin to B0
3. Button 2
 1. Top pin to ground
 2. Bottom pin to B1
4. LED Bar
 1. D0-2 to Pin 0-2 of LED Bar
 2. Other side of LED bar wire to ground with a register
5. Shift Reg 1
 1. PC3 to SRCLR
 2. PC2 to SRCLK
 3. PC1 to PCLK
 4. PC0 to SER

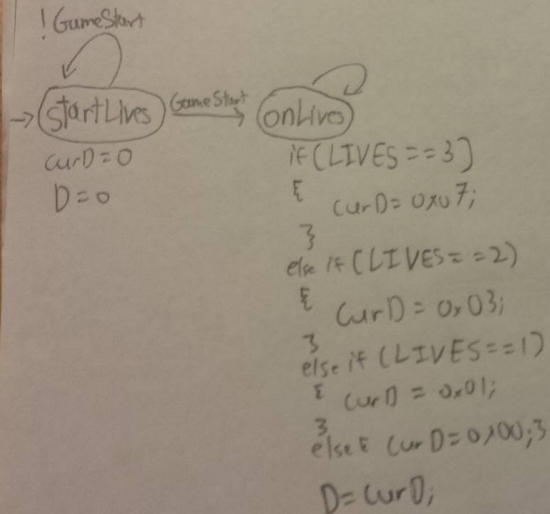
5. OE and GND to ground
6. Vcc to power
6. Shift Reg 2
 1. Qh' of Shift Reg 1 to SER
 2. OE and GND to ground
 3. Vcc to power
7. Shift Reg 3
 1. Qh' of Shift Reg 2 to SER
 2. OE and GND to ground
 3. Vcc to power
8. Shift Reg 4
 1. Qh' of Shift Reg 3 to SER
 2. OE and GND to ground
 3. Vcc to power
- All SRCLR, SRCLK, PCLK are wired in series to each other
 - So SR2's would be wired to SR1's and SR3's to SR2's and so on
9. LED Matrix
 1. 0-7 = Qa-Qh of SR1
 2. 8-15 = Qa-Qh of SR2
 3. 16-23 = Qa-Qh of SR3
 4. 24-31 = Qa-Qh of SR4

State Machines:



Lives SM

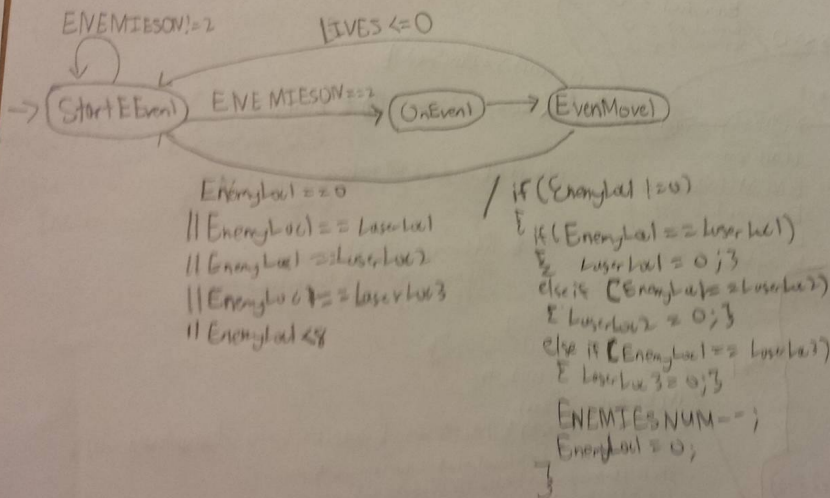
unsigned char curD;
period = 10;

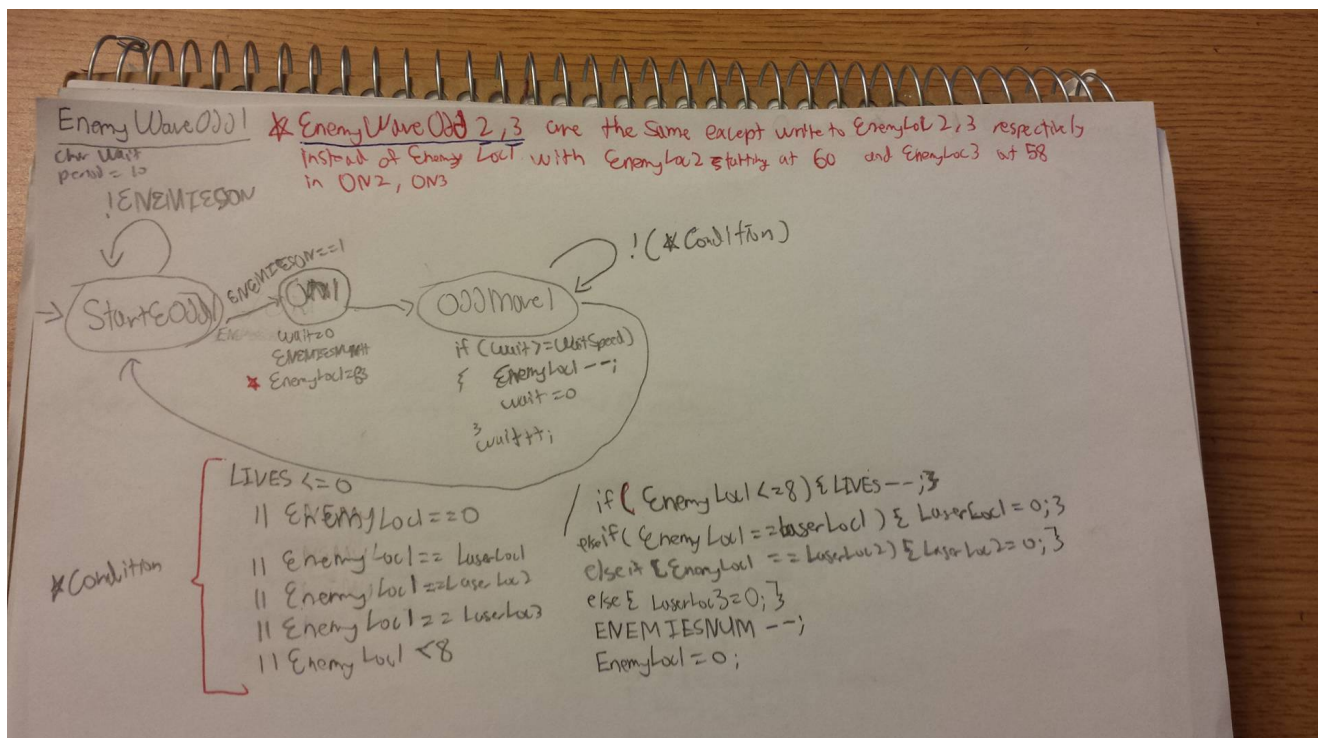
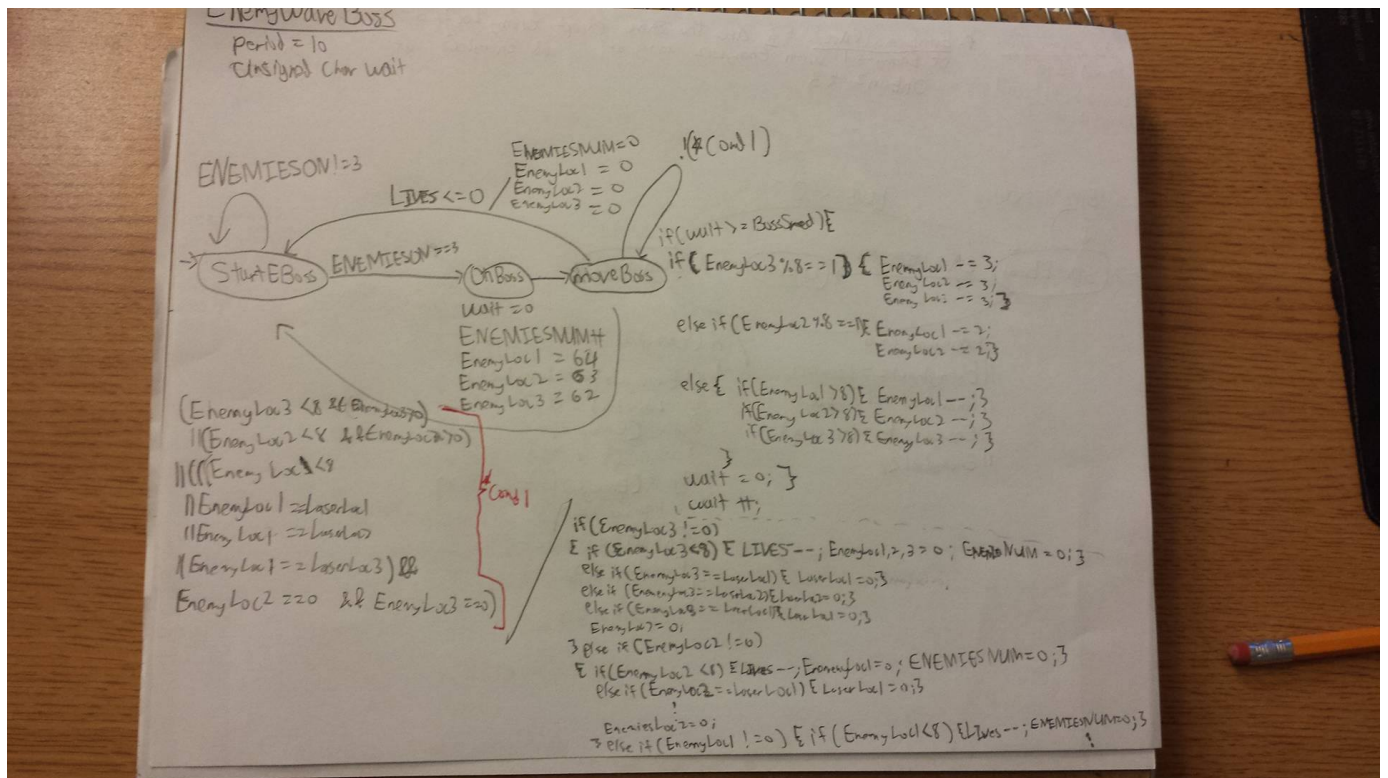


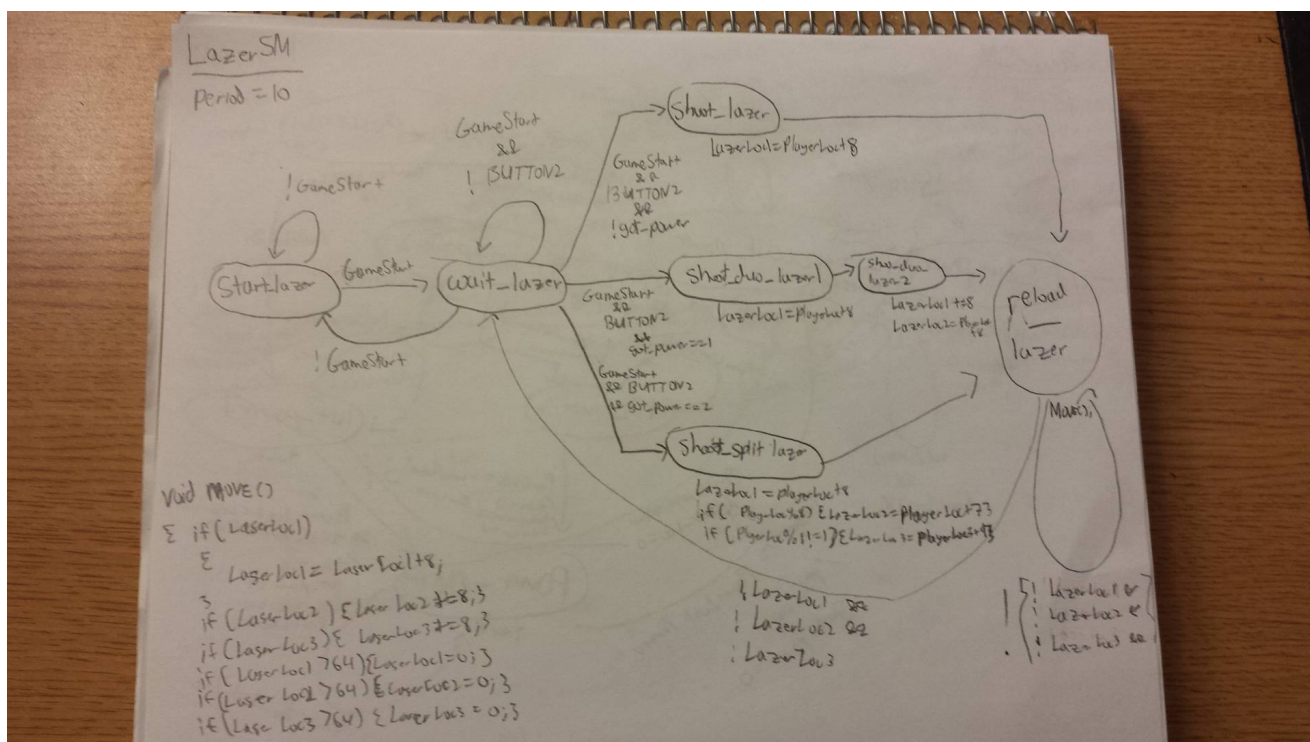
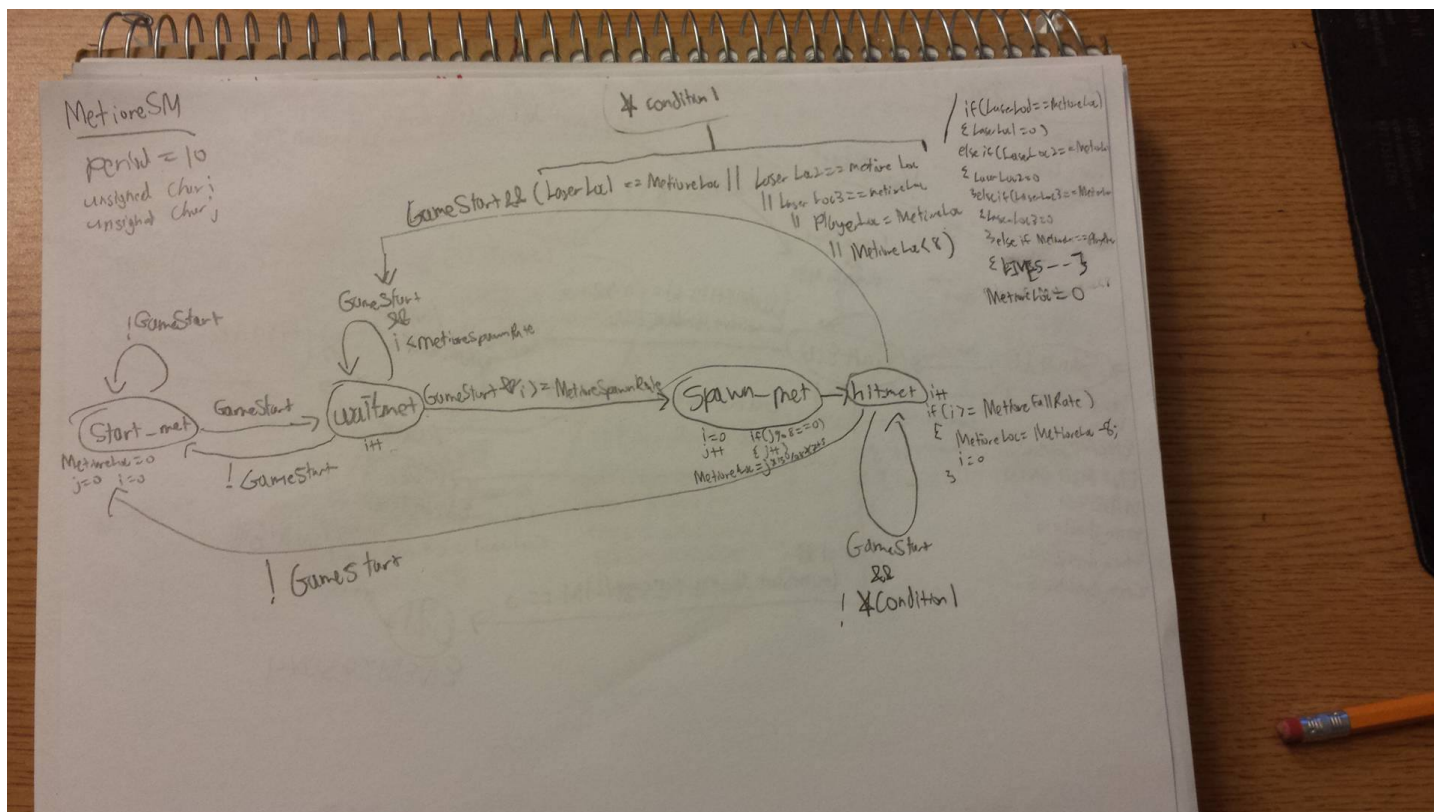
EvenEnemyWave

period = 10
unsigned char curL1;
unsigned char L2;

* EvenEnemyWave2 & 3 are the same except Enemy loc 2, 3 respectively instead of Enemy loc 1 with Enemy loc 2 starting at and Enemy loc 3 at in OnEven 2, 3

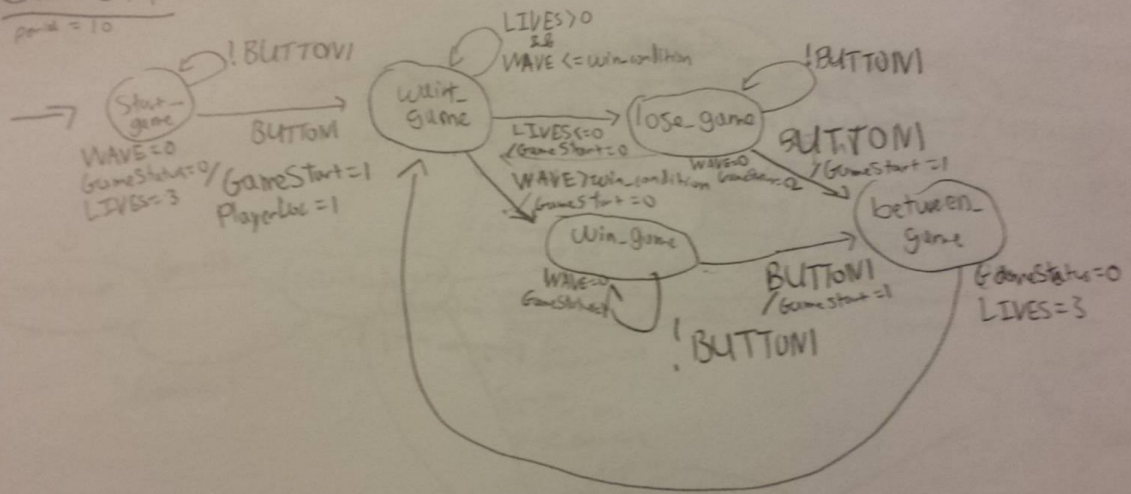






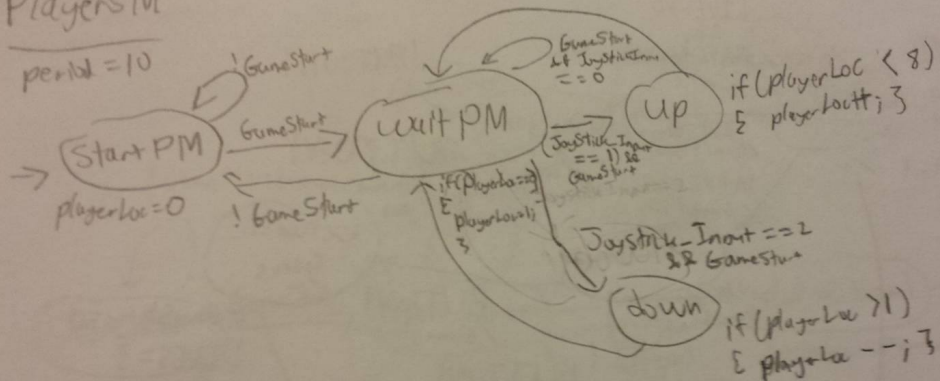
Game SM

period = 10



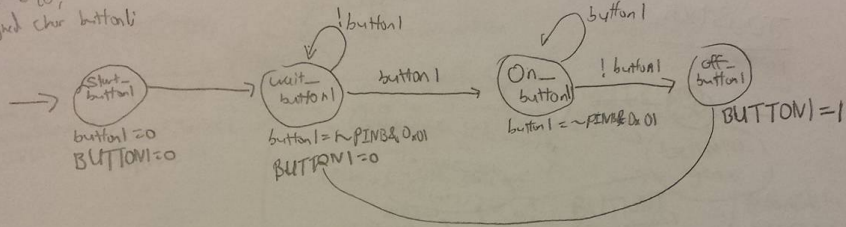
Player SM

period = 10



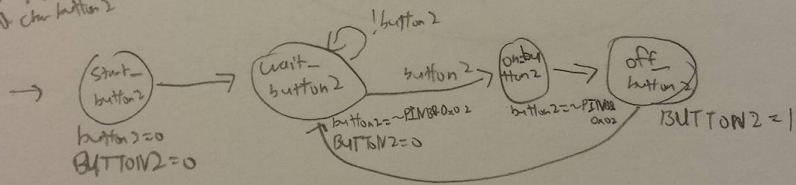
Button1-SM

period = 10;
unsigned char button1;



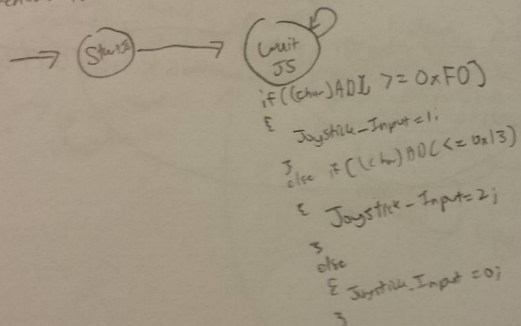
Button2-SM

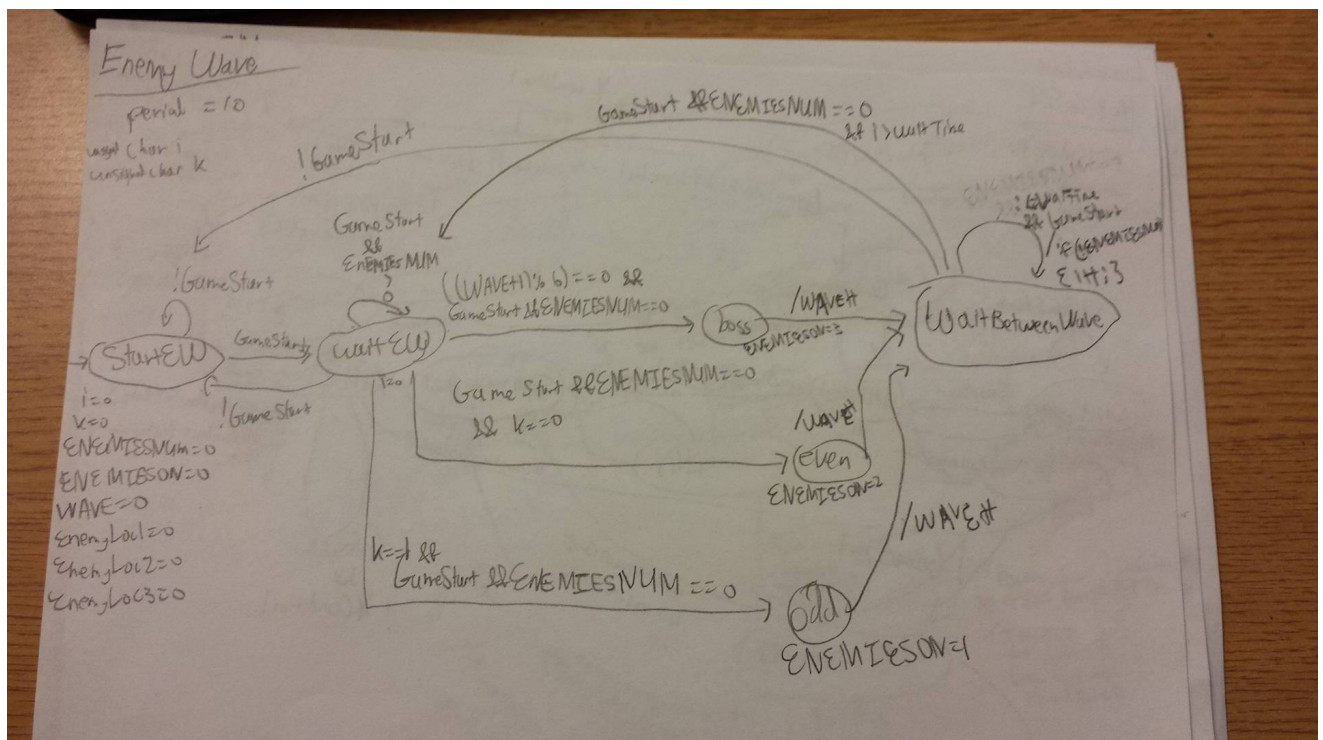
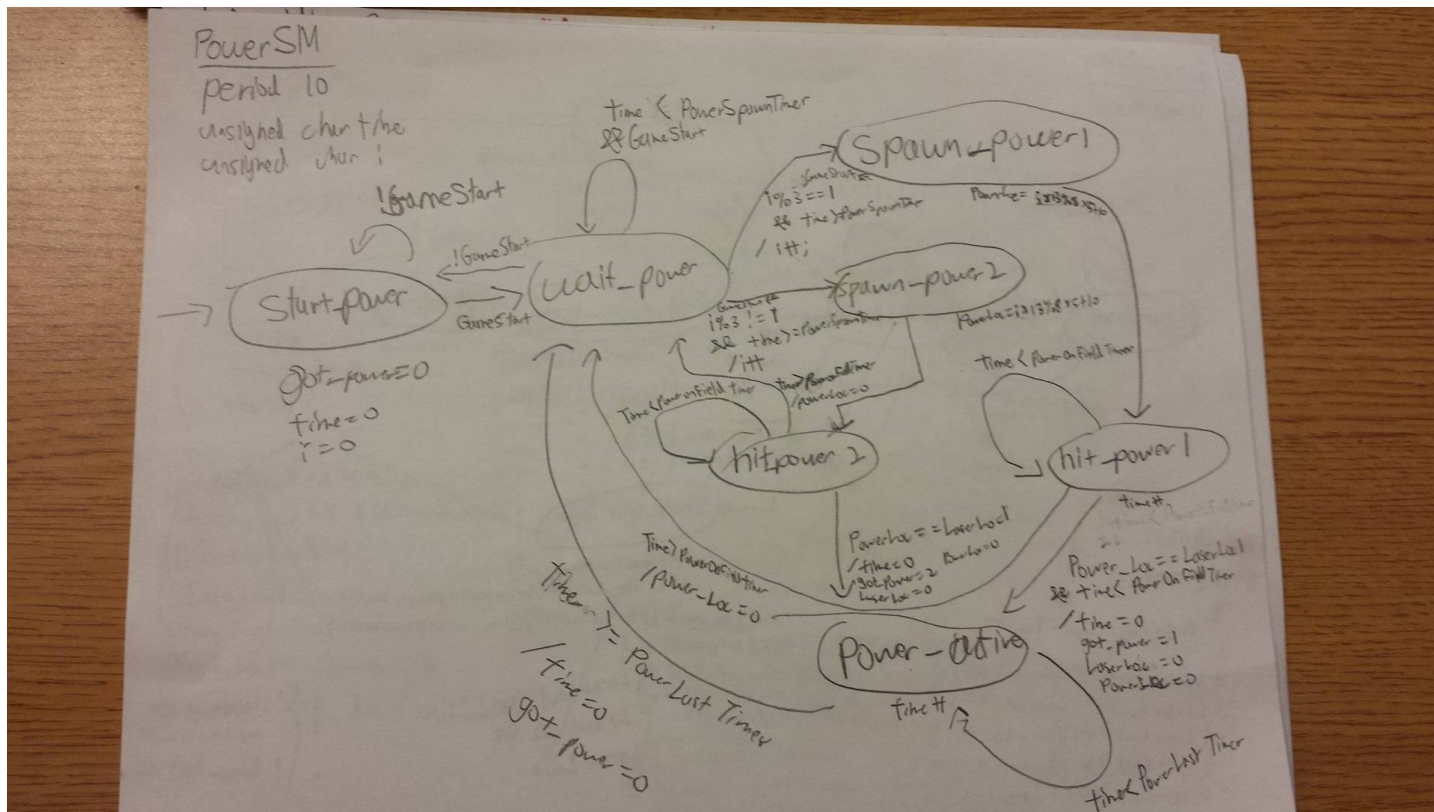
period = 10
unsigned char button2;



Joystick

period = 10





Summary:

I would like to create a shooter game using a joystick, shift registers, and a LED matrix as my build upon. The shooter game will be similar to that of the space invaders arcade game. I will use the LED matrix as a screen for my game and use the joystick to move the player up and down the screen. The objective of the game would be to clear multiple levels by killing the enemy by shooting them with a “laser” that the player will shoot. If the enemy makes it to the first row, where the player is located, then the player will lose a life. There will be multiple different types of levels: straight, diagonal, and boss. The straight level is in which the enemy travels in a straight line. The diagonal level is in which the enemy travels diagonally down the LED matrix. Finally the boss level is the one in which that you must kill the right parts of the boss in order to damage the boss. If the player loses all lives then the game is lost. There will also be meteors which will spawn randomly on the LED Matrix which will fall towards the first row. If the meteor hits the player, the player will lose a life. However, the meteors can also be shot to make them disappear before reaching the player. Another thing that will be randomly generated on the LED matrix is power buffs. There are two types of power buffs. The first is duo shot, which will allow the player to shoot two shots in the same column for the duration of the buff. The other buff is scatter shot. Scatter shot is a buff in which it allows the player to shoot one shot on top and another under the original shot that the player will shoot from. There is an LED bar which will keep track of the player’s life; also there will be two buttons in which one will be the start/restart button and the other being the trigger.

I was able to complete all the parts of the project in which I proposed. I added some extra features in which to make the game more interesting. I created some of the random buff spawns to not actually give buffs. I did this so that it would make the player question their decisions on whether they should shoot at the enemy or the buffs. Another feature I added was that the game will be flickering if there are enemies and the flickering will become even worse if there are meteors falling. I did this because I thought it resembled a feature that is similar to the flashing red danger screens in many games. Since the flickering gets worse it allows the players to know that there are enemies and meteors approaching them, therefore I thought it might be also beneficial to the game play experience.

I first tested this project by playing the game by myself. I tried to come up with multiple scenarios that would lead to a game over to see if the results would be what I expect my results to be. After doing this, I allowed my friends who are CHASS and business majors to play my game. I thought it would be best if they played it since they would not have a background in engineering and might be able to find bugs for which I could not think of test cases for. One of the things they found for me was the bug in which one of my laser shot from the split shot would not register as hit to one of the enemies. This was a special niche case which did not happen many times since split shot was a buff that lasted for a short period of time. However, due to the help of my friends testing the game I was able to find this bug and fix it. The only problem that I know of with my game is that the flickering on the LED matrix and the brightness of the LED matrix might be a little too much and caused people who played the game in a dimly lit rooms difficulty.

Video Demonstration:

<https://youtu.be/r7mEHP0g4sM>

How it Works:

The inputs from the joystick and the buttons lead gets computed in the micro controller and then it leads to outputting the data to the LED matrix and LED bar. You can start the game by pushing the left button to start or restart after the game is over. Use the second button to shoot and the joystick to move left or right.