UNIVERSITY OF SCIENCES AND

TECHNOLOGY

FACULTY OF POSTGRADUATE STUDIES

Faculty of Engineering , Department of medical Engineering

Remove noise from CT image using hybrid technique

By

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A Thesis

Submitted to the faculty of postgraduate studies in partial

Fulfillment of the Requirement for the Degree of Master

of Science in Medical Engineering

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June 2015

ABSTRACT:

Medical images are generally noisy due to the physical mechanisms of the acquisition process. In Computed tomography (CT) scan there is a scope to adapt patient image quality and dose. Reduction in radiation dose (i.e. the amount of X-rays) affects the quality of image and is responsible for image noise in CT. Most of the de-noising algorithms assume additive Gaussian noise. This thesis contains a comparative analysis of a number of de-noising algorithms namely wiener filtering, Average filtering , Lee filtering ,Bilateral filtering, hyper median filtering ,Wavelet filtering, Total variation filtering and NL-means filtering. Then, some quantitative performance metrics like Mean Square Error (MSE), Peak Signal to Noise Ratio (PSNR), Signal to Noise Ratio (SNR), Structural Similarity Index (SSIM), and Evaluation Time (ET) were computed and compared with the previous filters mentioned. This comparison helps in the assessment of image quality and fidelity; it concludes that the bilateral filtering is the most efficient method in removing Gaussia\\\\n noise from CT scan images.The proposed method combines the bilateral filter and the wavelet decomposition transform to obtain better results than 2all the other filters compared.

الملخص:

الصور الطبيه عموما تحتوي علي ضجيج من الاليات الفيزيائيه اثناء عمليه اكتساب الصوره .في الصور المقطعيه هنالك تطبيق لتيف جوده صوره المريض والجرعه .

التقليل في جرعه الاشعاع (كميه الاشعه السينيه) توثر على جوده الصوره وهي مسئوله عن الضجيج الموجود في الصوره المقطعيه .معظم الخوارزميات لازاله الضجيج تعتمد علي اضافه ضجيج القاوس .

هزه الدراسه تعتمد علي مقارنه وتحليل عدد من خوارزميات ازاله الضجيج وبعض من مقايس الاداء الكمي تم حساب ومقارنه تلك المقايس مع خوارزميات ازاله الضجيج وهزه المقارنه ساعده في تقيم جوده الصوره .

1.1 Introduction

Digital images play an important role both in day to-day applications, such as, satellite television, magnetic resonance imaging, computer tomography as well as in areas of research and technology such as geographical information systems and astronomy. In the diverse fields, mentioned above, scientists are faced with the problem of recovering original images from incomplete, indirect and noisy images [1]. Noises are added in the image during acquisition by camera sensors and transmission in the channel [2]. The presence of noise gives an image a mottled, grainy, textured or snowy appearance [3].Therefore; the problem of recovering an original image from noisy image has received an ever increasing attention in recent years [4]. The recovering can be accomplished by image de-noising, a process of estimating the original image from an image that has been contaminated by noise degradation [5] CT scan stands for computed tomography. It basically uses x-rays to obtain structural and functional information about the human body. In CT the image quality is influenced by many technical parameters. One of the most important parameter is the radiation dose. The quality of image increases with the significant amount of radiation dose [6]. But an increased amount of x-rays being absorbed by the human body increases the chances of cancer. So we need to reduce the radiation dose which is responsible for image noise in CT. So for proper analysis and diagnosis, it is required to4reduce the image noise. Noise removal therefore plays a vital role in medical imaging applications in order to enhance and recover the analysis details that may be hidden in the data. For this purposefiltering is thus applied to clear such images. Any noise reduction algorithm aims to enhance the fidelity of an image which actually means removing the random and uncorrelated structures and retaining the resolution. De-noising of image data has been an active area of research

and different methods such as Hyper median filtering, wiener filtering, use of N l mean filter, wavelets decomposition, bilateral filtering, etc have been used.

1.2Problem Definition

The random noise in a CT image ultimately limits the ability of the radiologist to discriminate between two regions of different density. Because of its unpredictable nature, such noise cannot be completely eliminated from the image and will always lead to some uncertainty in the interpretation of the image .The x-ray computed topographic (CT) scanner has made it possible to detect the presence of lesions of very low contrast.

The main scope of this project is to implement a software programmer using Mat lab to help the radiologist to interpret ct image with a clear view.

1.3Objectives of study

The objective of this thesis is to remove noise from the CT images using a hybrid technique.

1.4Thesis Layout

This thesis consists of six chapters:

Chapter one: Introduction, introduces the problem and the objectives of the thesis.

Chapter two: Theoretical Background defines the CT scan uses, image production and reconstruction, image enhancement.

Chapter three: Literature Review reviewing a number of previous trials to de-noise ct image.

Chapter four: Methodology.

Chapter five: Results and discussion of the proposed de-noising method.

Chapter six: Conclusions and future work.