**CSCE 155N Matlab Programming Project 3 – Summer 2014**

**Assigned: Wednesday 8/6/2014**

**Due: Friday 8/15/2014 at 11:59 PM**

**(hardcopy in office on Monday)**

**Gearing Up!**

**Or**

**Dropping the Ball!**

**Problem Statement:**

In ***Gearing Up***. You will simulate the rotations of gears in a drive train. The user specifies the size and position of each gear, along with the rotation rate for the designated drive gear. You might decide to use spokes and/or cogs on the gears to enhance the visual affect of rotation. A printed legend showing the RPMs of each gear would also be nice.

In ***Dropping the Ball***, you will show a ball being dropped from a specified height under the influence of gravity.  It falls to the floor, possibly interacting with the floor (friction, effect of spin on the ball, elasticity of the collision, etc.) and bounces.  Allowing the simulation to continue will show the ball as it bounces lower and lower until it stops.  Think of the toy "super balls" which you could spin as you threw it to the floor, then watch as it bounces back and forth because of the spin.

There are enhancements that you are very welcome to implement for bonus credit. (Bonus points or “stars” accumulate through the semester separate from regular credit points. After preliminary final grades are calculated, these bonus stars are considered for adjustments of generally half a grade and sometimes more.) See the project rubrics for suggested enhancements.

Features for a minimal implementation include the following:

* Visualize and animate the gears or the bouncing ball.
* Allow user to set up initial conditions.
* Be correct with the physics.
* Include complete documentation as detailed below and in the rubric.
* Design the program in a top-down, bottom-up modular fashion using functions.
* Include evidence of testing in an incremental, modular fashion.

You are to work in teams of two or three students to design prototypes in Matlab. Larger teams may be allowed by permission, but there would be higher expectations. Teams should include at least one more “advanced” student and one “beginner” student.

**Resources:**

Most research will likely be for features of Matlab needed to implement various functionalities. No advanced mathematics or specialized domain knowledge should be needed. Make use of your Piazza account to ask for and share research sources. Do remember that it is very important to document exactly where you found materials and code samples. It is expected that this project is ultimately yours.

**Collaboration:**

Work together as a class on any or all aspects of the research and design. Ideally take advantage of the talents of each member of the team, but recognize that each is responsible for the entire project! This means being prepared to answer questions on the code even on parts you did not program. It is essential to keep track of who did what and where any useful information was found. Record each time you helped someone else and each time someone helped you. Keeping a log is highly recommended. Note that Piazza keeps a record automatically!

**What and How to Submit:**

Read and have your program conform to the “Program Documentation Guidelines” which are online.

By the deadline hand in electronically the two files, gearing.m or dropping.m (the Matlab script file for the game), and gearing.docx or running.docx (which contains summaries, documentation, and sample runs). Also submit a hardcopy of a grading rubric form. Only one copy of everything per group needs to be submitted – it does not matter who does the handing it. At my office by Monday after the deadline, hand in the hardcopy version, stapled together with the cover page in front.

Each team member should electronically on his/her own account submit his/her own analysis of the relative contributions of all the members toward the project. This is in addition to the acknowledgement section of the main report. Assuming allocation is fairly even, all will receive the same grade.

The Word document should contain the following, all carefully labeled:

* Cover page with name(s) and the account under which it is submitted, title, date submitted, etc.
* A discussion of the features you implemented in the project. Describe how they work and what Matlab options were used to program them. This should be at a fairly high level, not a line-by-line analysis of the code.
* Acknowledge all collaborations (both internal to the team and external), detailing what each person contributed individually, and what was done jointly. Indicate approximate percentages of the work contributed by each person in design, coding, testing, documentation, and report preparation.
* A discussion of the testing that was performed. This should include testing of each component as it was being built, and testing of the final program ensuring that it works properly under a comprehensive range of conditions. Printouts may be useful
* An “instruction manual” that a non-programmer can use
* A copy of the code