

醫用超音波原理

Computer Homework #3: Doppler Processing

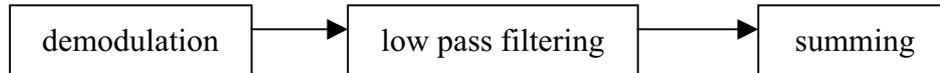
Due 12:00am 1/3/2001 by emailing to

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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.



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. (40%)
2. Ignore all even samples, re-do Problem 1 by using only the odd samples. Explain your results. (20%)
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. 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.