Speckle Reduction

Motivation

Among the most important imaging modalities today is ultrasound imaging. It is a safe, versatile imaging modality that can be used to image soft tissues and blood flow and is the only modality allowed during pregnancy to follow up the vitality and normal growth of the fetus. Nevertheless, ultrasound images look very noisy due to the presence of the so called "speckle noise" that arise from the incoherent interactions of ultrasound waves with the scattering structures inside the body. Speckle noise cannot be removed by averaging and can only be reduced by using such acquisition techniques as frequency or spatial compounding or using post-processing methods. In this project, we study the use of different post-processing methods of speckle reduction. We start with reconstructed ultrasound images containing speckle and apply several methods then evaluate their performance using image quality measures.

Research Tasks Involved

A. Computer simulation of speckle noise.
B. Design linear filters for speckle reduction.
C. Design nonlinear filters for speckle reduction.
D. Design diffusion filters for speckle reduction.
E. Design quantitative evaluation criteria to assess the results of different methods.

Design Input

- Sample ultrasound images with matlab code to read it.
- Sample Matlab code for different filtering methods.

Design Output

- A lab notebook (preferably in Microsoft OneNote® format) with all the experiments done to address each of research tasks listed above including documented Matlab code for each.

References

[1]   Christos P. Loizou and Constantinos S. Pattichis, *Despeckle Filtering Algorithms and Software for Ultrasound Imaging*, Morgan & Claypool Publishers, 2008.