Efektivitas Algoritma Selective Mean Filter Untuk Mengurangi Noise Pada Citra Fluoroscopy

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Abstrak

Penelitian ini bertujuan untuk mengimplementasikan algoritma pengurangan noise dengan Selective mean filter (SMF) dan untuk menyelidiki waktu komputasi dalam proses denoising pada citra–citra sinar-X fluoroscopy. SMF adalah teknik mean filter (MF), tetapi dalam aplikasinya, hanya piksel dalam nilai ambang yang digunakan untuk menghitung nilai piksel rata-rata. Keefektifan SMF kemudian dibandingkan dengan filter sudah dikenal, seperti adaptive mean filter (AMF) dan bilateral filter (BF). Pengolahan citra menggunakan komputer Acer Nitro 5 Intel Core i5-8300H 2.3 GHz dengan RAM 8GB, Grafic Processor Units (GPU) Nvidia Geforce GTX 1050 4GB, dan sistem operasi Windows 10 Home dengan SSD M.2 NVMe 2280 256GB. Algoritma diimplementasikan menggunakan Matlab R2019b. Citra – citra fluoroscopy dari fantom NEMA SCA & I Cardiovascular Fluoroscopic Benchmark dengan ukuran 512 x 512 piksel dilakukan filtering, faktor paparan low, normal, dan high pada mode 15 FPS dan 30 FPS dengan field of view (FOV) 25 cm. Selain itu, kualitas citra yang telah difilter dinilai, termasuk tingkat noise, rasio signal-to-noise (SNR), rasio contrast-to-noise (CNR), dan resolusi spasial. Hasil penelitian menunjukkan bahwa dengan menggunakan SMF didapatkan peningkatan kualitas citra dalam hal tingkat noise, SNR, CNR, dan resolusi spasial dibandingkan dengan AMF dan BF. Waktu yang dibutuhkan oleh SMF untuk memproses citra adalah 0,36 detik, sedangkan AMF dan BF masing-masing 10,6 dan 1,4 detik.

Kata kunci : Selective mean filter, pengurangan noise, fluoroscopy, kardiovaskular

Effectiveness of Selective Mean Filter Algorithm to Reduce Noise in Fluoroscopy Image

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Abstract

This study aims to implement noise reduction algorithm with a Selective mean filter (SMF) and to investigate its computation time in the denoising process on X-ray fluoroscopy images. The SMF was the mean filter (MF) technique, but in its application, Selective pixels within threshold value were only used to calculate the average pixel value. The effectiveness of SMF was then compared to well-known filters, such as adaptive mean filter (AMF) and bilateral filter (BF). The notebook of Acer Nitro 5 Intel Core i5-8300H 2.3 GHz with 8GB RAM, Graphic Processor Unit (GPU) Nvidia Geforce GTX 1050 4GB, and the Windows 10 Home operating system with SSD M.2 NVMe 2280 256GB were utilized. The algorithm was implemented using Matlab R2019b. The fluoroscopy images of NEMA SCA & I Cardiovascular Fluoroscopic Benchmark Phantom with size of 512 x 512 pixels were filtered, exposure factors of low, normal, high for 15 FPS and 30 FPS with a field of view (FOV) of 25 cm. In addition, image quality of the filtered images was assessed, including noise level, signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), and spatial resolution. The results showed that by using the SMF, the higher improvement of image quality in terms of noise level, SNR, CNR, and spatial resolution compared to AMF and BF, was achieved. The time needed by SMF to process an image was about 0.36 seconds, while the AMF and BF are 10.6 and 1.4 seconds, respectively.

Pembimbing Akademik
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