

قال تعالى :

(يا ايها الناس اتقوا ربكم الذي خلقكم من نفس واحدة و خلق منها زوجها وبث
منهما رجالا كثيرا ونساء واتقوا الله الذي تساءلون به والارحام ان الله كان عليكم رقيبا)

سورة النساء الاية {1}

Dedication

To my parents

To my sisters

To my teachers

To my friends

To the memory of my

uncle

May his soul rest in peace

Acknowledgement

*I would like to express my deepest gratitude to Dr Yousif Mohamed
Yousif Abdallah without his help this work could not have been
accomplished*

*I also would like to thanks my friends for the stiumulation and
constant encouragement*

Abstract

The main objective of this study is Enhancement of Edge Detection of Thyroid scintigraphy Using Image Processing Technique. And specific objectives of the study are Read image, to detect region of interest, to remove background, to retain the image. The study carried out on two images of thyroid scintigraphy. The software is implemented using MATLAB R2009b and image segmentation method was implemented in six steps. in the first step Image Readed in MATLAB software (original images) in the second step Entire thyroid gland was Detected in the third step the Images was Dilated in the fourth step Interior Gaps was Filled in the images in the fifth step Connected Objects on Border was Removed In the sixth step the Object was Smoothened and finally outlined original images was obtained.

ملخص البحث

الهدف الرئيسي من هذه الدراسة هو كشف حواف صور الغدة الدرقية باستخدام تقنية معالجة الصور. والأهداف المحددة لهذه الدراسة هي قراءة الصورة، كشف المناطق المهمة في الصورة، ازالة خلفية الصورة، و الاحتفاظ بالصورة أجريت الدراسة على صورتين من صور الغدة الدرقية وتمت معالجت صورتا الغدة الدرقية باستخدام برنامج الماتلاب وطبقت طريقة انقسام الصور في ست خطوات الخطوة الاولى قرئت الصورة في برنامج الماتلاب ، في الخطوة الثانية تم كشف الحواف لصورة الغدة الدرقية (الثنائية) في الخطوة الثالثة تم توسعة الصورة ، في الخطوة الرابعة ملأت الفجوات الداخلية للصورة في الخطوة الخامسة تم ازالة الاجسام المرتبطة بالحدود في الصورة ،في الخطوة السادسة ملس الصورة و اخيراً تم الحصول على صورة للغدة الدرقية مرسومة الحواف.

Contents

Items	Page NO.
الاية	I
Dedication	II
Acknowledgements	III
Abstract (English)	IV
Abstract (العربية)	V
Contents	VI
List of figures	VIII
List of abbreviation	IX
Chapter one : Introduction	
1.1 Introduction	1
1.2 Problem of study	2
1.3 Objective of study	2
1.3.1. General Objective	2
1.3.2. Specific Objectives	2
1.4. Overview of the Study	3
Chapter two :literature review	
2.1.Thyroid Anatomy and Physiology	4
2.1.1. Embryology and Anatomy	4
2.1.2 .Normal Physiology and Metabolism	5
2.2. Nuclear Medicine Examination of thyroid	8
2.2.1. Thyroid Scintigraphy	8
2.2.2. Multinodular Goiter	11
2.2.3. Thyroid Nodules	13
2.2.4. Hyperthyroidism	17
2.2.4.1 Radioiodine Therapy of Hyperthyroidism	18
2.2.5. Thyroiditis	22
2.2.6. Mediastinal Goiter	24
2.2.7. Neonatal Hypothyroidism	25
2.3. Image Processing in Nuclear Medicine	26
2.3.1. Image quality in nuclear medicine	29
2.3.2. Image analysis and processing in nuclear medicine	31

2.3.3. Digital images	31
2.3.4. Types of digital images – MatLab	33
2.4. Matlab simulation and programming in thyroid MatLab image tool	34
2.4.1. Image processing techniques – MatLab	35
2.4.2. Contrast enhancement	35
2.4.3. Organ contour	36
2.4.4. Image interpolation	37
2.4.5. Image filtering	38
2.4.6. Filtering in MatLab	41
2.5. Previous studies	42
Chapter three : Material and Method	
3.1 Materials	44
3.2. Methods:	44
3.2.1 Study duration	44
3.2.2. Study place	44
3.2.3. Sampling	44
3.2.4. Methods of data Collection	44
3.2.4.1. Steps of segmentation technique	44
3.2.5. Methods of data analysis	46
3.2.6. Method of data storage	46
3.2.7. Ethical issue	46
Chapter four : Results	
4.1. First image	47
4. 2. Second image	52
Chapter five : Discussion and Conclusion and Recommendation	
5.1 Discussion	57
5.2 Conclusion	59
5.3 Recommendation	59
5.4 References	61

List of figures:

Figure 2.1	Anatomic distribution of lymph nodes that drain the thyroid gland	6
Figure 2.2	A schematic representation of iodine metabolism in the thyroid gland	7
Figure 2.3	Normal ^{99m} Tc thyroid scan	9
Figure 2.4	Subtle cold nodule	10
Figure 2.5	Lingual ectopic thyroid	10
Figure 2.6	Graves' disease	12
Figure 2.7	Multinodular goiter	13
Figure 2.8	Autonomously functioning thyroid nodule	16
Figure 2.9	Subacute thyroiditis	22
Figure 2.10	Mediastinal goiter	24
Figure 2.11	A digital image is a 2D array of pixels	32
Figure 2.12	Basics steps of frequency domain filtering	39
Figure 2.13	Illustration of filtering process in spatial domain	40
Figure 3.1	Segmentation steps	45
Figure 4-1	Original thyroid gland image	47
Figure 4-2	Entire thyroid gland	48
Figure 4-3	Dilated Image	49
Figure 4-4	Filled Interior Gaps image	49
Figure 4-5	clear border image	50
Figure 4-6	Smoothen Object image	51
Figure 4-7	outlined original image of thyroid	51
Figure 4-8	Original thyroid gland image	52
Figure 4-9	Entire thyroid gland	53
Figure 4-10	Dilated Image	54
Figure 4-11	Filled Interior Gaps image	54
Figure 4-12	clear border image	55
Figure 4-13	Smoothen Object image	56
Figure 4-14	outlined original image of thyroid	56

List of abbreviation:

PTU	propylthiouracil
TSH	thyroid stimulating hormone
T4	thyroxine
T3	triiodothyronine
Tg	thyroglobulin
TRH	thyrotropin-releasing hormone
RAIU	radioactive iodine uptake
FNA	fine needle aspiration
CT	Computed Tomography
MRI	Magnetic resonance imaging
MNG	multinodular goiter
DTC	differentiated thyroid cancer
Gy	Gray
AFTN	autonomously functioning thyroid nodules
HCG	chorionic gonadotropin
rhTSH	recombinant human TSH
CHT	Congenital hypothyroidism
Voxels	Volume elements
FBP	Filtered Back-Projection
DMSA	De-Methylo-Sulfo-Acid
MDP	Methylo-Di-Phosphonate
SNR	signal-to-noise-ratio
Pixels	picture elements
FoV	Field of View
RGB	Red, Green and Blue