

UNC Charlotte, ECGR 6185/8185, Spring 2013: Lab 1

Ultrasound distance sensor

Learning Objectives

This lab will have students control a ultrasonic sensor to measure a distance from the board to the closest object (i.e. a wall). This will be done using the Renesas board.

Prelab Activity

1. Write a state machine for this lab, show it to the TA when you demonstrate the lab.
2. What is the speed of sound?
3. What is the range of the PING))) sensor?

Laboratory Assignments

You may use the PCs in EPIC 2148 or your own PC to do this lab experiment. The machines in EPIC 2148 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 an ultrasonic sensor.

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 HEW 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 RX62N Eval Board.
- 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 main objective is to use the PING))) ultrasonic device to create a distance measuring device.
- Req. 5 – Follow the guidelines for using the device found on the class webpage.
- Req. 6 – When SW1 is pressed, take a measurement and display the results on the LCD.
- Req. 7 – Display the distance in meters on the LCD in the form x.xxx. If the measurement is out of bounds, display 9.999.
- Req. 8 – If the watchdog times out, the processor should reboot to the initial state.
- Req. 9 – The software for this lab should use a state machine.
- Req. 10 – Do not use floating point numbers for this lab.
- Req. 11 - The I/O ports on the Renesas board are 3.3 v, and the PING))) I/O line runs at 5.0v, so some additional hardware will be needed to allow these two devices to communicate.

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