

Reducing the absorbed dose in analogue radiography of infant chest images by improving the image quality, using image processing techniques

A. Karimian^{*1}, S. Yazdani², M.A. Askari²

*¹Department of Biomedical Engineering, Engineering Faculty
, University of Isfahan, Isfahan, Iran*

Karimian@eng.ui.ac.ir

*²Engineering Faculty of Islamic Azad University, Najafabad
Branch, Isfahan, Iran*

Introduction

- ❖ Radiography diagnosis is one of the most appreciated techniques for medical studies
- ❖ Analogue radiography shortcomings are: bad contrast and high un-sharpness of the radiograph quality , specially in the edge regions because of the scattered photons
- ❖ In infants radiography studies, the shortcomings are more serious and important because of the limitation in exposure amount
- ❖ To overcome the limitations and assisting the medical doctors (interpreters), converting radiographs to a digital format and doing further digital image processing may be one of the best methods

Purpose

- ❖ The quality improvement of infant chest x-ray images by using image processing techniques in MATLAB environment
- ❖ Reduce the X-ray exposure amount in infant radiography studies

Materials and methods

In this research work, After capturing the digital images by using the scanner, the following two methods were used to improve the image quality of chest x-ray images and then as an option the images could be colored by pseudo coloring technique

- ❖ Spatial domain technique
- ❖ Frequency domain technique

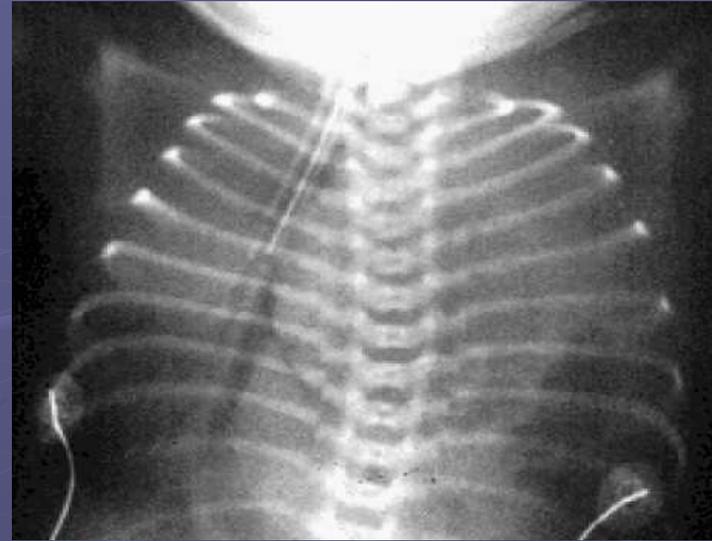
Spatial technique steps

1. Converting the images to gray scale
2. Applying the linear and nonlinear spatial filters (Laplacian filter)
3. Using histogram equalization (to improve the contrast)
4. Applying the median filter

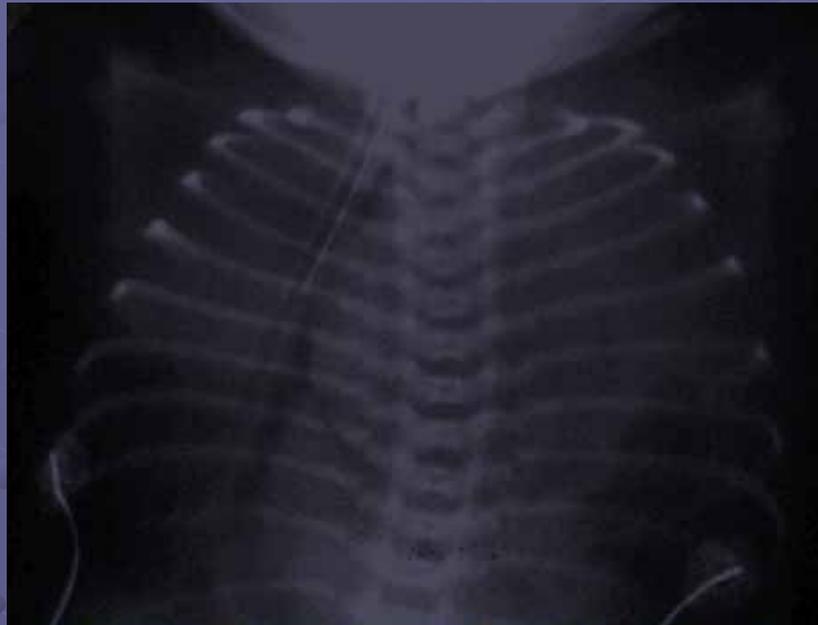
Frequency domain steps

1. Converting the images to gray scale
2. Obtaining the Fourier transform of the image
3. Applying low pass Butterworth filter to the image
4. Obtaining the inverse Fourier transform
5. Applying histogram equalization

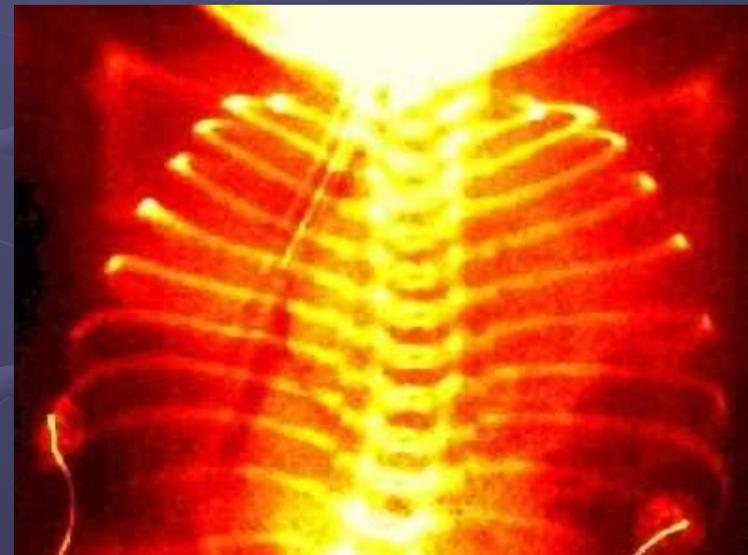
Spatial domain technique results



Object image after using Spatial domain technique

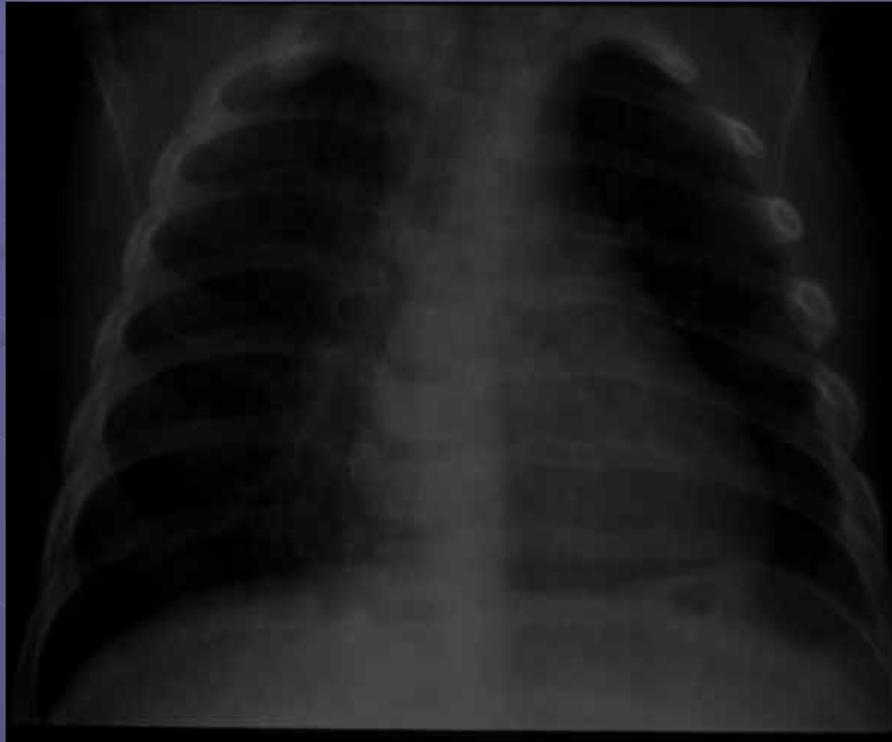


Original gray scaled image

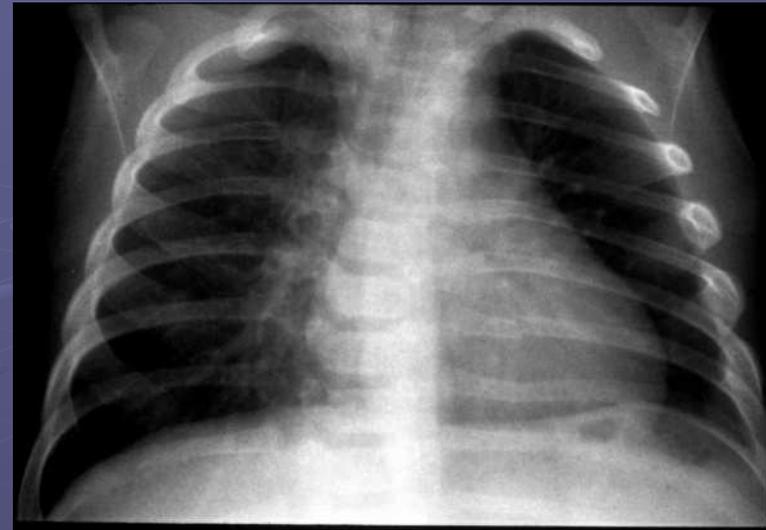


Object image after using Frequency domain technique

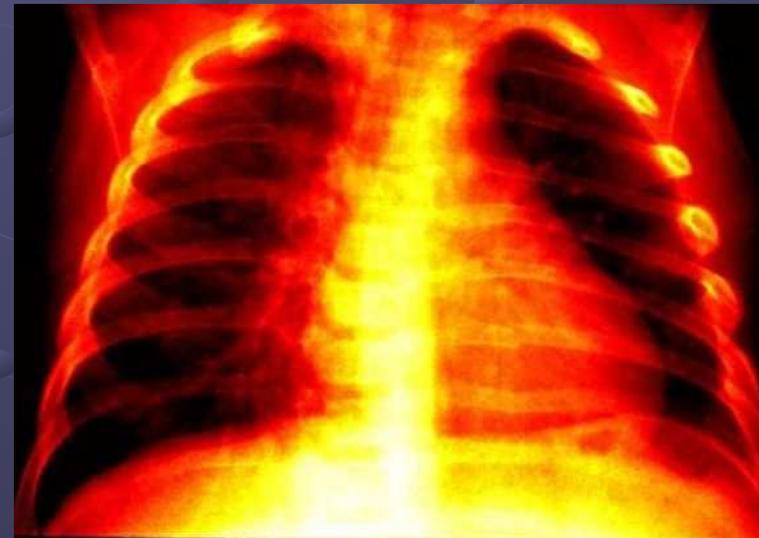
Frequency domain technique results



Original gray scaled image



After Frequency domain technique



Object image after using Frequency domain technique⁸

Conclusion

Our results showed :

- ❖ Using the suggested techniques in this research work, may help the medical specialists to diagnose the defects in the primary stages and prevent from more repeat the X-ray radiology imaging which results preventing from exceed absorbed dose or over dose of the infants and children
- ❖ Most of the radiography machines in the world are analogue (not digital) and therefore the suggested techniques will help to improve their function
- ❖ The suggested method is cheap in comparison with digital radiography

❖ It can be also concluded from the above results that filtering in the frequency domain is more simple and efficient in comparison with spatial domain.