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Speckle suppression in medical ultrasound images through Schur decomposition
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Abstract
A technique based on Schur decomposition to supress the multiplicative (speckle) noise from medical ultrasound images is presented in this study. An image which carries the speckle noise is divided into small overlapping segments, size of these segments depends on the nature of speckle carried by the image and a global covariance matrix is calculated for the whole image by averaging the covariances of all segments. The global covariance matrix is decomposed through Schur decomposition to obtain the orthogonal vectors. A subset of these orthogonal vectors that correspond to largest magnitudes of eigenvalues are selected to filter out the speckle noise from the image. The proposed approach is compared with four benchmark filtering techniques, homomorphic wavelet despeckling, Wiener, Frost and Gamma. Two types of simulated ultrasound images and five types of real ultrasound images of foetal neck, left kidney, right kidney, musculo skeletal nerve and lymph node are tested. The proposed approach performed maximum suppression of speckle noise in all types of the images with optimal resolution and edge detection. The despeckling performance of the proposed approach is even better compared with the benchmark schemes once the speckle noise is rough, which is usually the case for soft tissue. © The Institution of Engineering and Technology 2017.

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