(PROJECT 5 DEMO): REAL TIME TASKS AND HARDWARE SENSORS

J. Vining
ECE/CSE 474, Embedded Systems
University of Washington – Dept. of Electrical and Computer Engineering

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Reviewer: _____

Score (of out 150 pts): _____

Group Members:

1. _____
2. _____
3. _____

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1.0 COMPILE, LOAD, AND EXECUTE CODE ON ATMEGA (5 PTS)

2.0 REAL TIME TASK: ACCELEROMETER (145 PTS)

2.1.1 How did you do it? (30 / 145 pts)

Explain how you calculated position and angle w.r.t. gravity from the accelerometer analog output:

- How did you calculate the sampling frequency that was required to meet the spec?
- How does your program calculate position?
- How does your program calculate angle?

2.1.2 Position (75 / 145 pts)

Move your accelerometer board around a 8.5" x 11" sheet of paper in the following steps
NOTE: This is standard letter paper size, (8.5" x 11") = (21.59cm x 27.94cm)

- Start accelerometer board at top corner of paper.
  - This is the origin – you may cycle power to your board or provide another means for resetting the origin here.
  - Show that the net distance traveled is 0cm.
- Move board along the long edge of the paper.
  - Show that the distance traveled is 27.94cm +/- tolerance specified in assignment**
- Move board along the short edge of the paper.
  - Show that the distance traveled is (21.59cm + 27.94cm) +/- tolerance**
- Move board along the long edge of the paper.
  - Show that the distance traveled is (21.59cm + 27.94cm + 21.59cm) +/- tolerance**
- Move board along the short edge of the paper.
  - Show that the distance traveled is (21.59cm + 27.94cm + 21.59cm + 27.94cm) +/- tolerance**
  - Show that the Δx, Δy, Δz from origin = 0cm +/- tolerance**

** Tolerance = (+/- 1cm per 5cm traveled within a 5sec time interval)

After completing the above sequence:

- What is your overall error for distance traveled?
- What is your overall error for Δx, Δy, Δz from origin?

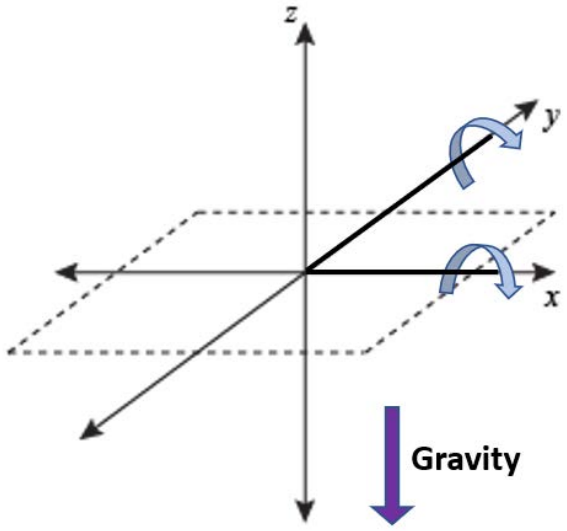
There will be a 1st, 2nd and 3rd place prize (**EXTRA CREDIT** +30pts, +20pts, +10pts respectively) for the least amount of error!

Points for tolerancing:
(- 0pts) +/- 1.0cm per 5cm traveled within a 5sec time interval
(-10pts) +/- 1.5cm per 5cm traveled within a 5sec time interval
(-20pts) +/- 2.0cm per 5cm traveled within a 5sec time interval
(-40pts) +/- 2.5cm per 5cm traveled within a 5sec time interval
(-60pts) +/- 3.0cm per 5cm traveled within a 5sec time interval

2.1.3 Angle (40 / 145 pts)

Using the graph below as a reference, show the following static angles of your accelerometer board and the value on the display:

- Rotation around **x-axis**: 45deg and 90deg
  - These angles should show up in **∡y** w.r.t. gravity
- Rotation around **y-axis**: 45deg and 90deg
  - These angles should show up in **∡x** w.r.t. gravity



Flip your chip upside down and show that the angle of your **z-axis** w.r.t. gravity is: 180deg