COSC 4P78 – Lab 5

For this lab, you'll be making a simple wall-following robot, using the ultrasonic rangefinder.

Preliminary Task:
This lab does not rely on Lab 4, but does rely on the completion of the three labs preceding it.

Ultrasonic Rangefinder:
You've been provided with the following ultrasonic rangefinder:
http://www.robotshop.com/ca/en/hc-sr04-ultrasonic-range-finder.html

Note the links to both the datasheet and library.
The Arduino IDE's library manager should be sufficient for installing the library from the `.zip` file.
Once the library is installed, you may need to restart the IDE.
The library also should have included a sample program, under *Examples* in the menu.

Try it out (or write your own version) with the Serial Monitor.
- It's worth noting that this rangefinder might tend to time out when it doesn't detect a wall within range (taking up to 200ms to return a result)
  - Only five samples per second is pretty bad, but this should only matter during testing
  - Once it's actually somewhat close to a wall, it *shouldn't* time out (often)

Warning: this sucker is a bit sensitive to electrostatic discharge! Ground yourself before handling it by touching *unpainted* metal (e.g. the screws holding the shelves in place)!

Wall-following:
In a sense, wall-following is even simpler than line-following. It's mostly just more of a nuisance because of the combination of needing to synchronize with an independent mechanism, and not wanting to smash into a wall.
- It's advised to simply mount the ultrasonic facing to the left (or right) of the robot, using one of the brackets that came with the robot. You might want to add a bit of tape or a wire tie to keep it secured
- If, for some reason, you feel like being ambitious, you can try to attach either that bracket, or the sensor bracket you were provided with last week, and mount it to a servo
  - If you want to try this, feel free to ask me for advice, but since servos come later, it won't be explained in detail here

The principle of wall-following is pretty simple:
- If you start getting too close, you need to correct away from the wall
- If you're drifting too far, you need to correct towards the wall
- You may or may not wish to correct proportionally to the measured error
- Because sound-based sensors aren't immensely reliable (nor are ultrasonics that cost less than four bucks apiece), you may wish to actually make decisions based on, for example, the average of the last two or three readings