CS120B Custom Project Report

Full demo: https://youtu.be/Q7RuQu2hal0 (3:45/Complete)
https://youtu.be/JQ6FZE83EEo(2:10/ Compressed does not include win screen showcase due to time)

Complexity 1: https://youtu.be/bBm8hvFajPQ
Complexity 1 & 2: https://youtu.be/DV7FZrfLBs4
Complexity 1, 2 & 3: https://youtu.be/ucQ1IN8G6h8

Project Description:

Using 4 buttons, 2 joysticks, 1 atmega1284 and a Nokia 5110 screen, A Space invaders like game named @SCII Invaders was created. The Project uses a Nokia 5110 screen to display the enemy characters and the player characters throughout the game, in addition to displaying the Win/Loss/Pause and main screen. When starting the game up for the first time, the player is prompted to push the Start button, that being the button in the middle of both joysticks. The players are then able to work together to bring down two waves of invaders, attempting to not let any reach the bottom. At any time, the players can decide to reset the game with the reset button located at the top of the board or pause the game.

User Guide:

Rules:

The Players must work together to survive two rounds of invaders. For the first round, the Invaders will drop down in a staircase manner, with a delay in the spawn of the next enemy. For the second wave, all enemies will spawn at the exact same time and rush towards the players. The player must assure they do not allow no more than 2 invaders to breach the defences, as doing so will doom their city and lose them the game. If the players are successful and are able to ward off the invaders, they are rewarded with a win screen. The play is not allowed to shoot multiple times in a row, and must either hit a target to be allowed to fire again or wait until their projectile reaches the end of the screen. If the invaders reach the player character's ground level, they will be unable to harm the invader and simply watch as they cross the boarder, losing them a life.

Controls:

The Players have a total of 4 buttons and 2 joysticks that are used for controls. Each joystick controls the movement for one of the characters/player, with A being player 1 and b being player 2. At any time the player may shoot with the button next to their joystick, however they are only allowed one shot, refilling once it reaches the end of the screen or they hit a target. The players are only allowed to move left and right to position themselves in front of the enemy and fire. The button between both player controls can be used to pause the game at any time, and the button on the top right corner can be used at any time to reset back to the menu screen.

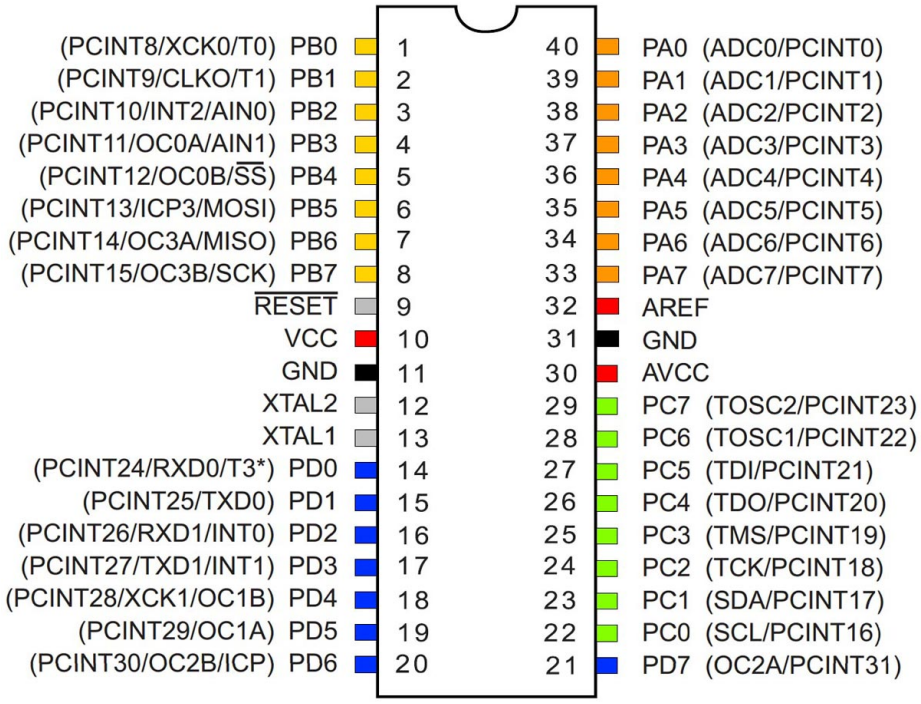
Special Considerations:

Ideally the game requires two players to be played as it was made to be played, however since either character can destroy all enemy invaders, a single player can win the game. The only issue with using a single player is that the game would be considerably more difficult as the enemies do move quite quickly for a singular play if their aim is not precise.

Source Files:

- Main.c: The main file with the whole game. Includes main function in addition to game function which handles running the actual game in multiple states. In addition includes bitmap arrays created with LCD assistant.
- Nokia5110.h: header for the Nokia 5110. Include bare bone code used to generate images on the screen, including a write data, write command, initialize and clear function. Followed LCD lab ideas to implement the Nokia.h functions in addition to NOKIA 5110 datasheet and https://www.sparkfun.com/products/10168 product page which include an Arduino example as reference
- Timer.h: Timer objectfrom lab
- simAVRheader: file from lab

Components:



Ports used : A,B,D

PortB -> NOKIA 5110

B0: Chip enable (CE)

B1: Reset (RST)

B2: DC (Data/Command)

B3: none

B4: none

B5: Mosi(data transfer)

B6: none

B7: Clock (CLK)

PortA -> Inputs

A0: ADC (joystick player1)

A1: Start/Pause
A2: Player 1 shoot
A3: ADC (Joystick player2)
A4: Player 2 shoot
A5: None
A6: none
A7: Reset Button

PortD -> lives (lcd bulbs)
D0: led1
D1: led2
D2: led3
D3: none
D4: none
D5: None
D6: none
D7: none

Technologies learned

Throughout the project, I learned more about LCD screens, ADC conversion, state machines, shared variables and timers. Through the nokia 5110, I was able to learn more about Voltage values, bias values and how instruction sets are used not only to initialize screens, but why they are necessary and what can happen if incorrect values are used/thresholds are breached. I learned more about reading data sheets too from trying to understand the set values for the Nokia 5110. From the joysticks, I was able to understand more about ADC conversion on the atmega and how potentiometers can be used in order to detect changes in the inputs, such as when creating a function that would assure what direction the user was attempting to move in. The two player complexity allowed me to further my understanding in shared variables, state machines and timers as i had to assure correct states were created to assure no incorrect interaction was happening between the two players, and that the two players could play in real time.