ECGR4161/5196, Spring 2009: Lab 3

Stepper Motors

Learning Objectives

This lab will have students control a stepper motor so that a stick attached to the motor makes one clockwise or one counter-clockwise rotation in one minute. This will be done using the Renesas board.

General Information

The general steps for this lab are:

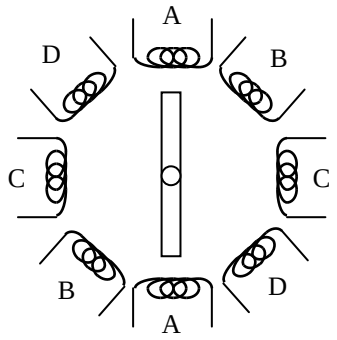
1. Identify the hardware interfacing needed for the stepper motor.
2. Create the connector for the device
3. Build the project and load onto your board. Run the program and observe the operation.
4. Demonstrate for a TA and turn in a lab report.

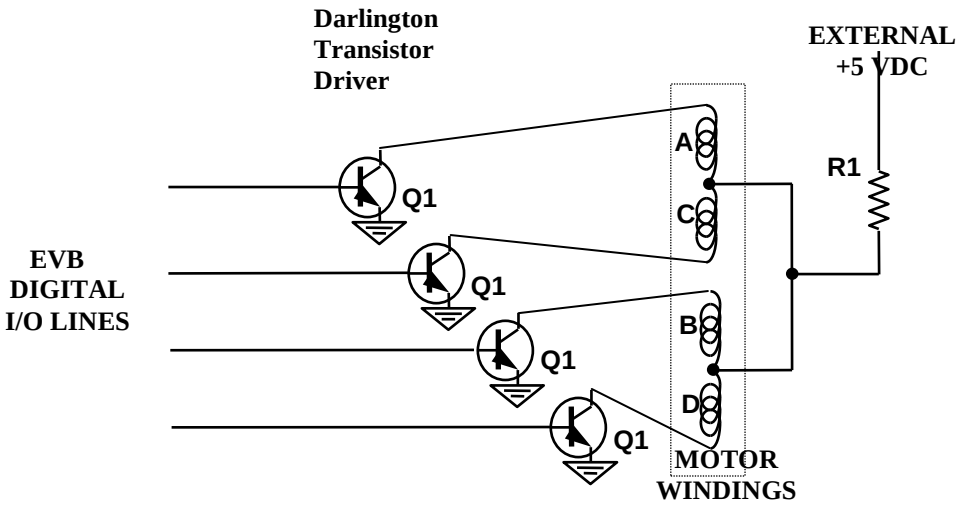
Laboratory Assignments

You may use the PCs in Woodward 203 or your own PC to do this lab experiment. The machines in Woodward 203 already have the software tools loaded. In this lab you will be utilizing onboard timers and I/O ports of the Renesas board to control a stepper motor.

A stepper motor is a simple way to achieve precise position control without using feedback devices. The purpose of this lab is to build a hardware/software system to properly sequence the windings of a stepper motor. Write a driver program which will turn the individual windings on and off in the proper sequence to achieve clockwise (SW2 pressed) and counter-clockwise (SW3 pressed) rotation of the stepper motor. Use half-stepping, as described in class and below.

Step	A	B	C	D
1	ON			
2	ON	ON		
3		ON		
4		ON	ON	
5			ON	
6			ON	ON
7				ON
8	ON			ON
9	ON			





1. Identify which ports on the Renesas board will serve as your control pins.
2. Design your connector/circuit and acquire the parts.
3. Write code for the Renesas board which control the stepper. Verify that the new functionality works as specified.
4. Complete your lab report.
5. Bring the new board to the lab TA and demonstrate the new code. When the TA checks your board, she will also take your lab report. You **will not** need to include a printout or soft copy all of the code – just "snippets".

Requirements

Req. 1 – The code generated is written in C for the QSK62P.
Req. 2 – The code is well commented and easy to follow
Req. 3 – Your lab report should include the final build output from the builder.
Req. 4 – The ULN2803 or ULN2003 (also may be labeled a DS2003, MC1413) Darlington Transistor Driver chip will be attached to the via four output pins of one port.
Req. 5 – The stepper motor will be attached to the driver chip according to the instruction sheet provided on the class webpage.
Req. 6 – The general operation of the system is that the stepper motor will rotate 360 degrees in 60 seconds and resemble the smooth sweep motion of a clock's second hand.
Req. 7 – The system will start out running and always run in a clockwise direction.
Req. 8 – The system will be powered by a 5v bench power supply. DO NOT power the stepper motor with a PC's power supply (through the USB Cable). Failure to satisfy this requirement will result in a grade of "0" for the lab.

Lab Report

Include in the checkout part of your lab report the lines:

1. The "second hand" moves at a constant speed _____
2. The "second hand" moves 360 degrees in 60 seconds _____

Include in your lab report observations and procedure like the following:

The general learning objectives of this lab were . . .

The general steps needed to complete this lab were . . .

Some detailed steps to complete this lab were . . . .

1. *Step one*
2. *Step two*
3. *. . . .*

Code generated or modified to complete this lab...

No need to include all the files for the lab. Just include the modified code.

Some important observations while completing/testing this lab were . . .

Here include the memory report given at the end of the compile process.

In this lab we learned . . . .