Quasi-Gaussian DCT Filter for Speckle Reduction of Ultrasound Images

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Abstract. In recent time, ultrasound imaging is a popular modality for various medical applications. The presence of speckle noise affects difficulties on features extraction and quantitative measurement of ultrasound images. This paper proposes a new method to suppress the speckle noise while attempting to preserve the image content using combination of Gaussian filter and discrete cosine transform (DCT) approach. The proposed method, called quasi-Gaussian DCT (QGDCT) filter, is a quasi Gaussian filter in which its coefficients are derived from a selected 2-dimensional cosine basis function. The Gaussian approach is used to suppress speckle noise whereas the selected DCT approach is intended to preserve the image content. The filter will be implemented on the synthetic speckle images and the clinical echocardiograph ultrasound images. To evaluate the effectiveness of the filter, several quantitative measurements such as mean square error, peak signal to noise ration, speckle suppression index and speckle statistical analysis, are computed and analyzed. In comparison with established filters, results obtained confirmed the effectiveness of QGDCT filter in suppressing speckle noise and preserving the image content.

Keywords: Gaussian, DCT, speckle, ultrasound image, echocardiography