醫用超音波原理

Computer Homework #3: Doppler Processing
Due 12:00am 1/7/2004 by emailing to
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0. Load hw3_dat.mat. In this data file, *DopplerData* represents a PW Doppler data set. The size of the data is 128 X 400, representing gated received data with 128 firings and 400 data samples for each firing. In the same data file, the following parameters are also included:

    -   *PRI*: pulse repetition interval in *usec*.
    -   *fs*: sampling frequency in *MHz*.
    -   *f0*: center frequency of the transmitted pulse in *MHz*.

    For each firing, perform the following processing. The total number of samples will reduce from 400 to a single complex sample after the processing. Repeat the processing for all firings in order to obtain 128 complex samples.

demodulation	→	low pass filtering	→	summing
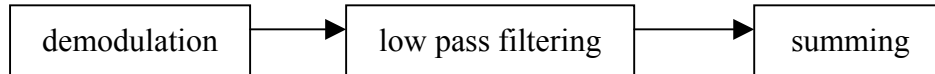
1. Based on the 128 complex samples, calculate the velocity profile using FFT. The profile should be plotted on a logarithmic scale with a 40dB range. The horizontal axis should also be labeled with proper velocity scale. (30%)
2. Re-do Problem 1 by using only the even samples. Also re-do Problem 1 by using only the first 200 data points during summation. Explain your results. (30%)
3. Based on the original complex samples, calculate and plot the mean velocity, variance and energy as the number of samples increases from 2 to 128. Also compare with the results when only using the center 100 (151:250) points for the summing. Note that the discrete correlation function is defined as the following (40%)

$$\hat{R}(n \cdot T) = \frac{1}{N-n} \sum_{i=1}^{N-n} S((i+n) \cdot T) S^*(i \cdot T).$$

4. (bonus) Explore any related Doppler issues based on the dataset.