Fine-Tuned Medical Images Denoising using Median Filtering

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Abstract
Computer Tomography (CT) images are usually suffering from noise such as Poisson noise, Salt and Pepper noise, Gaussian noise and Photoelectronic noise. A proposed Median Filter (MF) will be implemented using CUDA. The proposed MF filter will be used to withdraw the additive noises present in the CT images. The noise density will be added step by step to the CT image to compare performance of the filter evaluation. The goal of the proposed study was to obtain real-time performance using Nvidia platform - CUDA for denoising medical images of different types of resolution and size. The fast-track thus obtained is compared with CPU implementation of the filter in sequential domain. The dataset I have used for this research work has been provided by Cancer Imaging Archive of the Department of Biomedical Informatics at the University of Arkansas for Medical Sciences supported by the NIH Center for Interventional Oncology and the NIH Intramural Targeted Anti-COVID-19 (ITAC) Program consisting of CT Images in COVID-19 from 661 patients. The median filter (MF) produces an optimal denoising solution, but the performance is slowing down with increasing the image size and resolution. With a continuous increase in the resolution of medical images, the implementation of the filter must face the challenges of time, and the computational complexity reaches large volumes of data. The GPU performances of existing algorithms are analyzed, and the computational gain is discussed.

Keywords: Median Filtering; CUDA Processing; Medical Imaging; COVID-19