Lab 3
ESE 112 Fall 2007

Touchdown!

1.)Introduction

In nature, animals use their senses to produce a remarkably wide range of sophisticated behaviors. While humans often use their senses in seemingly complex ways, most animals have very limited high level brain function yet are able to use feedback to greatly improve their locomotion. Moreover, recent research has shown that even very simple sensors (as simple as a binary switch) can lead to vast behavioral complexity. In this lab you will build from scratch a simple contact sensor for EduBot that uses an LED to indicate that the leg is contact with the ground.

2.)Pre-lab Exercise (due before start of the lab (Feb. 1st)

1.) What electronic components are available for this lab?
2.) Give an example of an open-loop or feed-forward robotic behavior.
3.) Give an example of a closed-loop or feed-back robotic behavior.
4.) Describe in detail an algorithm that would use the contact sensor (assume you could get the contact information from the leg to the onboard CPU) that you will build in this lab to improve any one of RHex's locomotive behaviors. (You can should search the literature (research papers, books etc) for ideas (remember to cite sources used)).

3.)Lab Exercise (Two week lab)

Your goal, in groups of two (everyone must find a new partner, that is, you may not work with anyone who you've partnered with for any lab this semester.) is to attach to a leg of the robot (to be provided to you) a sensor that turns on an LED when the foot contacts the ground. The following are the electronic components you will have access to.

1.) A resistive flex sensor: A small thin strip whose resistance changes as it is bent
2.) Resistors

3.) Potentiometers
4.) Comparator/Op Amp
5.) LEDs
6.) 1.4v hearing aid batteries (you should use two for your circuit)
7.) DIP switch

As can be seen the above description is very vague. Therefore you should spend some time thinking through how you will solve this problem (it is not that easy). Once you have a design you think will work, first construct your circuit using the breadboards provided (if you've never used a breadboard there are a number of small tutorials available online). Show the lab instructor the working circuit and then solder (remember someone else must be in the room when soldering) your circuit together on the smallest piece of pc board you can fit it on. Finally, attach the circuit to the robot leg for testing. The finished product should turn the LED on when the leg is in contact with the ground (and switch is in the on position) otherwise the LED should be off.

4.)Lab Write-Up (To be done individually)

1.) Describe your circuit. Carefully explain the choices you made in your design.
2.) What mistakes did you make (if any) in your initial design? How did you debug your circuit?
3.) In the pre-lab you were asked how you could use the contact sensor to improve the robot's behaviors. Now assume instead of a binary contact sensor you could use the flex sensor to tell exactly how much the leg is compressed. How could you use that additional information to further improve the robot's locomotion?
4.) Describe your contribution to your group. As a percentage, how much of the work did you do? How much did everyone else do? Did your group work well together?