醫用超音波原理

Computer Homework #1: Speckle Statistics

Due 12:00am 10/29/2003 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 $[0, 2\pi]$.
   Plot the histograms of the amplitude and intensity of the above data.
2. Create a new array of 1,000 data points based on the original array. The i^{th} point of the new array is the sum of 10 consecutive data points of the original array (from (i-1)*10+1 to i*10). Plot the histograms of the amplitude and intensity of the new array. Calculate the ratio of the mean to the standard deviation of the amplitude and intensity arrays.
3. Repeat 1 and 2 by making the amplitude distribution normal with (0, 2).
4. Repeat 1 and 2 by making the phase distribution normal with (0, 1).
5. Repeat 2 by creating a new array of 500 data points. The i^{th} point of the new array is the sum of 20 consecutive data points of the original array (from (i-1)*20+1 to i*20).
6. 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.
7. (bonus, not required) Use the program to investigate any issues relevant to this topic (speckle statistics).