

depending on the subjective feeling of the doctor, not depending on the objective facts.

Therefore, a quantification method capable of quantifying the margin feature, the cysts feature, the calcifications feature, the echoic feature and the heterogenesis feature of a tumor, and an imaging method capable of imaging the margin feature, the cysts feature, the calcifications feature and the heterogenesis feature of a tumor are required in the field.

SUMMARY OF THE INVENTION

~~The object~~Embodiments of the present invention ~~is seek~~ to provide a quantification method capable of quantifying the margin feature, the cysts feature, the calcifications feature, the echoic feature and the heterogenesis feature of a tumor, for the diagnosis of a doctor.

~~The object~~Embodiments of the present invention ~~is also seek~~ to provide an imaging method capable of imaging the margin feature, the cysts feature, the calcifications feature and the heterogenesis feature of a tumor, for the diagnosis of a doctor.

~~To achieve the object~~In an embodiment, the quantification method of the margin feature of a tumor of the present invention, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of: (A) retrieving a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region; (B) displaying the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image; (C) retrieving a center

of gravity of the tumor contour annular region, defining a section line extending outwardly from the center of gravity and penetrating the tumor

contour annular region, and providing a measured line segment being on the section line and in the tumor contour annular region; (D) calculating the moving variance of the gray scale of each of the plurality pixel points on the measured line segment; and (E) quantifying the margin feature of the tumor on the section line, based on the moving variance of the gray scale of each of the plurality pixel points on the measured line segment.

~~To achieve the object~~In another embodiment, the imaging method of the margin feature of a tumor, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of: (A) retrieving a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region; (B) displaying the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image; (C) retrieving a center of gravity of the tumor contour annular region, defining a section line extending outwardly from the center of gravity and penetrating the tumor contour annular region, and providing a measured line segment being on the section line and in the tumor contour annular region; (D) calculating the moving variance of the gray scale of each of the plurality pixel points on the measured line segment; and (E) defining a margin imaging upper limit and a margin imaging lower limit based on the moving variance of the gray scale of each of the plurality pixel points on the measured line segment, and imaging the margin feature of the tumor on the section line in coordination with a rainbow level.

~~To achieve the object~~According to an aspect, the quantification method of the cysts feature of a tumor of the present invention, executed by a computer system including a display device, a processor, a memory, an

input device, and a storage device, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of: (A) retrieving, by a processor, a tumor contour and a tumor

contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region; (B) displaying, by the display device, the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image, wherein the tumor inner region is the region enclosed by the tumor contour; (C) calculating, by the processor, both the minimum value and the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region; and (D) quantifying, by the processor, a cysts feature of the tumor in the tumor inner region, based on both a threshold value defined by the minimum value and the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region plus a multiple, not equal to one, of the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region, and calculating, by the processor, the ratio of the region having the cysts feature over the tumor inner region, wherein when one of the plurality pixel points in the tumor inner region has a gradient value of the gray scale smaller than the threshold value, the pixel point is defined as belonging to the cysts feature; and (E) displaying, by the display device, an image pattern including the cysts feature of the tumor.

~~To achieve the object~~ According to an aspect, the imaging method of the cysts feature of a tumor of the present invention executed by a computer system including a display device, a processor, a memory, an input device and storage device, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of: (A) retrieving, by a processor, a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in

the tumor contour annular region; (B) displaying, by the display device, the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image wherein the tumor inner region is the region enclosed by the tumor contour; (C) calculating, by the processor, both the minimum value and the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region; and (D) defining, by the processor, a cysts imaging upper limit and a cysts imaging lower limit, ~~based on both the minimum value and the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region,~~ and imaging the cysts feature of the tumor in the tumor inner region based on said defining, and displaying, by the display device, an image pattern including the cysts feature of the tumor, wherein the cysts imaging upper limit is a value defined by the minimum value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region plus a multiple, not equal to one, of the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region, and the cysts imaging lower limit is the minimum value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region, wherein the cysts imaging upper limit is greater than the cysts imaging lower limit, and wherein when the gradient value of the gray scale of a pixel point in the tumor inner region is between the cysts imaging upper limit and the cysts imaging lower limit, the pixel point is defined as belonging to the cysts feature.

~~To achieve the object~~According to an aspect, the quantification method of the calcifications feature of a tumor of the present invention, executed by a computer system including a display device, a processor, a

memory, an input device and a storage device, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of: (A) retrieving, by a processor, a tumor contour

and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region; (B) displaying, by a display device, the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image wherein the tumor inner region is the region enclosed by the contour; (C) calculating, by the processor, both the minimum value and the standard deviation of the gradient value of the gray scale of the plurality of pixel points in the tumor inner region; (D) retrieving, by the processor, a cysts region in the tumor inner region based on a threshold value defined by both the minimum value and the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region plus a multiple, not equal to one, of the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region; (E) calculating, by the processor, the maximum value, the standard deviation, and the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region; and (F) quantifying, by the processor, the calcifications feature of the tumor in the tumor inner region, based on the ~~threshold~~maximum value, ~~the standard deviation, and defined by~~ the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region plus a multiple, not equal to one, of the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region, and calculating, by the processor, the ratio of the region having the calcifications feature over the tumor inner region but outside the cysts region, wherein when one of the plurality pixel points in the tumor inner region but outside the cysts region has a gradient value of

the gray scale larger than the threshold value, the pixel point is defined as belonging to the calcifications feature; and (G) displaying, by the display device, an image pattern including the calcifications feature of the tumor.

~~To achieve the object~~According to an aspect, the imaging method of the calcifications feature of a tumor of the present invention, executed by a computer system including a display device, a processor, a memory, an input device, and a storage device, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of: (A) retrieving, by a processor a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region; (B) displaying ~~the~~by a display device, a tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image, wherein the tumor inner region is the region enclosed by the tumor contour; (C) calculating, by the processor, both the minimum value and the standard deviation of the gradient value of the gray scale of the plurality of pixel points in the tumor inner region; (D) retrieving, by the processor, a cysts region in the tumor inner region based on ~~both~~ a threshold value defined by the minimum value and

~~the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region plus a multiple, not equal to one, of the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region;~~ (E) calculating, by the processor, the maximum value, the standard deviation, and the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region, based on the gradient value of the gray scale of each of the plurality pixel points in the tumor inner region but outside the cysts region; and (F) defining, by the processor, a calcifications imaging upper limit and a calcifications imaging lower limit, ~~based on the maximum value, the standard deviation, and the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region,~~ and imaging thea calcifications feature of the tumor in the tumor inner region but outside the cysts region based on said defining, and displaying, by the display device, an image pattern including the calcifications feature of the tumor, wherein the calcifications imaging upper limit is the maximum value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region and the calcifications imaging lower limit is the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region plus a multiple, not equal to one, of times of the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region, and wherein when the gradient value of the gray scale of a pixel point in the tumor inner region but outside the cysts region is between the calcifications imaging upper limit and the calcifications imaging lower limit, the pixel point is defined as the image of the calcifications feature.

~~To achieve the object~~In an embodiment, the quantification method of the echoic feature of a tumor of the present invention, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of: (A) retrieving a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region; (B) displaying the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image; (C) calculating the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region; (D) selecting a reference block in the tumor external region, and calculating the mean value of the gradient value of the gray scale of the plurality pixel points in the reference block based on the gradient value of each of the gray scale of the plurality pixel points in the reference block; and (E) quantifying the echoic feature of the tumor based on the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region and the mean value of the gradient

value of the gray scale of the plurality pixel points in the reference block.

~~To achieve the object~~In an embodiment, the quantification method of the heterogenesis feature of a tumor of the present invention, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of: (A) retrieving a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region; (B) displaying the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image; (C) defining a plurality of reference masks from the plurality pixel points in the tumor inner region, each of the plurality of reference masks including a reference pixel point and plural pixels points adjacent to the reference pixel point; (D) calculating the local mean and the local variance of the gradient value of the gray scale of the reference mask for each of the plurality of reference masks; (E) calculating the variance of local mean, the mean of local variance, and the variance of local variance of the gradient value of the gray scale of the reference mask of the plurality of reference masks; and (F) quantifying the heterogenesis feature of the tumor by the calculation of a heterogenesis index for each of the plurality of the reference masks, based on at least one selected from a group consisted of the variance of local mean, the mean of local variance, and the variance of local variance of the gradient value of the gray scale of the reference mask for each of the plurality of reference masks. To achieve the object, the imaging method of the heterogenesis feature of a tumor of the present invention, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of: (A) retrieving a tumor

contour and a tumor contour annular region from the gray scale image,
wherein the tumor

WHAT IS CLAIMED IS:

1. A quantification method of the margin feature of a tumor, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of:

(A) retrieving a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region;

(B) displaying the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image;

(C) retrieving a center of gravity of the tumor contour annular region, defining a section line extending outwardly from the center of gravity and penetrating the tumor contour annular region, and providing a measured line segment being on the section line and in the tumor contour annular region;

(D) calculating the moving variance of the gray scale of each of the plurality pixel points on the measured line segment; and

(E) quantifying the margin feature of the tumor on the section line, based on the moving variance of the gray scale of each of the plurality pixel points on the measured line segment.

2. The quantification method as claimed in claim 1, wherein the step (D) includes a step (D1), calculating the standard deviation of the moving variance of the gray scale of the plurality pixel points on the measured line segment.

3. The quantification method as claimed in claim 2, wherein the step (D) includes a step (D2) following the step (D1), calculating the mean value of the moving variance of the gray scale of the plurality pixel points on the measured line segment.

4. The quantification method as claimed in claim 3, wherein the step (E) includes a step (E1), defining a threshold value for identifying the blur of the margin feature of the tumor on the section line, based on the standard deviation and the mean value of the moving variance of the gray scale of the plurality pixel points on the measured line segment.

5. The quantification method as claimed in any one of claims 1 to 4, further comprises a step (F) following the step (E), changing the orientation of the section line to scan the whole margin of the tumor, for quantifying all the margin feature of the tumor.

6. An imaging method of the margin feature of a tumor, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of:

(A) retrieving a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region;

(B) displaying the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image;

(C) retrieving a center of gravity of the tumor contour annular region, defining a section line extending outwardly from the center of gravity and

penetrating the tumor contour annular region, and providing a measured line segment being on the section line and in the tumor contour annular region;

(D) calculating the moving variance of the gray scale of each of the plurality pixel points on the measured line segment; and

(E) defining a margin imaging upper limit and a margin imaging lower limit based on the moving variance of the gray scale of each of the plurality pixel points on the measured line segment, and imaging the margin feature of the tumor on the section line in coordination with a rainbow level.

7. The imaging method as claimed in claim 6, wherein the step (D) includes a step (D1), calculating the standard deviation of the moving variance of the gray scale of the plurality pixel points on the measured line segment.

8. The imaging method as claimed in claim 7, wherein the step (D) includes a step (D2) following the step (D1), calculating the mean value of the moving variance of the gray scale of the plurality pixel points on the measured line segment.

9. The imaging method as claimed in claim 8, wherein the step (E) includes a step (E1), defining the margin imaging upper limit and the margin imaging lower limit, based on the standard deviation and the mean value of the moving variance of the gray scale of the plurality pixel points on the measured line segment.

10. The imaging method as claimed in claim 9, wherein the margin imaging upper limit is the mean value of the moving variance of the gray

scale of the plurality pixel points on the measured line segment, plus 3 times of the standard deviation of the moving variance of the gray scale of the plurality pixel points on the measured line segment; and the margin imaging lower limit is the mean value of the moving variance of the gray scale of the plurality pixel points on the measured line segment, minus 3 times of the standard deviation of the moving variance of the gray scale of the plurality pixel points on the measured line segment.

11. The imaging method as claimed in any one of claims 6 to 10, wherein the rainbow level is a level changing continuously from red to purple, through orange, yellow, green, blue, and indigo; and when a pixel point on the measured line segment having the moving variance of the gray scale larger than or equal to the margin imaging upper limit, the pixel point is covered by a red block while the margin feature of the tumor is imaged.

12. The imaging method as claimed in any one of claims 6 to 11, wherein the rainbow level is a level changing continuously from red to purple, through orange, yellow, green, blue, and indigo; and when a pixel point on the measured line segment having the moving variance of the gray scale smaller than or equal to the margin imaging lower limit, the pixel point is covered by a purple block while the margin feature of the tumor is imaged.

13. The imaging method as claimed in any one of claims 6 to 12, wherein the rainbow level is a level changing continuously from red to purple, through orange, yellow, green, blue, and indigo; and when a pixel point on the measured line segment having the moving variance of the gray

scale between the margin imaging upper limit and the margin imaging lower limit, the pixel point is covered by a block having the color selected from the rainbow level corresponding to the relation among the moving variance of the gray scale of the pixel point, the margin imaging upper limit and the margin imaging lower limit, while the margin feature of the tumor is imaged.

14. The imaging method as claimed in any one of claims 6 to 13, further comprises a step (F) following the step (E), changing the orientation of the section line to scan the whole margin of the tumor, for imaging all the margin feature of the tumor.

15. A quantification method of the cysts feature of a tumor, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of:

(A) retrieving a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region;

(B) displaying the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image;

(C) calculating both the minimum value and the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region; and

(D) quantifying the cysts feature of the tumor in the tumor inner region, based on both the minimum value and the standard deviation of the

gradient value of the gray scale of the plurality pixel points in the tumor inner region.

16. The quantification method as claimed in claim 15, wherein the step (D) includes a step (D1), defining a threshold value for calculating the ratio of the region having the cysts feature over the tumor inner region, based on both the minimum value and the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region.

17. An imaging method of the cysts feature of a tumor, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of:

(A) retrieving a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region;

(B) displaying the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image;

(C) calculating both the minimum value and the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region; and

(D) defining a cysts imaging upper limit and a cysts imaging lower limit based on both the minimum value and the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region, and imaging the cysts feature of the tumor in the tumor inner region.

18. The imaging method as claimed in claim 17, wherein the cysts imaging upper limit is the minimum value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region, plus 0.1 times of the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region; and the cysts imaging lower limit is the minimum value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region.

19. The imaging method as claimed in claim 17 or 18, when a pixel point in the tumor inner region having the gradient value of the gray scale between the cysts imaging upper limit and the cysts imaging lower limit, the pixel point is covered by a peach block while the cysts feature of the tumor is imaged.

20. The imaging method as claimed in any one of claims 17 to 19, further comprises the below steps following the step (D):

(E) defining a plurality of reference masks from the plurality pixel points in the tumor inner region, each of the plurality of reference masks including a reference pixel point and plural pixels points adjacent to the reference pixel point, wherein the gradient value of the gray scale of the reference pixel point is between the cysts imaging upper limit and the cysts imaging lower limit; and

(F) covering the reference pixel point and all the plural pixels points with a peach block while the gradient value of the gray scale of at least one of the plural pixels points is between the cysts imaging upper limit and the cysts imaging lower limit and the cysts feature of the tumor is imaged.

21. The imaging method as claimed in claim 20, further comprises the step (G) following the step (F):

(G) removing the peach block covering the reference pixel point and all the plural pixels points while only the gradient value of the gray scale of the reference pixel point is between the cysts imaging upper limit and the cysts imaging lower limit and the cysts feature of the tumor is imaged.

22. A quantification method of the calcifications feature of a tumor, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of:

(A) retrieving a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region;

(B) displaying the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image;

(C) calculating both the minimum value and the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region;

(D) retrieving a cysts region in the tumor inner region based on both the minimum value and the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region;

(E) calculating the maximum value, the standard deviation, and the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region; and

(F) quantifying the calcifications feature of the tumor in the tumor inner region, based on the maximum value, the standard deviation, and the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region.

23. The quantification method as claimed in claim 22, wherein the step (F) includes a step (F1), defining a threshold value for calculating the ratio of the region having the calcifications feature over the tumor inner region, based on the maximum value, the standard deviation, and the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region.

24. An imaging method of the calcifications feature of a tumor, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of:

(A) retrieving a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region;

(B) displaying the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image;

(C) calculating both the minimum value and the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region;

(D) retrieving a cysts region in the tumor inner region based on both the minimum value and the standard deviation of the gradient value of the

gray scale of the plurality pixel points in the tumor inner region;

(E) calculating the maximum value, the standard deviation, and the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region, based on the gradient value of the gray scale of each of the plurality pixel points in the tumor inner region but outside the cysts region; and

(F) defining a calcifications imaging upper limit and a calcifications imaging lower limit based on the maximum value, the standard deviation, and the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region, and imaging the calcifications feature of the tumor in the tumor inner region.

25. The imaging method as claimed in claim 24, wherein the calcifications imaging upper limit is the maximum value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region; and the calcifications imaging lower limit is the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region, plus 2.8 times of the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region.

26. The imaging method as claimed in claim 24 or 25, when a pixel point in the tumor inner region but outside the cysts region having the gradient value of the gray scale between the calcifications imaging upper limit and the calcifications imaging lower limit, the pixel point is covered by a yellow block while the calcifications feature of the tumor is imaged.

27. A quantification method of the echoic feature of a tumor, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of:

(A) retrieving a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region;

(B) displaying the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image;

(C) calculating the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region;

(D) selecting a reference block in the tumor external region, and calculating the mean value of the gradient value of the gray scale of the plurality pixel points in the reference block based on the gradient value of each of the gray scale of the plurality pixel points in the reference block; and

(E) quantifying the echoic feature of the tumor based on the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region and the mean value of the gradient value of the gray scale of the plurality pixel points in the reference block.

28. The quantification method as claimed in claim 27, the echoic feature of the tumor is quantified by dividing the difference between the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region and the mean value of the gradient value of

the gray scale of the plurality pixel points in the reference block with the mean value of the gradient value of the gray scale of the plurality pixel points in the reference block.

29 The quantification method as claimed in claim 27 or 28, the tumor has the hyperechoic feature while a resulting value of the quantification method is larger than or equal to 0.

30. The quantification method as claimed in any one of claims 27 to 29, the tumor has the hypoechoic feature while a resulting value of the quantification method is smaller than 0.

31. A quantification method of the heterogenesis feature of a tumor, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of:

(A) retrieving a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region;

(B) displaying the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image;

(C) defining a plurality of reference masks from the plurality pixel points in the tumor inner region, each of the plurality of reference masks including a reference pixel point and plural pixels points adjacent to the reference pixel point;

(D) calculating the local mean and the local variance of the gradient value of the gray scale of the reference mask for each of the plurality of

reference masks;

(E) calculating the variance of local mean, the mean of local variance, and the variance of local variance of the gradient value of the gray scale of the reference mask of the plurality of reference masks; and

(F) quantifying the heterogenesis feature of the tumor by the calculation of a heterogenesis index for each of the plurality of the reference masks, based on at least one selected from a group consisted of the variance of local mean, the mean of local variance, and the variance of local variance of the gradient value of the gray scale of the reference mask for each of the plurality of reference masks.

32. The quantification method as claimed in claim 31, wherein each of the plurality reference masks includes 25 pixel points.

33. The quantification method as claimed in claim 31 or 32, wherein the step (F) includes a step (F1), defining a threshold value for calculating the ratio of the region having the heterogenesis feature over the tumor inner region, based on the heterogenesis index for each of the plurality of the reference masks.

34. The quantification method as claimed in any one of claims 31 to 33, wherein the heterogenesis index is a function of the variance of local mean.

35. The quantification method as claimed in any one of claim 31 to 34, wherein the heterogenesis index is a function of the mean of local variance.

36. The quantification method as claimed in any one of claims 31 to

35, wherein the heterogenesis index is a function of the variance of local variance.

37. The quantification method as claimed in any one of claims 31 to 36, wherein the heterogenesis index is a function of the ratio of the variance of local variance divided by the variance of local mean.

38. The quantification method as claimed in any one of claims 31 to 37, wherein the heterogenesis index is a function of the ratio of the mean of local variance divided by the variance of local variance.

39. The quantification method as claimed in any one of claims 31 to 38, wherein the heterogenesis index is a function of the ratio of the mean of local variance divided by the variance of local mean.

40. An imaging method of the heterogenesis feature of a tumor, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of:

(A) retrieving a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region;

(B) displaying the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image;

(C) defining a plurality of reference masks from the plurality pixel points in the tumor inner region, each of the plurality of reference masks including a reference pixel point and plural pixels points adjacent to the reference pixel point;

(D) calculating the variance of the gradient value of the gray scale of the reference mask for each of the plurality of reference masks;

(E) calculating the mean variance of the gradient value of the gray scale of the reference mask of the plurality of reference masks;

(F) calculating of a heterogenesis index for each of the plurality of the reference masks, based on the variance of the gradient value of the gray scale of the reference mask for each of the plurality of reference masks;

(G) calculating the maximum value, the minimum value, the mean value, and the standard deviation of the heterogenesis indices of the plurality of the reference masks, based on the heterogenesis index for each of the plurality of the reference masks; and

(H) defining a heterogenesis imaging upper limit and a heterogenesis imaging lower limit based on the maximum value, the minimum value, the mean value, and the standard deviation of the heterogenesis indices of the plurality of the reference masks, and imaging the heterogenesis feature of the tumor in the tumor inner region in coordination with a rainbow level.

41. The imaging method as claimed in claim 40, wherein the heterogenesis imaging upper limit is the maximum value of the heterogenesis indices of the plurality of the reference masks; and the heterogenesis imaging lower limit is the mean value of the heterogenesis indices of the plurality of the reference masks, minus 0.1 times of the standard deviation of the heterogenesis indices of the plurality of the reference masks.

42. The imaging method as claimed in claim 40 or 41, wherein the

rainbow level is a level changing continuously from red to purple, through orange, yellow, green, blue, and indigo; and when a reference mask having the heterogenesis index equal to the heterogenesis imaging upper limit, the reference pixel point of the reference mask is covered by a red block while the heterogenesis feature of the tumor is imaged.

43. The imaging method as claimed in any one of claims 40 to 42, wherein the rainbow level is a level changing continuously from red to purple, through orange, yellow, green, blue, and indigo; and when a reference mask having the heterogenesis index smaller than or equal to the heterogenesis imaging lower limit, the reference pixel point of the reference mask is covered by a purple block while the heterogenesis feature of the tumor is imaged.

44. The imaging method as claimed in any one of claims 40 to 43, wherein the rainbow level is a level changing continuously from red to purple, through orange, yellow, green, blue, and indigo; and when a reference mask having the heterogenesis index between the heterogenesis imaging upper limit and the heterogenesis imaging lower limit, the reference pixel point of the reference mask is covered by a block having the color selected from the rainbow level corresponding to the relation among the heterogenesis index of the reference mask, the heterogenesis imaging upper limit and the heterogenesis imaging lower limit, while the heterogenesis feature of the tumor is imaged.

45. The imaging method as claimed in any one of claim 40 to 44, wherein each of the plurality reference masks includes 25 pixel points.

WHAT IS CLAIMED IS:

1. A quantification method of a cysts feature of a tumor executed by a computer system including a display device, a processor, a memory, an input device, and a storage device, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of:

(A) retrieving, by a processor, a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region;

(B) displaying, by a display device, the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image, wherein the tumor inner region is the region enclosed by the tumor contour;

(C) calculating, by the processor, both the minimum value and the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region;

(D) quantifying, by the processor, a cysts feature of the tumor in the tumor inner region based on a threshold value defined by the minimum value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region plus a multiple, not equal to one, of the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region, and calculating, by the processor, the ratio of the region having the cysts feature over the tumor inner region,

wherein when one of the plurality pixel points in the tumor inner region has a gradient value of the gray scale smaller than the threshold value, the pixel point is defined as belonging to the cysts feature; and

(E) displaying, by the display device, an image pattern including the cysts feature of the tumor.

2. An imaging method of a cysts feature of a tumor executed by a computer system including a display device, a processor, a memory, an input device, and a storage device, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of:

(A) retrieving, by a processor, a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region;

(B) displaying, by a display device, the tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image, wherein the tumor inner region is the region enclosed by the tumor contour;

(C) calculating, by the processor, both the minimum value and the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region; and

(D) defining, by the processor, a cysts imaging upper limit and a cysts imaging lower limit, imaging a cysts feature of the tumor in the tumor inner region based on said defining, and displaying, by the display device, an image pattern including the cysts feature of the tumor,

wherein the cysts imaging upper limit is a value defined by the minimum value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region plus a multiple, not equal to one, of the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region, and the cysts imaging lower limit is the minimum value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region,

wherein the cysts imaging upper limit is greater than the cysts imaging lower limit, and

wherein when the gradient value of the gray scale of a pixel point in the tumor inner region is between the cysts imaging upper limit and the cysts imaging lower limit, the pixel point is defined as belonging to the cysts feature.

3. The imaging method as claimed in claim 2, wherein, when a pixel point in the tumor inner region having the gradient value of the gray scale between the cysts imaging upper limit and the cysts imaging lower limit, the pixel point is covered by a peach block after the cysts feature of the tumor is imaged.

4. The imaging method as claimed in claim 2, further comprising steps (E) and (F) following (D):

(E) defining a plurality of reference masks from the plurality pixel points in the tumor inner region, each of the plurality of reference masks including a reference pixel point and plural pixels points adjacent to the reference pixel point, wherein the gradient value of the gray scale of the reference pixel point is between the cysts imaging upper limit and the cysts imaging lower limit; and

(F) covering the reference pixel point and all the plural pixels points with a peach block after the gradient value of the gray scale of at least one of the plural pixels points is between the cysts imaging upper limit and the cysts imaging lower limit and the cysts feature of the tumor is imaged.

5. The imaging method as claimed in claim 4, further comprising a step (G) following the step (F):

(G) removing the peach block covering the reference pixel point and all the plural pixels points while only the gradient value of the gray scale of the reference pixel point is between the cysts imaging upper limit and the cysts imaging lower limit and the cysts feature of the tumor is imaged.

6. A quantification method of a calcifications feature of a tumor executed by a computer system including a display device, a processor, a memory, an input device, and a storage device, applying on a gray scale image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of:

(A) retrieving, by a processor, a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region;

(B) displaying, by a display device, a tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image, wherein the tumor inner region is the region enclosed by the tumor contour;

(C) calculating, by the processor, both the minimum value and the standard deviation of the gradient value of the gray scale of the plurality of pixel points in the tumor inner region;

(D) retrieving, by the processor, a cysts region in the tumor inner region based on a threshold value defined by the minimum value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region plus a multiple, not equal to one, of the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region;

(E) calculating, by the processor, the maximum value, the standard deviation, and the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region;

(F) quantifying, by the processor, a calcifications feature of the tumor in the tumor inner region based on a threshold value defined by the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region plus a multiple, not equal to one, of the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region, and calculating, by the processor, the ratio of the region having the calcifications feature over the tumor inner region but outside the cysts region,

wherein when one of the plurality pixel points in the tumor inner region but outside the cysts region has a gradient value of the gray scale lager than the threshold value, the pixel point is defined as belonging to the calcifications feature; and

(G) displaying, by the display device, an image pattern including the calcifications feature of the tumor.

7. An imaging method of a calcifications feature of a tumor executed by a computer system including a display device, a processor, a memory, an input device, and a storage device, applying on a gray scale

image consisting of a plurality of pixel points and displaying at least one tumor therein, comprising the steps of:

(A) retrieving, by a processor, a tumor contour and a tumor contour annular region from the gray scale image, wherein the tumor contour is in the tumor contour annular region;

(B) displaying, by a display device, a tumor contour over the gray scale image for defining a tumor inner region and a tumor external region on the gray scale image, wherein the tumor inner region is the region enclosed by the tumor contour;

(C) calculating, by the processor, both the minimum value and the standard deviation of the gradient value of the gray scale of the plurality of pixel points in the tumor inner region;

(D) retrieving, by the processor, a cysts region in the tumor inner region based on a threshold value defined by the minimum value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region plus a multiple, not equal to one, of the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region;

(E) calculating, by the processor, the maximum value, the standard deviation, and the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region based on the gradient value of the gray scale of each of the plurality pixel points in the tumor inner region but outside the cysts region; and

(F) defining, by the processor, a calcifications imaging upper limit and a calcifications imaging lower limit, imaging a calcifications feature of the tumor in the tumor inner region but outside the cysts region based on said defining, and displaying, by the display device, an image pattern including the calcifications feature of the tumor,

wherein the calcifications imaging upper limit is the maximum value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region and the calcifications imaging lower limit is the mean value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region plus a multiple, not equal to one, of times of the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region, and

wherein when the gradient value of the gray scale of a pixel point in the tumor inner region but outside the cysts region is between the calcifications imaging upper limit and the calcifications imaging lower limit, the pixel point is defined as the image of the calcifications feature.

8. The imaging method as claimed in claim 7, wherein the calcifications imaging upper limit is the maximum value of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region, and the calcifications imaging lower limit is the mean value of the

gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region plus 2.8 times of the standard deviation of the gradient value of the gray scale of the plurality pixel points in the tumor inner region but outside the cysts region.

9. The imaging method as claimed in claim 7, wherein, when a pixel point in the tumor inner region but outside the cysts region having the gradient value of the gray scale between the calcifications imaging upper limit and the calcifications imaging lower limit, the pixel point is covered by a yellow block after the calcifications feature of the tumor is imaged.