

## In-Class Exercise 9/30/2017

### WNFA 106-1

In today's in-class exercise, we will ask you to modify `signal_constellation.m` ([https://www.dropbox.com/s/4snmltgm4csexd8/signal\\_constellation.m?dl=1](https://www.dropbox.com/s/4snmltgm4csexd8/signal_constellation.m?dl=1)), such that you get a better understanding of the signal constellation concepts that we covered in the lecture.

The original matlab script uses QPSK. Two plots are generated:

- (1) The signal constellation plot with four symbols in the I/Q two dimension coordinate system.
- (2) A figure with 3 sub-plots: (1) input data symbols (ranging from 1 to M, where M is the modulation order) (2) phase  $\phi_m$  corresponding to the input data symbols (3) the generated modulated waveform

The goal of this exercise is to use 16-QAM instead of QPSK.

You can start by:

- (1) Modify M in line 2 to use a proper value for 16-QAM.
- (2) Instead of using line 11-12, with a phi (phi is the initial phase) table mapping to different data symbols, you can use the commented line 14-17, which implements a I and Q table mapping to different data symbols.
- (3) Modify line 24-26 to use the I/Q table instead
- (4) Modify line 39-41 to plot I/Q in a plot instead of phi
- (5) Modify line 43-49 to plot the modulated in-phase and quadrature signals in two separate sub-plots
- (6) Finally, modify line 52 to generate the combined modulated waveform.