UNC Charlotte, ECGR 4892/6185, Spring 2006: 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 (you can use the MSP430 instead to earn 30% extra credit).

General Information

The general steps for this lab are:

1. Generate a new project for the Renesas Board. Name your new project Lab3.
2. Open and edit your main.c file to perform the lab functions.
3. Program the lab. Don't forget the necessary include files to get the correct functionality.
4. Compile the code into an .x30 file, and load onto the board.
5. Test the program and repeat steps 2, 3, and 4 until the program works as required.
6. Write your lab report.
7. Demonstrate for the professor and turn in your report and files.

Prelab Activity

None.

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			
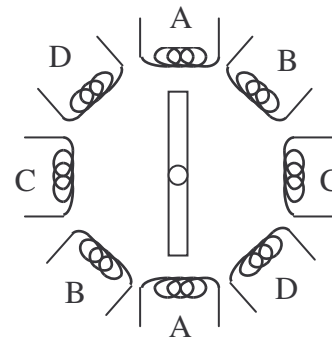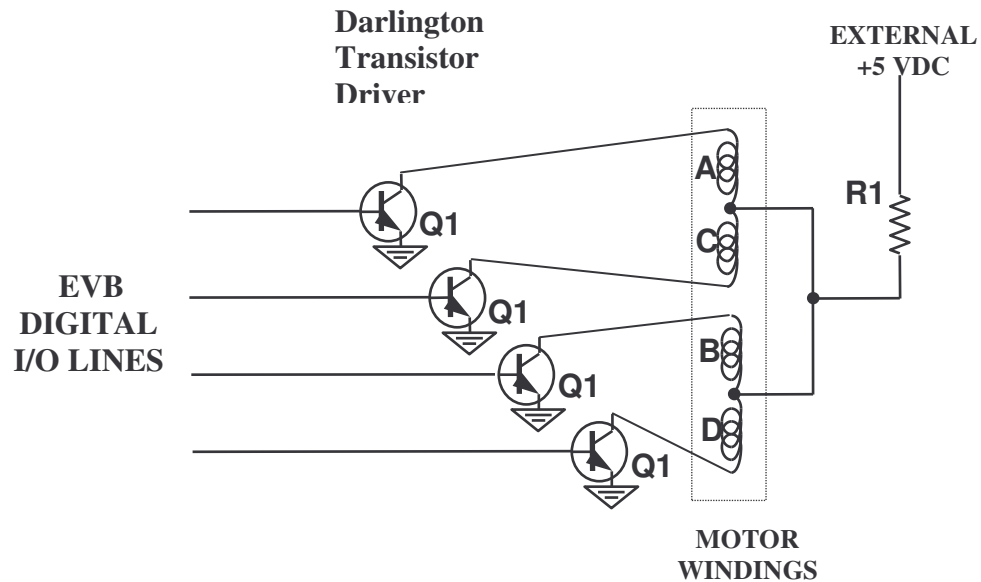
Steps

1. Modify the main.c file and include the appropriate files. Include commenting along the way.
2. Build your program slowly, testing along the way. Perform compiles and solve each requirement one at a time. Make sure comments are written as you progress.
3. Continue to build and test the program until all of the requirements have been met. Did we mention you should write your comments as you progress, not at the end?
4. If you run into problems, use the break point functionality of KD30 to step through the code until you find the problem.
5. Once all the requirements have been met, ensure that everything works.
6. Finish lab write-up and demonstrate for the professor.
7. Submit your report, C code (*.c) and .map files on a floppy disk, CD ROM, or email.

Requirements

Req. 1 – The code generated is written in C for the MSV30626-SKP

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 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 in the

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 in a clockwise direction. If SW2 is pressed, the motion will stay or switch to clockwise. If SW3 is pressed, the motion will stay or switch to counter-clockwise.

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 your lab report observations and procedure like the following:
The general learning objectives of this lab were . . .
Pre-lab question answers
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 for this lab…
Some important observations while completing/testing this lab were . . .
In this lab we learned . . . .

Send the code the .map file, and the report to Sami via email.