



شبكة المعلومات الجامعية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ





شبكة المعلومات الجامعية



شبكة المعلومات الجامعية

التوثيق الالكتروني والميكرو فيلم

جامعة عين شمس

التوثيق الالكتروني والميكرو فيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون أية تغيرات



يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %



شبكة المعلومات الجامعية



بعض الوثائق الأصلية تالفة



شبكة المعلومات الجامعية



بالرسالة صفحات
لم ترد بالأصل

Computer-Aided Diagnostic Tools for Dental Radiograph

by

Eman Mohamed Saied Mohamed Khier Dieb

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
In
Systems and Biomedical Engineering

✓/copy

B
1-292



FACULTY OF ENGINEERING, CAIRO UNIVERSITY.
GIZA, EGYPT.
2008

Computer-Aided Diagnostic Tools for Dental Radiograph

by

Eng. Eman Mohamed Saied Mohamed Khier Dieb

**A Thesis Submitted to the
Faculty of Engineering at Cairo University
in partial Fulfillment of the Requirements for the
Degree of MASTER
in Systems and Biomedical Engineering**

Under the supervision of

Assist. PROF. DR. YASSER M. KADAH
Dep. of Systems and Biomedical Engineering,
Faculty of Engineering, Cairo University.

Assist. PROF DR. NAHED H. SOLOUMA
Laser Research Institute, Cairo University

**FACULTY OF ENGINEERING, CAIRO UNIVERSITY.
GIZA, EGYPT.
2008**

Computer-Aided Diagnostic Tools for Dental Radiograph

by

Eman Mohamed Saied Mohamed Khier Dieb

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in partial Fulfillment of the Requirements for the
Degree of MASTER
in Systems and Biomedical Engineering

Under the supervision of

Approved by the
Examining Committee

Prof. Dr. Sayed M. AlSherbiny

Dep. of Systems and Biomedical Engineering, Faculty of Engineering, Helwan, Helwan
University.

S. El-Sherbiny

Prof. Dr. Abdullah Sayed Ahmed

Dep. of Systems and Biomedical Engineering, Faculty of Engineering, Cairo University.

Abdullah Sayed Ahmed

Prof. Dr. Yasser M. Kadah

Dep. of Systems and Biomedical Engineering, Faculty of Engineering, Cairo University.

Yasser M. Kadah

Assist. Prof. Dr. Nahed H. Solouma
Laser Research Institute, Cairo University

Nahed Solouma

FACULTY OF ENGINEERING, CAIRO UNIVERSITY.
GIZA, EGYPT.

ACKNOWLEDGMENTS

First of all, thanks to ALLAH, the most helpful and merciful.

My deepest and most sincere gratitude goes to my supervisor, Prof. DR. Yasser M. Kadah , Assist. Prof. of Systems and Biomedical Engineering Dep. , Cairo University, for his advice and help.

I would like to thank Assist. Prof. Dr. Nahed H. Solouma, Assist., Prof. of Laser Research Institute, Cairo University, for her precious guidance and scientific inspiration.

I would like also to thank Dr. Naglaa Abdel-Wahed. Oral Radiology Dept., Faculty of Oral & Dental Medicine, Cairo University, for her valuable materials that are used in this study.

Many thanks go to all my friends especially Eng. Ghada who helped me so much to finish this thesis.

Finally my most heartfelt thanks go to my parents and my sisters who strengthened me to do this work and for my husband for his patience and support.

This thesis is to my daughter, Aisha whose image needs no enhancement.

TABLE OF CONTENTS

	Page
Acknowledgement	iv
Tables of contents	v
List of figures	vii
List of abbreviations	x
Abstract	xi
Chapter 1 Introduction	1
1.1 Problem definition	2
1.2 Thesis objective	4
1.3 Thesis organization	4
Chapter 2 Background and Literature Review	8
2.1 Dental Radiograph	9
2.1.1 Introduction	9
2.1.2 Fundamentals of Dental Radiology	9
2.1.3 Basic Procedures	10
2.1.4 Faulty Radiographs	11
Chapter 3 Materials and Methods	17
3.1 Introduction	18
3.2 Materials	19
3.3 Methods	23
3.3.1 Preprocessing Filters	23
3.3.1.1 Spatial filtering	23
3.3.1.1 A) Mean filtering	25
3.3.1.1 B) Gaussian smoothing	26
3.3.1.1 C) Sobel Filter	29
3.3.1.1 D) Prewitt Filter	31
3.3.1.1 E) Unsharp masking	33
3.3.1.1 F) The Laplacian Filter	34
3.3.1.1 G) Laplacian of Gaussian Filter	35
3.3.1.2 Smoothing	38
3.3.1.2 A) Ideal Low Pass Filter	39
3.3.1.2 B) Gaussian Low Pass Filter	39
3.3.1.2 C) Butterworth Low Pass Filter	40
3.3.1.3 Sharpening	41
3.3.1.3 A) Ideal High Pass Filter	41
3.3.1.3 B) Gaussian High Pass Filter	42
3.3.1.3 C) Butterworth High Pass Filter	42

3.3.1.4 Noise Removal	43
3.3.2 Contrast Enhancement	46
3.3.2.1 Intensity Transformations	46
3.3.2.1 A) Binarization:	46
3.3.2.1 B) Image Negatives	47
3.3.2.1 C) Log Transformation	48
3.3.2.1 D) Contrast Stretching	49
3.3.2.2 Histogram Equalization	50
3.3.2.3 Power-law Transformation	53
3.3.3 Information Extraction	57
3.3.4 Calibration	59
3.3.4.1 Introduction	59
3.3.4.2 Step-wedge phantom	60
3.3.4.3 Calibration Techniques	61
3.3.4.3 A) Calibration 1st technique	61
3.3.4.3 B) Calibration 2nd technique	62
3.3.5 Image Compression	66
3.3.6 Region of Interest	69
3.3.7 Rotation	70
3.3.8 Zooming	71
 Chapter 4 Results	 74
4.1 Introduction	75
4.2 Acquisitions and Display	75
4.3 Processing to identify defects	76
4.4 Processing For Image Enhancement	77
4.4.1 System menu	78
4.4.2 System buttons	85
4.4.3 Panels	86
 Chapter 5 Conclusion and Future work	 89
Conclusion	90
Future work	91
 Appendix A: Background Of X-ray Machine	 93
 References	 102