

## ME 135 SPRING 2008

### ASSIGNMENT 6: MULTI-AXIS CONTROL AND HOMING

**Due: Thursday, April 10, 2008**

#### **Background**

The Scorbot has a multi-axis arm with five degrees of freedom. Your job is to take the controller you designed in the previous assignment and apply it to each of the five motors in the Scorbot robot. For this assignment, you will focus on joint level trajectory control. Previously, it was sufficient to apply a step input to a simple rotating motor. Applying a step input to a mechanical system, however, can induce undesirable oscillations. To ensure smooth motion, all of the states (acceleration, velocity and position) must be specified in feed forward control.

This will be your attempt at developing a systems level program. You will quickly notice that you need to know the starting position of the robot in order for it to function properly. This is accomplished by a process commonly known as homing. The simplest way to accomplish this is by moving each joint of the robot to its homing switch and initializing that position to a predetermined value.

#### **Task**

- 1) Generate a trapezoidal velocity profile for the motor controller you developed in the previous assignment. Test it first on a single axis.
- 2) Modularize the code to run PWM channels 0 through 5.
- 3) Test each channel individually.
- 4) Develop a single program to run all six channels at the same time.
- 5) Tune each axis of the Scorbot.
- 6) Test the program by running each axis of the Scorbot.
- 7) Develop a homing routine for your robot.

#### **Deliverables**

Your program should have the ability for the user to move any combination of axes of the Scorbot. This is a functional program, so be aware of the safety of both you and your robot and make sure to include software limits for the robot axes. It is up to you whether you want to use C, LabVIEW, or both.