Introduction

.[ ]

X-Ray (Mammography)

.[ ]

Digital Mammography

.[   ]

.

Hardware

Software

.[ ]

.

Calcifications

$[Ca^{++}]$.[ ]

(   )

(   ) $.((1)$

Benign

Malignant.   :

Shape   Distribution [   ].

[ ]

Image Features

(١)   .[٦،٧]

.

Auto Diagnosis Algorithms

.[٥،٨،١٣،١٤]   (CAD)

Image Measurements

.

.((١)   )

)

(

.(١)

(١)   :

.(   )

Malignant Ca^{++}		Benign Ca^{++}	
Distribution	Shape	Distribution	Shape
Clustered	Micro-Ca^{++} (μCa^{++})	Isolated	Skin Ca^{++}
Regional	Fine	Scattered	Vascular Ca^{++}
Segmental	Branching	Multiple groups	Rod-Like Ca^{++}
	Heterogeneous	Popcorn Ca^{++}	Round Ca^{++}
	Amorphous		Spherical or Lucent Centered Ca^{++}

(١)   .[٦،٧]

Research Material

١٦   Region of Interest

(ROI)   .

٨   ٨   .(   )

ROI

.

((١))

.(   )

(LS) LUMISCAN ١٠٠.

Spatial Resolution   ١٠٠μm

Pixel Depth   ١-Byte.

PIII   ١-GHz   ٢٥٦Mbyte

Windows ٩٨.

Image Processing.   Image Pro-Pluse(Ver.١،٣).

Excel Office ٢٠٠٠   .

[٩].

(١٠٠٪   ).   (٢)

((١))

.

(٢)
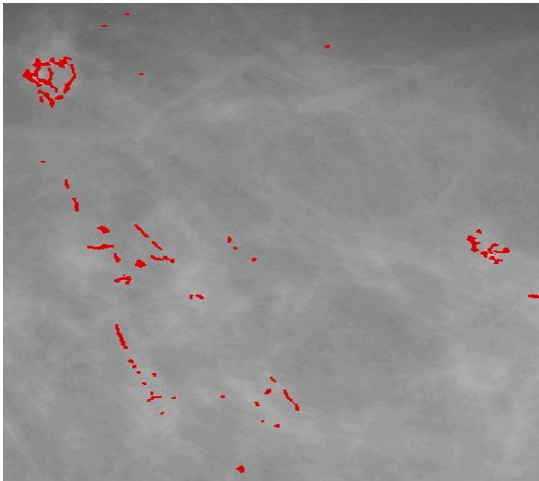
Theory

Image Measurements

Pattern Recognition   .[١٠]

.

( )   .(( )   )

( )   .

Phantom   .

Description	Measurement
.	Area
.	Length
.	Major Axis
.	Minor Axis
.Centriod	Maximum Diameter
.Centriod	Minimum Diameter
.	Perimeter
Centroid .	Minimum Radius
Centroid	Maximum Radius
$Roundness = \dfrac{Perimeter^2}{4\,\pi\,Area}$:	Roundness

(٢)   .

(٣)

)

Irregular Shape) [٦،٧].

( )

(٣)

.

)

Roundness)   .

.(٢)

:
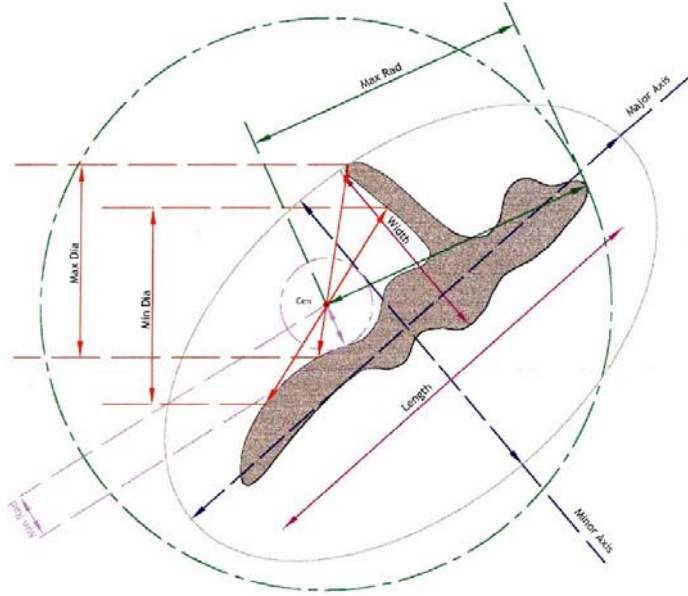
$$Roundness = \frac{Perimeter^2}{4\,\pi\,Area} = \frac{(2\,\pi\,r)^2}{4\,\pi\left(\pi\,r^2\right)} = 1$$

١

$.\left(Roundness > 1\right)$

Research theory	Measurement
	Area
	Length
	Major Axis
	Minor Axis
	Maximum Diameter
	Minimum Diameter
.	Perimeter
	Minimum Radius
	Maximum Radius
.	Roundness
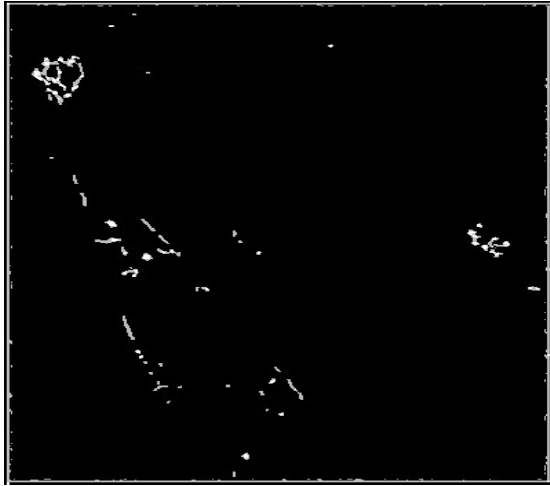
(٣) : .

.　　　　　–　　　–　　　–

(　　)　　　　　　　　　　　　( )

:Method

:　　.

CTE=١٠٠٠٠

$\frac{[\quad]}{[\quad]} \times ١٠٠\%$ (٢)

(١)

Threshold   .

("١")

Ca^{++} Mask   ("٠")

.(١،٢)   (٤)

.   ١٦

(٢)

.

.Image Pro Pluse

.   Excel ٢٠٠٠   Work Sheet

.((٥ و ٦))   (   )

Results

.

.

:

.   Average   (٢-   Maximum   (١-

(٥ و ٦)   .[ ]   ١cm

.(   )

(♦)

(▲)   .

Maximum (Roundness)

(٥)

Average Value (Roundness)

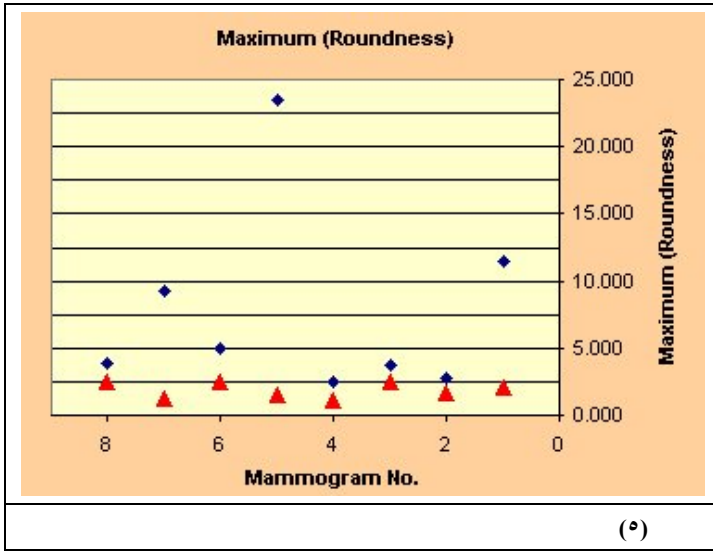**(٦)**
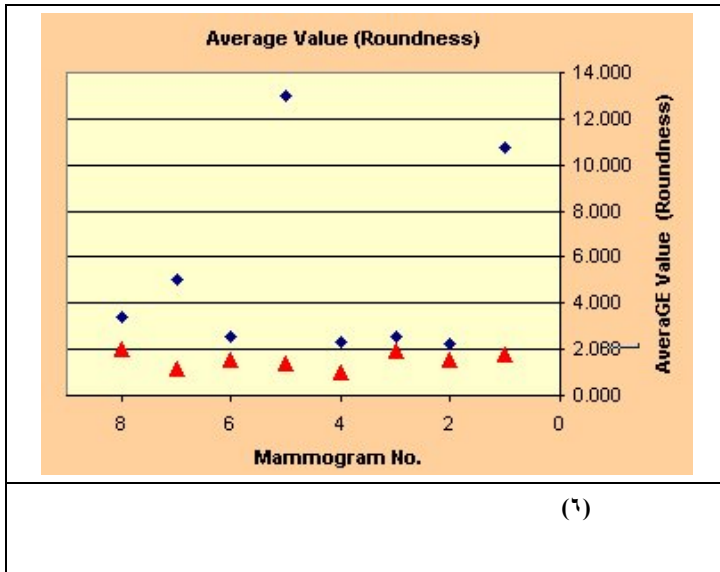
.

.

.

.

.

.Quantitatively   Contrast

.

:

٢٢٠

$$Contrast_{Average} = \frac{Malignant_{Min} - Benign_{Max}}{Malignant_{Min} + Benign_{Max}} * 100$$

:

$Malignant_{Min}$.

$Benign_{Max}$.

:

$$Contrast_{Maximum} = \frac{Malignant_{Min} - Benign_{Max}}{Malignant_{Min} + Benign_{Max}} * 100$$
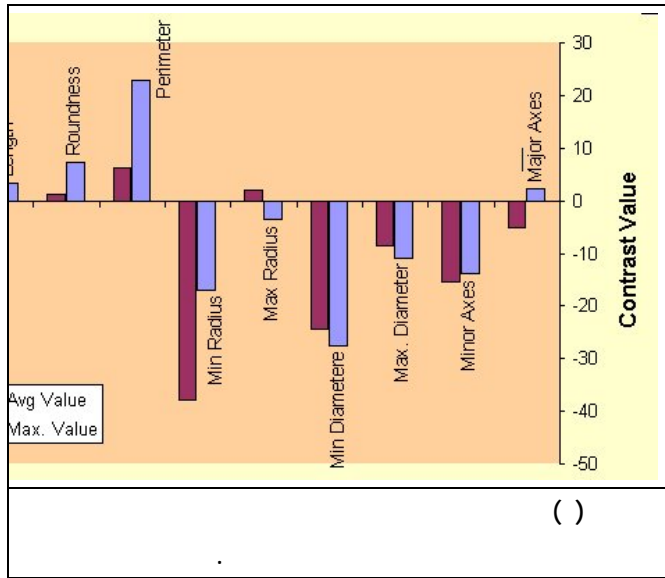
:

$Malignant_{Min}$.

$Benign_{Max}$.

(   )   .

)

(

.

.   (٧)

.

Perimeter
Roundness
Length

30
20
10
Contrast Value
0
-10
-20
-30
-40
-50

Min Radius
Max Radius
Min Diametere
Max. Diameter
Minor Axes
Major Axes

Avg Value
Max. Value

( )

.

Discussion

(٧)   :

.

Perimeter   Roundness (

.(

.

.

.

.

Heterogeneous & Irregular   Branching

.   .

.

.

.

:

●

(

.(

.

Threshold (TH)

.

:

$$TH = \frac{Malignant_{Min} + Benign_{Max}}{2}$$

:

$Malignant_{Min}$

.

$Benign_{Max}$

.

: (٤)

.

Threshold Value	Measurement
,	Length
,	Major Axis
,	Perimeter
,	Roundness

.

Summary

.[,]

.

.[ ]

.[   ]

.

.

.

.

.

Future Work:

.

١.Hermon C. and Beral V. (١٩٩٦). Breast Cancer mortality rates are levelling off or beginning to decline in many western countries: analysis of time trends, age-cohort and age-period models of breast cancer mortality in ٢٠ countries. *British Journal of Cancer*, Vol. ٧٣, ٩٥٥-٩٦٠.

٢.Sutton D., Whitehouse RW., Jenkins JPR., Daveis ER., Murfitt J. and Lees WR. (١٩٩٨). A Text Book of Radiology and Imaging, ٦th edition, Churchill Livingstone, London, U.K., pp ١٤٢٩-١٤٦٠.

٣.D'Orsi CJ. and Karellas A. (١٩٩٥). On line for digital mammography. Lancet, Vol. ٣٤٦, ٢٦٣-٢٦٤.

٤.Vyborny CL. (١٩٩٤). Can computers help radiologists read mammograms. Radiology, Vol. ١٩١, ٣١٥-٣١٧.

٥.Feig SA. and Yaffe MJ. (١٩٩٦). Current status of digital mammography. Seminars in Ultrasound, CT, and MRI. Vol. ١٧, No. ٥, ٤٢٤-٤٤٣.

٦.Sickles EA. (١٩٨٦). Breast Calcifications: Mammographic Evaluation. Radiology, Vol. ١٦٠, ٢٨٩-٢٩٣.

٧.D'Orsi CJ. and Kopans DB. (١٩٩٣). Mammographic Feature Analysis. Seminars In Roentgenology, Vol. XXVIII, No.٣, ٢٠٤-٢٣٠.

٨.Wu Y., Giger ML., Doi K., Vyborney CJ., Schmidt RA. and Metz CE. (١٩٩٣). Artificial neural network in mammography: Application to decision making in the diagnosis of breast cancer. Radiology, Vol. ١٨٧, ٨١-٨٧.

٩.Al-Hinnawi A.R. (٢٠٠٣). The Design of a Computer Auto Detection (CAD) Algorithm for Clustered Micro-Calcifications in Mammograms. Damascus University Journal for Engineering Sciences, Vol. ١٩-٢.

١٠.   Russ J.C. (١٩٩٥), The Image Processing Handbook ٢nd Edition. Chapter ٨, pp:٤٨١-٥٢٦, CRC Press, London.

١١.   Jiang Y., Nishikawa RM., Wolverton DE., Metz CE., Giger ML., Schmidt RA., VyborneyCJ., and Doi K. (١٩٩٦). Malignant and benign clustered micro-calcifications: automated feature analysis and classification. Radiology, Vol. ١٩٨, ٦٧١-٦٧٨.

١٢.   Ng KH., Bradley DA., Looi LM. and Lim YF. (١٩٩٣) Microradiography as a quantitative detection technique for micro-calcifications. Physica Medica, Vol. IX, No. ٢-٣, ٢١٥-٢١٧.

13. Papadopoulos A., Fotiadis D.I., and Likas A. (٢٠٠٣). An Automated microcalcification detection system based on hybrid neural network classifier. Artificial Intelligence in Medicine, Vol ٢٥, pp: ١٤٩-١٦٧.

14. Salfity M.F., Kaufmann G.H., Granitto P., and Ceccatto H.A. (٢٠٠٠). Simposio Argentino de Informatica y Salud, ١-٥ September, pp:٤١-٤٦.

/ /