醫用超音波原理

Computer Homework #1: Speckle Statistics

Due 12:00pm 3/21/2006 by emailing to

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1. Create an array of 10,000 complex data with the following statistics:
   (i) Uniform distribution of amplitude in [0, 1].
   (ii) Uniform distribution of phase in [0, 2π].
   Plot the histograms of the amplitude and intensity of the above data.
2. Create a new array of N data points based on the original array (N=10,000, 5,000, 2,000, 1,000 and 500). The i^{th} point of the new array is the sum of M consecutive data points (M=1, 2, 5, 10 and 20) of the original array (from (i-1)*M+1 to i*M). Calculate and plot the ratio of the mean to the standard deviation of the amplitude and intensity arrays as a function of M.
3. Repeat 1 and 2 by making the amplitude distribution normal with (0, 1).
4. Repeat 1 and 2 by making the phase distribution normal with (0, 1).
5. Suppose the amplitude array and the intensity array obtained in 2 are "smoothed" by a [0.5 0.5] filter, calculate the ratio of the mean to the standard deviation of the two arrays. Justify your answers.
6. (bonus, not required) Use the program to investigate any issues relevant to this topic (speckle statistics).