

CS/EE 120B

Custom Project: Flag Game

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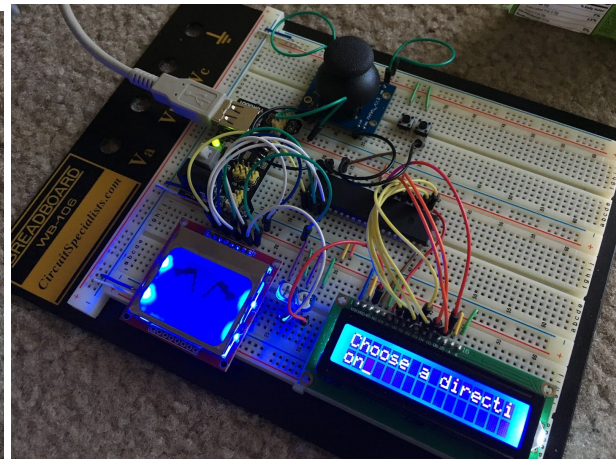
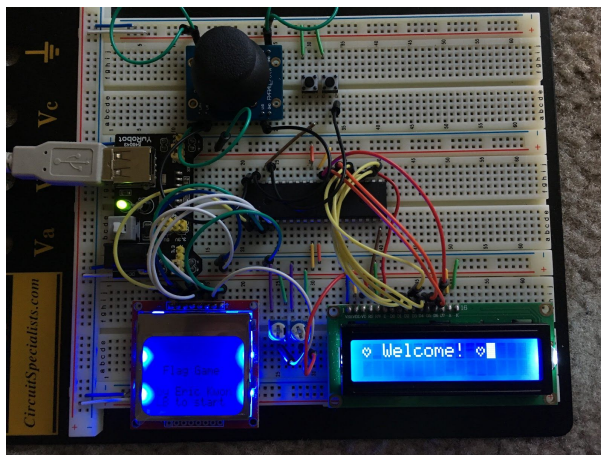
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Introduction

The Flag Game is a matching game where the user must match the direction of the flags to the direction of the joystick. When the flag is shown in the left, the user must move the joystick to the left. When the flag is shown in the right, the user must move the joystick to the right. When both flags are shown, the user can either move the joystick to the left or right. There are two buttons: the left button is to start the game from the menu, and the right button is to soft reset the game after the user have lost the game. Everytime the user correctly moves the joystick to the right position of the flag, a quick “Correct” message is shown, then the next flag is shown. If the user incorrectly moves the joystick, a quick “Wrong” message is shown, then the score screen is shown.

- Designed Custom Lab Project for Introduction to Embedded Systems using the Nokia 5110 LCD Screen, Joystick, EEPROM, and Special Characters

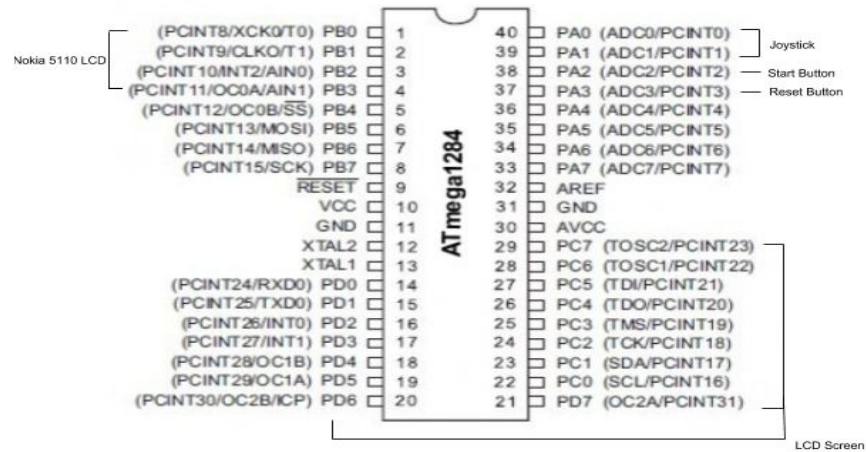


YouTube Link

<https://www.youtube.com/watch?v=o-7fjarPMkk>

Hardware

Pinout



Parts

- ATmega 1284
- **Nokia 5110 LCD**
- **Joystick**
- 16x2 LCD Screen
- Buttons

Software

- .h and .c helper files.
- Nokia 5110 LCD commands
- adc functions
- CreateCustomCharacter() function
- timer function
- ChooseFlag() function
- EEPROM

Complexities

Nokia 5110 LCD Screen

- The Nokia 5110 LCD Screen is used to display the menu, the game, and the instructions for the buttons.

Joystick

- The joystick is used to acquire input in cardinal directions from the user.

EEPROM

- EEPROM is a library used to store a certain data in the microcontroller itself and be able to obtain the same data whenever needed. For the Flag Game, the highscore is saved into the microcontroller so it can be obtained even when the game is shut off.

Special Characters

- Special Characters are used for aesthetic purposes. For the Flag Game, two hearts are drawn in the “Welcome” screen of the 16x2 LCD Screen.

Faults

Bugs

- Joystick Input has lag, thus the user must time the joystick correctly and hold it for a specific amount of time.
- “Correct” and “Wrong” Screen moves away too quickly for the user to even see the message.

Imperfections

- Flags are not truly randomly generated. They follow a random set of flags. To further elaborate, if the game is restarted, the same random sequence of flags will appear.

Future Work

I would love to incorporate a character holding a flag and make the character raise the correct flag according to the randomly generated flag. In addition, I would like to make the randomly generated flags truly random so users would not be able to predict. I would also like to put the “Correct” and “Wrong” Screen in a separate timer period as I would want the user to see if they matched the flag correctly or not. Lastly, I would love to implement a level system where after the user reaches a certain level, the time the user is able to make a decision is shortened or the game itself becomes more difficult.

Code

<https://github.com/jkwon031/CS120B-Labs/tree/master/Custom%20Lab%20Project>

- Main code for Flag Game

<https://github.com/jkwon031/CS120B-Labs/tree/master/Pictures>

- Pictures of Flag Sprite

https://github.com/jkwon031/CS120B-Labs/tree/master/nokia_includes

- Include Files for Nokia Screen

<https://github.com/jkwon031/CS120B-Labs/tree/master/includesCLP>

- Include Files for everything else

Sources

Hardware

UCR IEEE

Joystick Code

<http://maxembedded.com/2011/06/the-adc-of-the-avr/>

Nokia 5110 LCD Display Code

<https://echachik.blogspot.com/2014/09/nokia-5110-lcd-display-avr.html?fbclid=IwAR2cmlms1FO959KlzjGsYw2lQ3iNIZJzghG0SXc5XCBnF8UuWq-wpFTqmZl>

Special Characters Code

<https://openlabpro.com/guide/custom-character-lcd-pic/>