# Detection of Lung Cancer Nodules through CT scan Image

By

(Saqib Riaz Maken) 01-133102-232

(Rabnawaz Gondal ) 01-133102-229

Supervised by Sir Imran Fareed



**Session: 2010 – 2014** 

A Report is submitted to Department of Computer Software and Engineering Bahria University, Islamabad In partial fulfillment of requirement for the degree of BCE

### **Dedication**

We would like to dedicate this project to our loving parents who have been a constant support and shoulder to rely on. They have given us inspiration to tackle each and every task with enthusiasm and determination. Their love, affection and belief in us have made us push our limits and aim to aspire a lot more in life.

# Acknowledgements

We thank Allah Almighty for His countless and endless blessings for guiding us and everyone who helped us during the graduation project starting with endless thanks to our supervisor Sir Imran Fareed for providing our group with valuable information and advices. Thanks for the continuous support and kind communication. We dedicate this project to our parents and our supervisor Sir Imran Fareed.

#### **Abstract**

Lung cancer is very dangerous for health. It mostly occurs in men due to smoking. It is important to detect the lung cancer nodules and give them to doctors so that they start treatment. This project is design to standardize the nodules detection method which helps doctors to exam the CT images of lungs cancer more quickly and provide more efficient results. This project also solves the problem of intrapersonal and interpersonal variation which doctors face during the examination of CT scan images of lungs cancer. In this project, we will detect the lung cancer nodules through CT scan images. For this we provided two techniques. In first technique is thresholding and in second technique we are using feature extraction that is principal component analysis (PCA). Classifier is also used in second technique that is support vector machine (SVM) .Evaluation of both techniques will be based on by comparing and testing the both techniques.

## **Table of Contents**

Certifi	cate	i
Dedica	ation	ii
Acknowledgements		iii
Abstract		iv
Table	of Contents	V
List of	Figures	viii
List of	Tables	X
1.	Introduction	10
1.1	Incentive	10
1.2	Aim and Objectives	11
1.3	Challenges Faced	11
1.3.1	Exact Location of Nodules	12
1.3.2	Input Image for Support Vector Machine	12
1.3.3	Passing parameter for Strel Command	12
1.4	Structure of Thesis	13
2.	<b>Lungs Cancer Nodule Detection</b>	14
2.1	Lungs cancer	14
2.2	Causes of lung cancer	14
2.2.1	Smoking	14
2.2.2	Passive smoking	15
2.3	Symptoms of lungs cancer	15
2.3.1	Coughing	15
2.3.2	Dyspnea	16
2.3.3	Wheezing	16
2.3.4	Chronic Fatigue	16
2.4	Stages of lung cancer	16
2.5	Pulmonary Nodules	17
3.	Literature Review	18
4.	Implementation / Design	22
4.1	System overview	22
4.1.2	Image acquisition	23
4.1.3 4.1.4	Convert RGB image to Gray image	23 24
4.1.4	Gray Threshold Marphological Operation	24 25
4.2.1	Morphological Operation	25 25
4.2.1	Removing the useless region Reconstructing the image	
4.2.2	Binary Thresholding	25 26
4.2.3	Showing Nodules	20 27
4.2.4	Second technique	28
4.3.1	Flow chart of second technique	28
4.3.1	Extraction of nodules	26 29
4.3.3	Normalization	30

4.4	Conversion into row Images	30
4.4.1	Apply Principal Component Analysis	30
4.5	Mathematical Analysis	32
4.5.1	Apply Support Vector Machine	33
5.	System Testing and Evaluation	34
5.1	Dataset	34
5.1.1	First technique	34
5.1.2	Second Technique	39
6.	Conclusion	40
7.	References	41
8.	Graphical user interface	43
8.1	GUI screen shots	44

# List of Figures

Figure 1: sample image for lung cancer	10
Figure 2: lung cancer due to smoke	15
Figure 2.1: CT scan lung image	17
Figure 4.1: Flow chat of first technique	23
Figure 4.2: Gray Scale Image	24
Figure 4.3: Gray threshold image	24
Figure 4.4: image after applying removing border	25
Figure 4.5: Reconstructing the image	26
Figure 4.6: Image of binary thresholding	27
Figure 4.7: Showing Nodules	27
Figure 4.8 shows the flowchart of the proposed solution for second technique	28
Figure 4.9(a): Extraction of nodules	29
Figure 4.9(b): Extraction of nodules	29
Figure 4.9(c): Extraction of nodules	29
Figure 4.10(a): Normalization of nodules	30
Figure 4.10(b): Normalization of nodules	30
Figure 4.10(c): Normalization of nodules	30
Figure 5.1.1(a): Showing the original image	35
Figure 5.1.1(b): Showing the detected nodules	36

# **List of Tables**

- Table 1:
- Table 2
- Table 3:
- Table 4:
- Table 5:
- Table 6:
- Table 7 –