# CS 23N, Winter 2004
# Homework #2: Using servo to control robot arm
Handout #4

---

**Due in class on Wednesday, April 21.** Materials for this problem can be picked up from the lab (B38). Please email us if your teams have changed since homework #1.

For this assignment you will build a simple robot and use an improved version of your servo circuit to control it. There are two parts:

**Mechanical part** Construct a robot with a single arm attached via a servo to a base plate, as sketched in the class notes.

- Cut a Lexan base plate (about 8 in long and 4 in wide).
- Cut a rectangular hole for the servo in the base plate.
- Drill mounting holes for the servo.
- Mount the servo on the base plate.
- Cut a Lexan arm (6-8 in long and 1-2 in wide).
- Mount a servo arm onto your Lexan arm.
- Assemble the base plate with servo to the arm.

**Electronic part** Transfer your breadboard circuit from homework #1 to the provided solder boards. Use the circuit to make the robot move its arm back and forth. Advice: make sure the circuit is working properly before trying to transfer it to the solder board, since it's much harder to do development on the solder board.

After completing the problem above, you may also wish to experiment with the following optional extensions. In addition to the suggested extensions, you should feel encouraged to explore other changes/improvements to your device, and tell us what you did!

1. (Easy) Experiment with different motion patterns of the servo arm to try to create interesting effects. For example, if you have a weight hanging down on a string tied to your arm, you could try to design a servo motion that pumps energy into the swinging weight.

2. (Easy–medium) Try making additional types of joints. For example, you could use two servos at right angles to create an arm that can point in any direction. Or, you could use flexible materials to make hinges.

3. (Challenging) We will provide various types of sensors. Experiment with connecting these sensors to your PIC; see if you can have LEDs light when various conditions happen (sensor reading in some range, sensor reading follows some approximate sequence of values, etc.).

4. (Very challenging) Use one of the sensors to implement a feedback control loop. For example, if you have weight on a string as before, you could try to move it to a known position quickly with as little oscillation as possible.