EAS 199A: Homework 5 **Due 7 or 8 November 2011**

Use the Direct Format for all four problems. Problems 1 and 2 are completed by a team of two students. Problems 3 and 4 are individual assignments and must be submitted individually.

The fan project is 10 percent of the course grade. Components of the fan project are worth a total of 60 points. There is potential of up to 20 bonus points. The point distribution for the fan project is as follows. Only the Solidworks drawing is due for Homework 5.

20 points	Solidworks drawing for the laser cutter
20 points	In-class demonstration of fan operation
20 points	Documentation/presentation of fan design and operation
20 points	Bonus point potential for creative fan design and/or strong technical implementation.

A design with strong technical implementation (for bonus points) would have minimal use of glue, duct tape or other ad hoc fastening measures. It would have easy-to-use controls, and a modest about of bling (e.g. LEDs). The best bling is tied to necessary function.

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1. Collaborate with a partner to create the physical design of a structure for the desktop fan. The structure must be safe, i.e., it should not cause physical harm to people. The structure must support the DC motor, which drives the propeller. The structure must support the servo motor, which causes the direction of the air flow to oscillate. The structure should support the two motors and propellers and be adjacent to the Arduino and breadboard the provide the electrical power and control logic. The Arduino and breadboard are not attached to the acrylic structure, but it will be convenient to provide a rigid base to which the structure and the electronics can be attached.

   Create at least two hand sketches that show the physical features of the structure for the fan. The hand sketches should be simple, free-hand drawings the communicate the essence of the design. Use of a straight edge is encouraged, but not required. The objects in the sketch should be to approximate scale. This is not a CAD drawing. Rather, it is the kind of sketch an engineer might spontaneously draw to explain a physical object to another engineer.

   Label the sketches with the names of both team members, along with the standard identification of the course number, assignment number and due date. This document also serves to identify your team.

2. Complete a Solidworks drawing of the structural supports for your desktop fan. The structural parts will be cut from a 1/8 inch thick acrylic sheet. Start with the template that you download from the class web site (linked from Lecture 10), and follow the instructions given during the in-class tutorial. This is worth 20 of the 60 total points for the fan project.

   Each student team should submit a drawing via the D2L drop box. Individual members of a team can submit a separate drawing. Therefore, each team will have at least one, and possibly two designs. To complete the project, only one physical design will be submitted for grading. We will not make duplicates of the same design. We will not make parts that are trivially different, e.g. the same physical design with different initials.

   To receive full credit, a Solidworks drawing *that can be cut* on the laser must be received by 2:00 PM on Friday, November 4, 2011. Parts received after the midnight on 4 November 2011 must use the *Late Drop Box*. Any drawing submitted after 2:00 PM on 4 November 2011 will have a reduced number according to the following table. The time of submission will be determined by the timestamp at which the file was uploaded with the time rounded down to the nearest minute.

Received by	Maximum points
2:00 PM, 11/4/2011	Maximum possible
5:00 PM, 11/4/2011	90% of maximum (18 points)
9:00 AM, 11/7/2011	50% of maximum (10 points)
5:00 PM, 11/7/2011	25% of maximum (5 points)
5:00 PM, 11/8/2011	10% of maximum (2 points)
After 5:00 PM, on 11/8/2011	None

Drawings will be inspected before the parts are cut. If, in the judgment of laser operator, a drawing cannot be used for a cut, or if it does not meet other specifications (say for size limits) then you will receive feedback on the D2L site saying that your part was rejected.

If your part cannot be cut, then it is not considered "submitted" even if it was uploaded to the D2L site before the deadline. Therefore, it is in your interest to submit parts before the deadline so that any flaws can be corrected, and you can submit a completed drawing before the deadline.

In addition to common sense limits on the drawing and design, please make sure your drawings have the following the features

- All parts must fit in a rectangular area that is either 6 inches by 3 inches, or 12 inches by 1.5 inches.
- Make sure that all edges to be cut are in the Cut layer. Those edges will be cut completely through. Do not leave annotations, dimensions or initials in the Cut layer.
- Within the 18 square inch area limit, you may include as many sub-parts as you wish. The sample design had two separate parts: one for the servo support and one for the DC motor support.
- Each physical piece should have your initials (up to four letters) entered as text in the Engrave or Raster layer. Initials in the Engrave layer need to be created from geometric objects like circles and lines. Parts without initials may not make it back to their creator.

Uploading your part

- Save your Solidworks file with a name having the following pattern

  `EAS199A_fan_parts_Lastname_Firstname.SLDDRW`

  The file name should have no spaces in it. The "`EAS199A_fan_parts`" characters must be exactly as given above. The SLDDRW extension is automatically be added by Solidworks.

3. Read or watch at least two of the "Links to provocative ideas about the design process" from the class web site

   `http://web.cecs.pdx.edu/~gerry/class/EAS199A/notes/lecture_HTML/11.html`

   Watch the TIDEE Design Process presentation linked on the class web site. Find at least one other reference on the engineering design process. List the references you read or watched.

4. Answer each of the following questions by writing at least three complete sentences. For each part, cite at least one reference. List your references numerically at the end of the document that you turn in for grading.
   a. What is design?
   b. What is a design process?
   c. Describe the design process that you used for the structural support for the desktop fan project.
   d. Suppose that you are going to make a commercial product from the desktop fan prototype. Identify a potential market for this product and list three important design criteria you would use to develop that product.