

Sistem Evaluasi Resolusi Spasial Menggunakan Pengukuran FWHM dan FWTM pada Citra B-Mode Ultrasonogram (USG) sebagai Salah Satu Parameter Quality Control

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Abstrak

Sistem evaluasi resolusi spasial telah dilakukan pada citra B-Mode melalui pengukuran Full Width at Half Maximum (FWHM) dan Full Width at Tenth Maximum (FWTM) sebagai salah satu parameter Quality Control. Evaluasi ini bertujuan sebagai upaya penegakan diagnosis citra USG. Tipe resolusi spasial yang dievaluasi adalah resolusi aksial dan lateral. Multipurpose multi tissue phantom digunakan untuk scanning citra dengan variasi pengujian yaitu variasi gain (30 dB, 35 dB, 40 dB, 45 dB, 50 dB, 55 dB dan 60 dB) pada tiap masing-masing variasi frekuensi sumber (6,2 MHz, 8MHz dan 10 MHz). Citra resolusi aksial dan lateral phantom diperoleh menggunakan ultrasonogram (USG) melalui pencitraan B-Mode. Pengukuran dibuat menggunakan citra digital dan dihitung dengan cara objektif menggunakan analisis citra melalui perangkat lunak MATLAB. Pengukuran FWHM dan FWTM diperoleh melalui analisis In Plane-Point Spread Function (IP-PSF) menggunakan pendekatan fungsi Gaussian. FWHM dan FWTM dipengaruhi oleh gain dan frekuensi transducer. Gain yang semakin kecil dan frekuensi transducer yang semakin besar menghasilkan penurunan FWHM dan FWTM. FWHM dan FWTM yang semakin kecil merepresentasikan resolusi spasial yang semakin baik, begitu pula sebaliknya. Hasil penelitian juga menunjukkan Ultrasonogram ini lolos uji kelayakan resolusi aksial dan lateral berdasarkan Report of AAPM Ultrasound Task Group No. 1. Citra ultrasonogram menghasilkan nilai rata-rata FWHM sebesar (0.4821 ± 0.030) mm dan nilai rata-rata FWTM sebesar (0.873 ± 0.057) mm pada resolusi axial. Sedangkan pada resolusi lateral menghasilkan nilai rata-rata FWHM sebesar (0.549 ± 0.047) mm dan nilai rata-rata FWTM sebesar (0.987 ± 0.09) mm.

Kata Kunci: Resolusi Spasial, USG, FWHM, Point Spread Function, Quality Control

The Spatial Resolution Evaluation System Using The FWHM and FWTM Measurement on B-mode Image of Ultrasonogram (USG) as One of Quality Control Parameters

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Abstract

The spatial resolution evaluation system has been carried out on B-mode image used measuring the FWHM and FWTM as one of quality control parameters. This evaluation has the purpose to diagnose USG image accurately. The evaluated resolution type is axial and lateral. Multipurpose multi tissue phantom is used for image scanning with Gain (30 dB, 35 dB, 40 dB, 45 dB, 50 dB, 55 dB and 60 dB) on each frequency variation source (6.2 MHz, 8MHz and 10 MHz). The axial and lateral resolution images were obtained by using USG which uses B-Mode imaging. The measurement was made by using digital image and calculated objectively with MATLAB. The measurement of FWHM and FWTM was obtained from IP-PSF analysis (In Plane-Point Spread Function) using approximation for the Gaussian function. FWHM and FWTM are influenced by gain and transducer frequency. The result shows that there is influence from Gain and transducer frequency on FWHM and FWTM. The decreasing Gain and the increasing transducer frequency resulted in decreasing of FWHM and FWTM. The decreasing of FWHM and FWTM represents better spatial resolution, and vice

versa. The result also shows that the USG can pass the feasibility test of axial and lateral resolution based on Report of AAPM Ultrasound Task Group No. 1. The USG image produces averagely (0.4821 ± 0.030) mm of FWHM and (0.873 ± 0.057) mm of FWTM on axial resolution; while on lateral resolution it produces averagely (0.549 ± 0.047) mm of FWHM and (0.987 ± 0.09) mm of FWTM.

Keywords: Spatial resolution, USG, FWHM, Point Spread Function, Quality Control

Pembimbing Akademik

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