



INTISARI

Pencitraan ultrasonografi diagnostik memainkan peran penting dalam diagnostik medis modern karena sifatnya yang non-invasif, radiasi pengion minimum, dan aksesibilitas yang luas. Namun, kehadiran derau *speckle* secara signifikan mengurangi kualitas gambar, khususnya dalam hal kontras dan resolusi, sehingga berpotensi menghambat diagnosis klinis yang akurat. Penelitian ini mengimplementasikan metode *Speckle Reducing Anisotropic Diffusion* (SRAD) untuk pengurangan derau, diikuti dengan analisis komparatif dari dua teknik perbaikan kualitas: *Histogram Equalization* (HE) konvensional dan *Contrast-Limited Adaptive Histogram Equalization* (CLAHE). Efektivitas metode-metode tersebut dievaluasi menggunakan beberapa metrik kuantitatif, termasuk *Peak Signal-to-Noise Ratio* (PSNR), *Structural Similarity Index Measure* (SSIM), dan *Absolute Mean Brightness Error* (AMBE). Temuan penelitian ini menunjukkan bahwa sementara tapis SRAD efektif mengurangi derau *speckle*, CLAHE mengungguli HE konvensional dalam memperbaiki kualitas gambar, menunjukkan aplikabilitasnya yang lebih unggul dalam pencitraan ultrasonografi payudara klinis. Selain itu, analisis menunjukkan bahwa intensitas derau *speckle* memengaruhi kinerja metode penapisan dan perbaikan kualitas, dengan filter SRAD, HE, dan CLAHE menunjukkan kinerja terbaik pada tingkat derau yang lebih rendah.

Kata kunci: Ultrasonografi payudara, Tapis, Perbaikan kualitas, SRAD, Pemerataan histogram



ABSTRACT

Diagnostic ultrasound imaging plays a pivotal role in modern medical diagnostics due to its non-invasive nature, non-ionizing radiation, and widespread accessibility. However, the inherent presence of speckle noise significantly compromises image quality, particularly affecting contrast and resolution, thereby potentially impeding accurate clinical diagnosis. This study implements the Speckle Reducing Anisotropic Diffusion (SRAD) method for noise reduction, followed by comparative analysis of two enhancement techniques: conventional Histogram Equalization (HE) and Contrast-Limited Adaptive Histogram Equalization (CLAHE). The effectiveness of these methods was evaluated using multiple quantitative metrics, including Peak Signal-to-Noise Ratio (PSNR), Structural Similarity Index Measure (SSIM), and Absolute Mean Brightness Error (AMBE). Our findings demonstrate that while the SRAD filter effectively reduced speckle noise, CLAHE outperformed conventional HE in enhancing image quality, suggesting its superior applicability in clinical breast ultrasound imaging. Additionally, the analysis showed that speckle noise intensity affected the performance of the filtering and enhancement methods, with the SRAD filter, HE, and CLAHE performing best at lower noise levels.

Keywords: Breast ultrasonography, Filter, Enhancement, SRAD, Histogram equalization