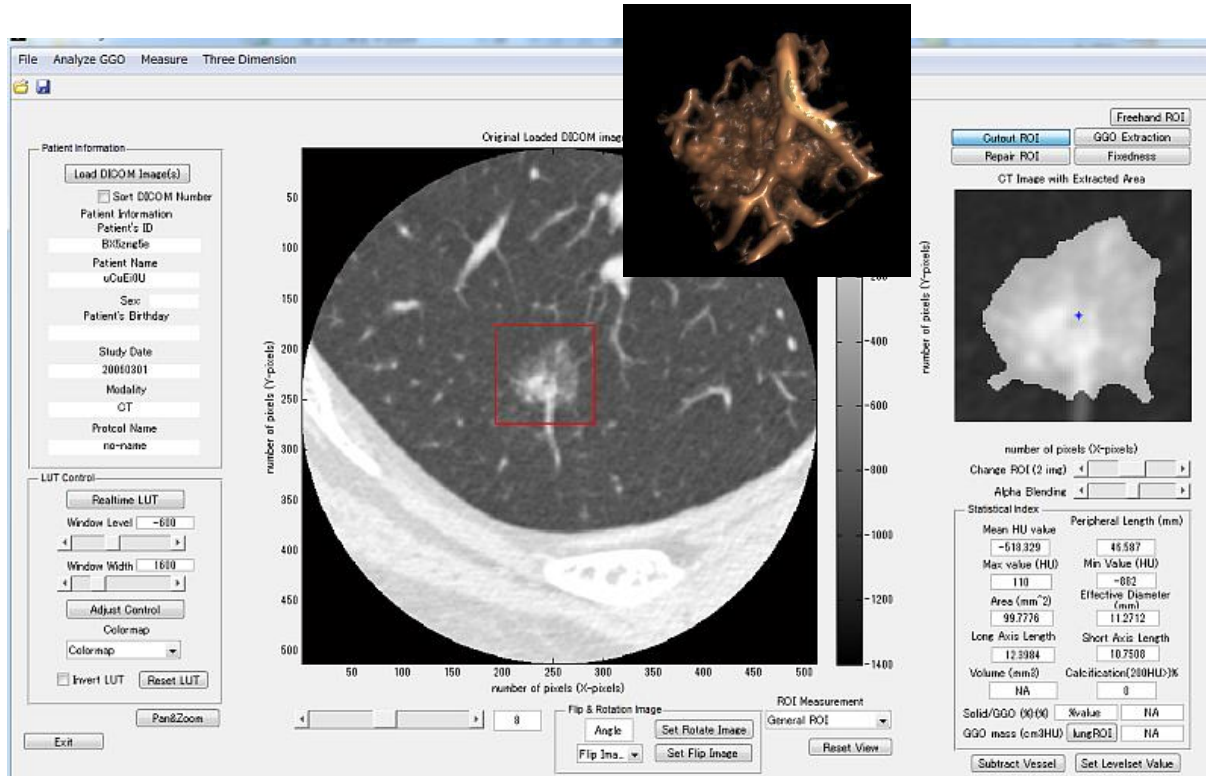


# WatchinGGO:

Ground Glass Opacity Analyzer for Lung Cancer Research and Education using Computed Tomography.

*Tumor Imaging Biomarker for Researchers*



*Quantitative measurement for solid nodule, mixed GGOs and pure GGOs.*

*Image and Volume analysis of nodules and GGOs.*

*Automatic or semi-automatic extraction of GGOs using user-selectable segmentation.*

*Automatic cross measure of diameter in GGOs (auto long and short axis)*

*Shape and Density descriptor using 2D and 3D texture measures.*

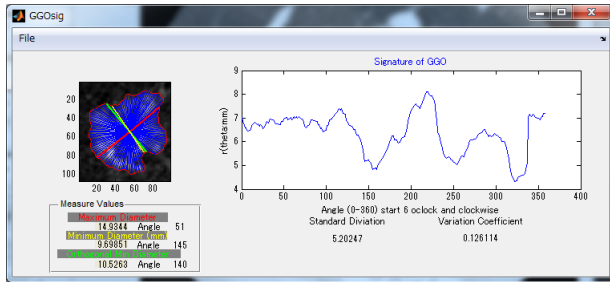
*Auto selection of maximum area slice of GGO and min GGO*



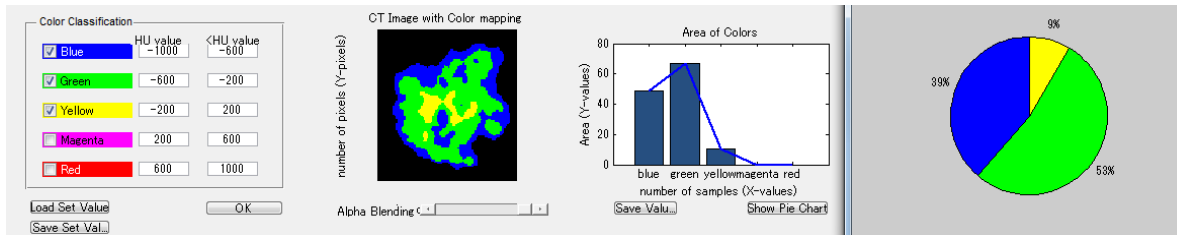
Developed by LISIT, Co., Ltd.

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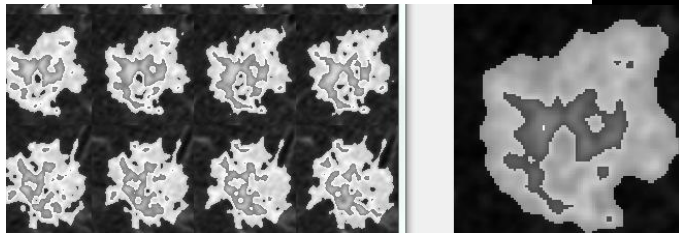
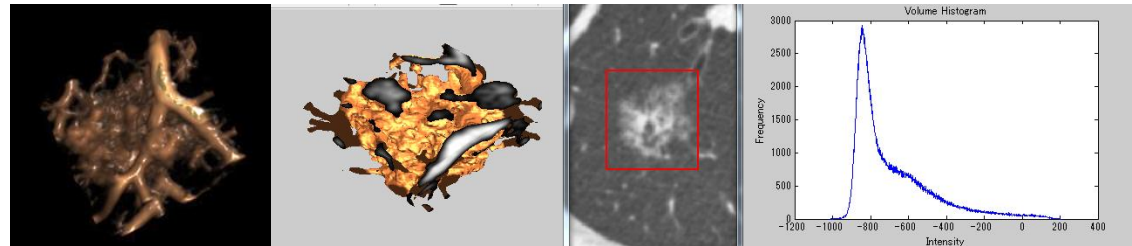


Automatic cross measure of diameter in GGOs (long and short axis) and shape curves show the degree of complex of tumor shape.

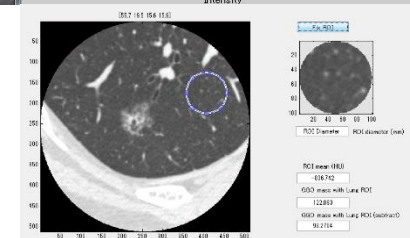


Quantitative density analysis for solid nodule, mixed GGOs and pure GGOs.

Three dimensional volume histogram for each images, VOI, GGOs.



subtract solid or vessels. Percent rate between pure GGOs and solid parts

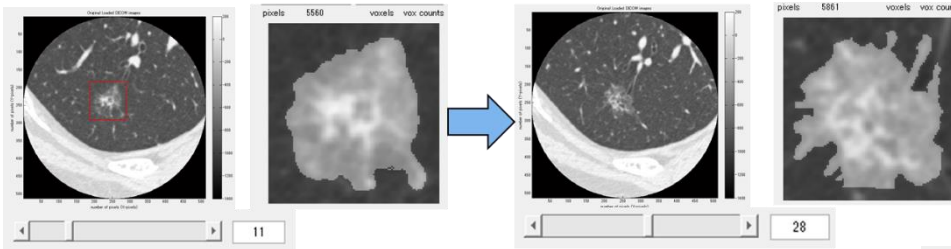


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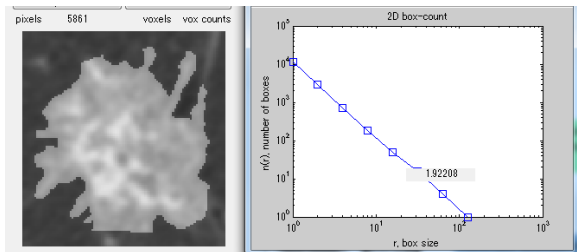


Orthogonal MPR selection of tumor VOI  
3D slice superimpose of three orthogonal slices

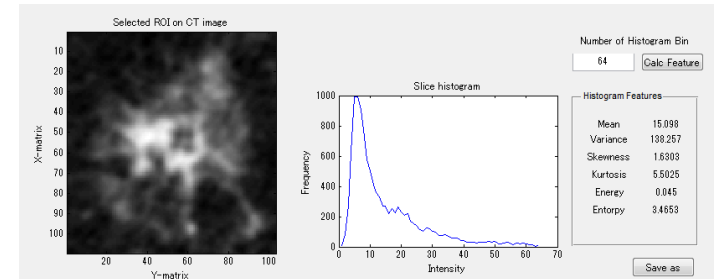


Automatic selection of maximum area of mixed GGOs

GGO texture measure.  
Lung tumor imaging biomarker



Fractal Analysis of GGOs



# Fractal Analysis of Cancer Tumor

File Analyze GGO(2D) Measure Three Dimension Information

Original Loaded DICOM images

Patient Information

Load DICOM Image(s)

Sort DICOM Number

Patient Information

Patient's ID

BX52ng5e

Patient Name

uCuEi0U

Sex:

Patient's Birthday

Study Date

20060301

Modality

CT

Protocol Name

no-name

LUT Control

Realtime LUT

Window Level -600

Window Width 1600

Adjust Control

Colormap

Level Window

Invert LUT

Reset LUT

Pan&Zoom

Exit

ROI Measurement

General ROI

ROI

Angle

Set Rotate Image

Flip Image

Set Flip Image

Reset View

Freehand ROI

Cutout ROI

Repair ROI

pixels 5819

GGO Extraction

Fixedness

voxels vox counts

number of pixels (Y-pixels)

number of pixels (X-pixels)

Change ROI (2 img)

Alpha Blending

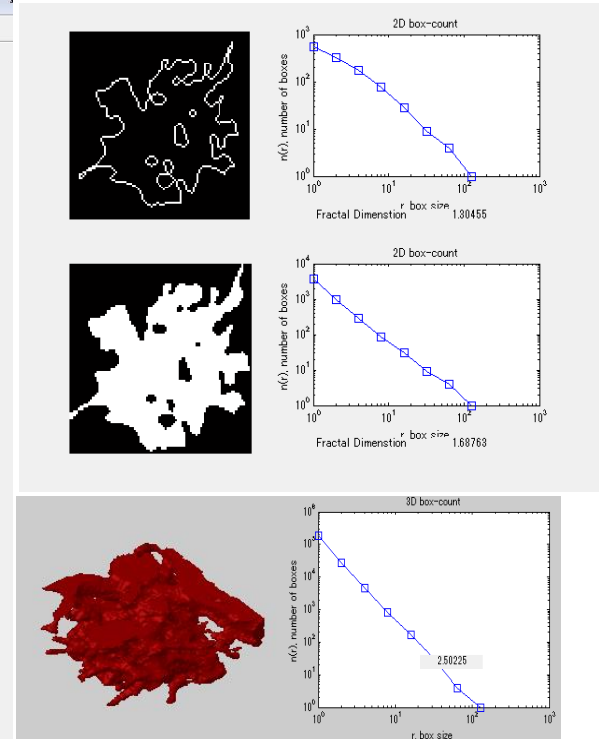
Statistical Index

Mean HU value	Peripheral Length (mm)
-461.299	NA
Max value (HU)	Min Value (HU)
134	-878
Area (mm <sup>2</sup> )	Effective Diameter (mm)
NA	9.8198
Long Axis Length	Short Axis Length
NA	NA
Volume (mm <sup>3</sup> )	Calcification(200HU)%
495.8	NA
Solid/GGO (%)	%value
NA	NA
GGO mass (cm <sup>3</sup> HU)	JuneROI
267.088	267.088

VOI cutting

Set as VOI

ピクセル情報 (X, Y) 強度



2D contour, 2D binary and 3D binary Fractal Dimension using Box-counting

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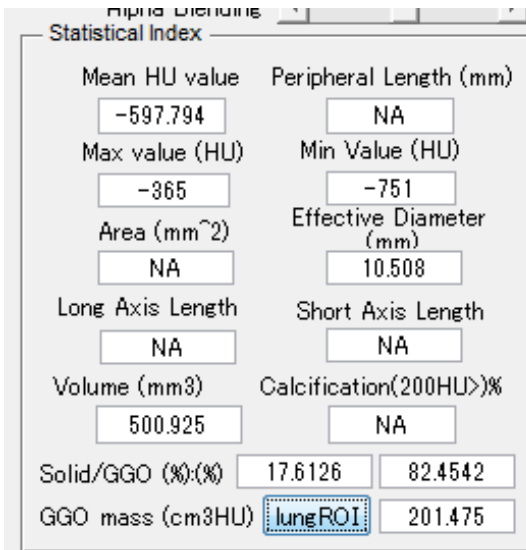
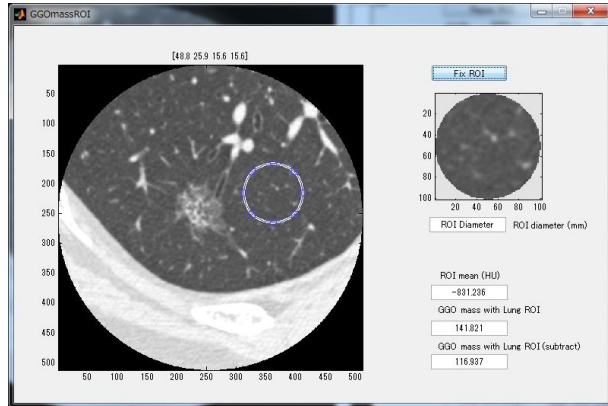


TABLE 1: Known Masses and Densities

	Density (g/cm <sup>3</sup> )	Standard Deviation	
		CT No.	%
Pine	0.367	-659.2	3.63
Mahogany	0.512	-513.4	13.60
Poplar	0.540	-496.5	1.76
Maple	0.693	-360.8	1.36
Ash	0.788	-251.8	2.93
Teak	0.798	-242.7	1.89
Water	1.000	-5.5	0.52
Graphite A	1.678	+424.3	1.36
Mean standard deviation			1.96

the major role of Compton interactions in CT imaging. The plot of the cube of the effective atomic number reflected the role of photoelectric interactions and gave the poorest correlation. Their study also demonstrated the very good correlation that exists (and would be expected from the above equations) between CT numbers and physical density (g/cm<sup>3</sup>). What they did not recognize, or at least did not describe, was that they had created a calibration curve for their particular EMI scanner. To the extent established by the limited experiment described below, for every CT number obtained from a properly calibrated scanner, there exists a unique corresponding value of physical density.

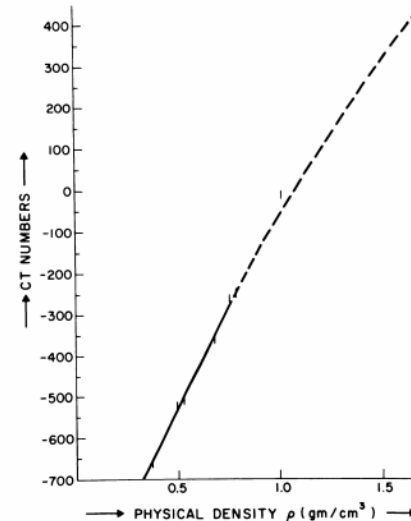


Fig. 1.—Calibration curve for Ohio-Nuclear 2010 CT scanner.

CT quotient (CTQ = CT number +1,000, mg/mL)

CT number (HU) = [weight (mg)/volume (mL)]-1,000

GGO-mass (cm<sup>3</sup> HU)= (HU+1000) × Volume

Mull RT. Mass estimates by computed tomography: physical density from CT numbers. AJR Am J Roentgenol 1984;143:1101-1104.



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The volume doubling times were calculated using the method originally described by Schwartz

