School of Engineering

Grand Valley State University

EGR 326 – Lab #9

**Interfacing a DC Stepper Motor to the STM32 MCU**

**Objectives**

* To gain experience with interfacing a stepper motor to a MCU
* To control the sequencing of steps in the motor for speed and direction control
* To send commands over I2C for MCU to MCU remote control
* To use the LCD to guide user input

**Introduction**

DC electric motors are an important element of some embedded systems that need to provide movement (e.g., fan duct control for air conditioning, vending machine dispenser, 3D printer position, etc...). Stepper motors provide precise positional control and can maintain a fixed position.

In this exercise, you will remotely control a bipolar stepper motor using four GPIO pins and the L293D motor driver board.

**Part I: Controlling the direction of motion of a stepper motor**

Create a program that will control you motor with a pushbutton.

* The first push should increment the stepper motor forward 10 steps
* The second push should return the stepper to its original position (10 steps backward)
* This routing should repeat upon successive pushbutton presses.

Demonstrate the working prototype to your instructor

**Part II: Communication MCU to MCU**

Often it is necessary for microcontrollers to communicate to each other. This frees resources or may be done for redundancy. All three types of communication (UART, I2C and SPI) can be used for this purpose.

Examine the code structure in Lecture 7 for I2C intercommunication between STMs. One code structure is used to setup the master, the other is the slave.

Create code and demonstrate to your instructor how you can toggle between two LEDs on the slave STM Nucleo board by pressing a pushbutton on the master STM (one toggle per press)

**Part III: Controlling the direction and position of the motor remotely**

Modify your C program from part one and two so that one STM controls the motor, while the other is connected to your keypad and two pushbuttons. Each STM is connected via an I2C communications port.

* Pressing any digit (1-9) will store and display the digit pressed to the screen (TERATERM or Debugger)
* Pressing the first button will increment the motor the number of cycles (cycle= 4 steps) entered from the keypad from the first step
* Pressing the second button will decrement the motor the number of cycles (cycle=4 steps) entered from the keypad from the first step
* You should also print to the console the present motor count (representing position).

Demonstrate the working prototype to your instructor

**Restate and answer the following questions in your lab notebook and report:**

1. Describe how to change the speed of the motor
2. Describe what limits the speed of the stepper motor.
3. Describe what reverses the direction of the motor.

**At The End Of The Laboratory**

* Clean up your workstation.
* Copy from your .c files containing code you’ve written for the exercise and paste into a Word file following the scanned images from your notebook entries. Then save the .doc file as .pdf for submission.
* Make sure you clearly understand the laboratory deliverables and due date as posted on Blackboard.