

DENOISING HISTOLOGICAL IMAGES FOR A BETTER COLOUR
IMAGE SEGMENTATION

SULASTRI BINTI PUTIT
(2011222828)

A dissertation report submitted in partial fulfillment of the
requirements for the award of the degree of
Master of Science (Computer Science)

Faculty of Computer and Mathematical Science
Universiti Teknologi Mara (UiTM), Malaysia

JUNE 2013

ABSTRACT

De-noising can be generally defined as removing noise in image. According to (Pierrick Coupe et.al, 2008), image de-noising is used to improve the accuracy of various image processing algorithms such as registration or segmentation. Generally, the quality of the artifact correction influences performance of the image processing procedure. So, the noise removal aims at improving the image quality for visual inspection. The preservation of relevant image information is important especially in medical context. The problem statements of the study have been defined as the problem of noise, the problem of colour image segmentation and the problem of conventional method in preparing histological images for analysis. In order to achieve better colour for image segmentation, the objectives of the study have to fulfill first which is to perform de-noising on colour histological images, then to perform colour image segmentation on histological images and finally to evaluate the effect of denoising on colour image segmentation. In this study, the de-noising concept for colour image preprocessing and segmentation are proposed since these two processes has been widely accepted as an important component of the image mining in order to enhance the images. Haar Wavelet transform is selected as the method for doing de-noising of the histological colour images in pre-processing step. Wavelet transforming has the advantage of multi-resolution in both time domains as well as in frequency domain, so it can be used to describe the partial characteristics for both domains. The reasons of doing the de-noising is to enhance the histological image prior to image segmentation as the accuracy of segmentation is heavily dependent on the pre-processed image. Then the images are used in providing steadfast data for image segmentation using Karhunen-Loeve and Otsu algorithm. Segmentation results are then evaluated using quantitative analysis, which is peak signal-to-noise ratio (PSNR). This methods is used to compare systematically to identify whether the images (with or without denoising) gives an effect on colour image segmentation. Outcome from the experimental test shows that enhancement of histological image using de-noising for a better colour image segmentation. Therefore, the outcome will benefit the pathologies to assist them in analysis and diagnosis of the histological images. It helps improve the performance in term of time and accuracy to analyze the histological image compared to traditional method which is time consuming and less accurate.

ACKNOWLEDGEMENT

First of all, I would like to take this opportunity to thank my supervisor, Prof. Madya Dr. Nursuriati Binti Jamil who gives me a lot of encouragement and guidance during the dissertation conduction. Her guidance has been a valuable asset for me during this dissertation.

I also would like to thank all my course mate and friends especially to Mohd Farhan bin Mukelas who have given appreciated opinion and idea of this dissertation. They are also willing to share their knowledge with me. All the discussion and recommended opinion of my course mate and friends were appreciated by me.

Finally, I would like to send my appreciation to my parents for their support and care throughout my whole life.

TABLE OF CONTENTS

APPROVAL.....	i
AUTHOR’S DECLARATION.....	ii
ABSTRACT.....	iii
ACKNOWLEDGEMENT.....	iv
TABLE OF CONTENT.....	v
LIST OF FIGURES.....	vi
LIST OF TABLES.....	vii
1 1 CHAPTER 1	3
1.1 Background of the Study	3
1.2 Problem Statement	6
1.3 Research Objective.....	7
i) To perform de-noising on colour histological images using Wavelet Transform.....	7
ii) To perform colour image segmentation on histological images.....	7
iii) To evaluate the effect of denoising on colour image segmentation.	7
1.4 Research Question	8
1.5 Scope and limitation of study.....	9
1.6 Significance of Study	9
2 CHAPTER 2	10
2.1 Introduction	10
2.2 Image De-noising.....	10
2.3 Related Work.....	15
2.4 Conceptual Framework	31
3 CHAPTER 3	33
3.1 Introduction	33

3.2	Research Methodology Diagram	34
3.3	Data Collection	36
3.4	Description of Algorithms.....	37
3.4.1	Wavelet Transform (WT)	39
3.4.2	The Haar Wavelet Transform (HWT)	39
3.4.3	Inverse Haar Wavelet Transform (IHWT).....	40
3.4.4	Thresholding.....	41
3.5	Wavelet Based Image De-noising	42
3.6	Image Segmentation	44
3.7	Performance Evaluation	45
4	CHAPTER 4	46
4.1	Introduction	46
4.2	Experimental Setup	46
4.2.1	Software Requirement	47
4.3	Analysis on Image De-noising.....	47
4.4	Analysis on the Histological Image Segmentation	56
4.5	Performance Evaluation and Comparative Result (Analysis on the Effect of Denoising Technique on Histological Images).....	69
4.6	Summary	71
5	CHAPTER 5	72
5.1	Introduction	72
5.2	Dissertation Future Work.....	73
5.3	Conclusion and Recommendations	74
	LIST OF REFERENCES	75