**Robotic Arm**

Custom Project Final Report

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**Introduction**

The Robotic Arm is created by putting two servo motors on top of one another to enable the arm to move both left and right, as well as up and down. The arm is controlled by an analog joystick. The arm is able to move in both axis if the joystick is pointed in the diagonal positions. The LCD used in this project displays a couple special characters that I have designed. The special characters are stored in EEPROM as well.

**High Level Description**

The robotic arm is controlled by a joystick. When the joystick is moved up, the voltage of the VRY pin increases. When the joystick is moved down, the voltage of the VRY pin decreases. The same goes for if the joystick is moved left and right. If the joystick is moved left, the voltage of the VRX pin increases, and when moved right, the voltage of the VRX pin decreases. The four directions in which the analog joystick moves are connected to two ADC channels. The voltage ranges from 0V to 5V. The servo motors of the robotic arm read the ADC values from the analog joystick. The rotation of the motors is controlled by a PWM signal. By changing the PWM signal, the motors are able to rotate in any angle and direction. For the operation of the motors, I used a fast PWM mode on the ATmega1284. I used OCR1A and OCR1B registers to set the PWM duty cycle. The LCD also displays two special characters that I have created. The characters are stored in the memory of the microcontroller. The EEPROM reads and writes back the data stored.

**User Guide**

Once the board is powered on, you are able to immediately move the joystick in whichever direction you choose to control the robotic arm. The joystick can be moved both left and right as well as up and down. In order to switch between the custom characters I have created, you can click any of the two buttons on the board to do so.

**Technologies and Components**

* Atmel Studio 7.0
* ATMega1284 microcontroller
* LCD Screen
* Analog Joystick
* X2 Servo Motor
* X2 Buttons

Youtube Link

<https://www.youtube.com/watch?v=nV8kwnaU8MQ>

Source Files

* Libraries
  + Io.h (used in previous LCD Lab)
    - Added an LCD\_addChar function to add my special character
    - <https://drive.google.com/open?id=1FyiJJUftBTarEu2q7BpOBOmgtkabGFuP>
      * This file is used to control the LCD display used in my project as well as add a special character.
* Code (main.c)
  + main.cpp
    - <https://drive.google.com/open?id=1uyHgPSL4oZqHUzbobMcatnq7uFuX71zX>
      * This file is used to implement the use of the joystick with the two servo motors used in my project.
  + ADC
    - Code used to read from ADC
      * This piece of code is used to control the robotic arm using the analog joystick.
      * <https://www.electronicwings.com/avr-atmega/servo-motor-interfacing-with-atmega16>