

**FOREIGN BODY DETECTION USING FUZZY
HISTOGRAM HYPERBOLIZATION (FHH) IMAGE
ENHANCEMENT SYSTEM**

FINAL YEAR PROJECT THESIS

Project Thesis submitted in part fulfillment of the
Bachelor of Computer Science (Hons.) with the supervision of my supervisor

Dr. Noor Elaiza Abdul Khalid

Computer Science Department

Faculty of Computer and Mathematical Sciences

Universiti Teknologi MARA

ACKNOWLEDGEMENT

First of all, all praises and thanks to Allah, Lord of al-Mighty, for His Guidance and will, for the revelation of some of His knowledge for me in the successful to write this research.

Many thanks to my lovely family and special friends for never quit in giving me full support, understanding and courage throughout the research without hassle.

This research would also not be possible and successful without the help and support from my supervisor, Dr. Noor Elaiza Abdul Khalid and also act as my course coordinator. Many thanks to her for giving instructions, advices, motivation, support and guide the research in obtaining a good research. Also thanks to my second course coordinator Dr. Fakhrol Hazman Bin Yusof that guide me during this research.

Finally, a deepest gratitude goes to my course colleagues of CS230 for their help and others who have, in one way or others, given me invaluable help, assistance and advice. And to the respondents for the cooperation they gave. Last but not least, to the seniors who have shared their knowledge. Thank you very much.

ABSTRACT

Image enhancement is a very powerful tool to improve the quality of an image for human viewing. It can reduce the noise, blurring and increasing the contrast range of an image. Medical images such as x-ray image usually present characteristics like low contrast of image ratios. Therefore, foreign body in soft tissue is very difficult to detect especially involve foreign materials that is non-radiopaque such as rubber, wood and thorn. This paper introduces foreign body detection using Fuzzy Histogram Hyperbolization image enhancement system. The objectives of this project are to design and develop an image enhancement by using Fuzzy Histogram Hyperbolization (FHH) technique and require interpretation and feedback from a expertise evaluator about the effectiveness of the output result image. The scope of this project is limited to the patient with suspected fishbone impaction in a part of human body like esophagus area. In the future, this project will help doctor to identify present fish bone within the esophagus from x-ray images to avoid serious complications cause by fish bone.

Keywords: Image enhancement, Fuzzy Histogram Hyperbolization, non- radiopaque.

TABLE OF CONTENTS

	Page
Approval	ii
Declaration	iii
Acknowledgement	iv
Abstract	v
List of Tables	ix
List of Figures	x
Chapter 1: Introduction	1
1.1 Project Background	1
1.2 Problem Statement	3
1.3 Project Objective	3
1.4 Project Scope	4
1.5 Project Significant	4
1.6 Summary	4
Chapter 2: Literature Review	5
2.1 Introduction	5
2.2 Foreign Body	6
2.2.1 Type of Foreign Body	6
2.2.2 Area of Suspected the Foreign Body	7
2.2.3 Detecting of Foreign Body	8
2.2.4 Removing the Foreign Body	10
2.3 Image Enhancement	12
2.3.1 Noise reduction	12
2.3.1.1 Fuzzy Filtering	13
2.3.1.2 Fuzzy Derivative and Fuzzy Smoothing	13
2.3.1.3 Image Sharpening	14

2.3.1.4	Morphological Filter	15
2.3.1.5	Median Filter	15
2.3.2	Contrast Enhancement	16
2.3.2.1	Histogram Equalization Approaches	16
2.3.2.2	Adaptive Morphological	18
2.3.2.3	Fuzzy wavelet and contourlet transforms	19
2.3.2.4	Fuzzy Histogram Hyperbolization	20
2.3.2.5	Wavelet	20
2.4	Summary	21
Chapter 3: Methodology		22
3.1	Introduction	22
3.2	Overview Framework	23
3.3	Gathering Information	27
3.4	System Requirement	30
3.4.1	Determine the Hardware To Be Used	30
3.4.2	Determine the software to be used	31
3.5	Data Collection	32
3.6	System Design and Development	33
3.6.1	Processing	34
3.6.2	Post- Processing	37
3.6.2.1	Image Fuzzification	39
3.6.2.2	Modification of Membership Function	41
3.6.2.3	Image Defuzzification	42
3.7	Summary	43
Chapter 4: Result and Finding		44
4.1	Research Plan	44
4.2	Experiment Result	44
4.3	Testing Result	46
4.4	Result Analysis	48