Assignment 7

Geosc 597-003
Techniques of Geophysical Experimentation

Due: 23 April

Analog to Digital Conversion & Quantization

Read section 1 of the document *From analog to digital* – subsections 1 - 4 should be informative. Use the python notebook *quantization_animated.ipynb* to interactively explore signal quantization. These files are available under the *resources* directory in the Git repository.

There are 4 cells in quantization_animated.ipynb.
Cell [1] imports all necessary libraries – you may need to install some via anaconda prompt or terminal.
Cell [2] defines a function that creates a sinusoidal waveform by solving the wave equation.
Cell [3] creates an interactive plot with analog and quantized signals. How does increasing the bit depth affect the quantized signal?
Cell [4] is broken – you need to make it work. Calculate the error between the signal and the quantized signal and the signal to noise ratio (SNR).

```
# CALCULATE ERROR BETWEEN SAMPLED SIGNAL AND QUANTIZED SIGNAL
error =

# CALCULATE SIGNAL TO NOISE RATIO (SNR)
# FIRST: CALCULATE MEAN POWER OF INPUT SIGNAL -- Ps
# SECOND: CALCULATE MEAN POWER OR VARIANCE OF QUANTIZATION RROR -- Pe
# SNR = Ps/Pe

Ps =
Pe =
SNR =
```

Final Project – Proposal

The project should help you solve a research problem you are facing while applying some of the skills covered in this course. We would like to help you define a project that is within the scope of the course and the semester time limit on the work. A good project will have several characteristics:

- Uses multiple disciplines we discuss (i.e. mechanical, electrical, software, etc.)
- Solves a problem with no commercial solution or no economical commercial solution.
- Will not cost thousands of dollars to build. Plan on $50 or less.
- Does not put you or others in the path of potential harm or danger.

Write a summary of one page or less that describes:

- What your project is.
- What it will do.

- What resources you will need to complete it.
- What parts you may need and a rough estimate of the cost.

What to upload to Canvas

You should upload the following with *consistent file names*:

- Working python notebook – **50 pts**
  - **Fully comment your code!**
- Final project proposal – **50 pts**
- Zip directory and upload to Canvas. (hw7_username.zip)