MIT IAP Laptop Radar Lab Exercises
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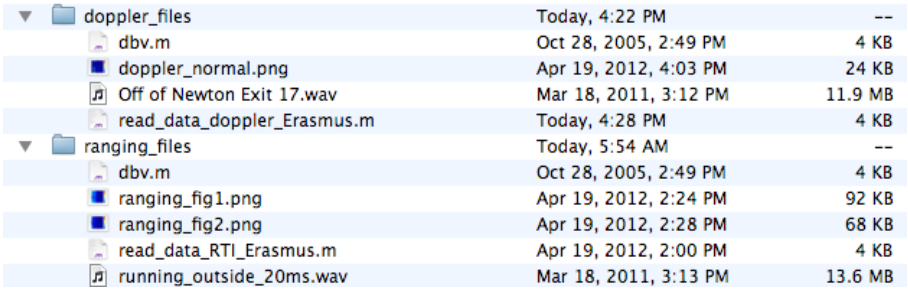
Assumptions:

- Working MATLAB
- ZIP archive file with folder structure at right



Doppler Radar Processing:
(folder `doppler_files`; use MATLAB script `read_data_doppler_Erasmus.m`)

Run the script; you should get a result which looks like the figure `doppler_normal.png` .

Questions:

1) The script has a center radar frequency set to a fixed value. If the actual frequency is different, what effect will this have on the Doppler determination?

2) What are the effects of varying the pulse time variable (`Tp`)? Show plotted examples and explain the differences that are seen.

3) What is the purpose of the `zpad` variable? If the factor "8" is changed, what effect does this have on the Doppler detection?

Range Radar Processing:
(folder `ranging_files`; use MATLAB script `read_data_RTI_Erasmus.m`)

Run the script; you should get two figures which look like `ranging_fig1.png`, `ranging_fig2.png`.

Questions:

1) The script assumes that the linear frequency modulation (LFM) starts at a given, fixed radar transmission frequency and ends at another fixed frequency. Suppose the

actual start and stop frequencies are different than the ones given in the script. What effect will this have on the range to target? Show a plotted example, and explain.

2) What is the purpose of the `zpad` variable? If the factor "8" is changed, what effect does this have on the range detection?

3) Plot the performance improvement in dB for clutter rejection, using the given 2-pulse clutter subtraction.

4) Investigate whether a more complex clutter rejection scheme would improve performance. You can try some of the following possibilities:

    a) Two-pulse clutter subtraction, but with the pulses separated by larger distances (e.g. subtract the 3rd pulse after the current one)
    b) Compute the mean of N pulses (N > 1) and subtract that from the current pulse
    c) Compute the median of N pulses (N > 1) and subtract that from the current pulse
    d) Your own scheme

Use the performance improvement plot developed in (3) above to make your evaluation. Which scheme performs best? Do any schemes have an impact on the target detection itself? How can you tell?