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Test Questions
Speckle Tracking Echocardiography (chapters 1 to 4)

Chapter 1: Assessment of Regional Longitudinal Stain by Using Speckle Tracking Echocardiography – A Validation Study

1: Which of the following limits the measurement to some sections of the heart like septum and the free wall during Doppler analysis?
(A): heart translation
(B): heart rotation
(C): active myocardial contraction
(D): all of the above

2: The AFI tool is based on automatic initial selection (within the myocardial wall) of predominant features according to their brightness, size and persistence, and tracking them from one frame to the next.
(A): True (B): False

3: The tracking algorithm causes _____ when the image quality is low.
(A): scattered radiation
(B): artifacts
(C): static
(D): none of the above

4: Echocardiographic examination usually includes _____, by inspecting the changes of length and thickening of each myocardial segment, where each segment comprises the whole width of the myocardial wall.
(A): measurement of elasticity
(B): blood flow rate
(C): qualitative assessment of wall motion
(D): cholesterol buildup chart

5: The ____ allow straightforward recognition of regions of reduced cardiac contractibility.
(A): M-mode maps
(B): H & D curves
(C): Heat units
(D): Histograms

6: Doppler-based techniques do not provide _____ of the heart.
(A): movement
(B): color chart
(C): longitudinal and transverse measurements
(D): none of the above

7: During systole, specifically during the ECG S-wave, the normal SR pattern reflects the _____ in the longitudinal direction and extension in the transversal direction.
(A): myocardial shortening
(B): heart rate
(C): ventricular contractibility

(D): none of the above

8: The advantage of visualizing the Strain and SR as M-mode maps allows examining which of the following?
(A): Peak Strain – SR
(B): Temporal evolution
(C): None of the above
(D): Both A and B

Chapter 2: Strain Measurements Relative to Normal State Enhance the Ability to Detect Non-Transmural Myocardial Infarction

9: Speckle Tracking Echocardiography (STE) is an angle-independent, cost-effective and available tool, developed for automatic evaluation of left ventricular (LV) regional function.
(A): True
(B): False

10: The STE program processes standard echocardiography into which of the following part?
(A): dimensional (2D) gray-scale cine loops
(B): frame-by-frame speckle movement
(C): contrast enhanced images
(D): both A and B

11: In Strain measurements study, which of the following animals were scanned?
(A): Chimpanzees
(B): Rats
(C): Hamsters
(D): None of the above

12: Reducing the noise increases the _____ in Speckle Tracking Echocardiography.
(A): sound waves
(B): spatial resolution
(C): blurring
(D): none of the above

Chapter 3: Speckle Reduction in Echocardiography: Trends & Perceptions

13: Speckle is the low-grained texture-like pattern seen in echocardiography, and indeed in all modalities of clinical ultrasound.
(A): True (B): False

14: The clinical ultrasound is performed in which of the following range?
(A): 1-20 MHz
(B): 21-40 MHz
(C): 41-50 MHz
(D): 51-70 MHz

15: ____ occurs when an acoustic pulse encounters an interface between tissues of differing acoustic impedances.
(A): Refraction
(B): Absorption
(C): Reflection
(D): Evaporation

16: _____ is a change in the direction of propagation when sound waves pass through an interface between media of different propagation speeds.
(A): Refraction
(B): Ionization
(C): Absorption
(D): None of the above

17: Absorption occurs when energy from the acoustic pulse is absorbed into the tissue by conversion to _____ energy.
(A): electric
(B): thermal
(C): magnetic
(D): none of the above

18: Refraction is governed by _____.
(A): Inverse Square law
(B): plank's constant
(C): Snell's law
(D): Faraday's law

19: In echocardiography, _____ is prominent in all cross-sectional views, and its effect is far more significant than additive noise sources such as sensor noise.
(A): speckle noise
(B): contrast resolution
(C): spacial resolution
(D): none of the above

20: Each ultrasound pulse encloses a three dimensional volume which defines the smallest resolvable structure, which is known as the _____.
(A): resolution cell
(B): ion pair
(C): T2 image
(D): atom

21: The reduction of speckle while preserving image structure is a challenging image processing problem, due to the multiplicative-like behavior of speckle.
(A): True (B): False

22: Which of the following is a negative effect of speckle?
(A): spurious 'false-fine' structures
(B): reduced image contrast
(C): eight-fold reduction in lesion detectability
(D): all of the above

23: Which of the following techniques can reduce speckle in Echocardiography?
(A): Compounding approaches
(B): Postacquisition methods
(C): Digital subtraction methods
(D): Both A and B

24: _____ is also known as frame averaging and operates by combining scans performed over time.

(A): Flux gain
(B): Temporal compounding
(C): Lossless compression
(D): None of the above

25: Which of the following adjust the level of filtering at each image location to remove speckle in Echocardiography?
(A): Adaptive filters
(B): Step-wedge filters
(C): Focusing lens
(D): None of the above

26: Which of the following approach replaced pixels with the weighted median of a dynamically sized window?
(A): Air gap techniques
(B): Line focus principle
(C): Adaptive weighted median filter (AWMF)
(D): all of the above

27: Diffusion filtering is an iterative method of smoothing an image, similar in concept to heat diffusion.
(A): True (B): False

28: The _____ isolates local frequency subbands using a quadrature mirror pair of filters.
(A): magnification
(B): wavelet transform method
(C): minification
(D): none of the above

29: The speckle noise is assumed to be either _____ in nature.
(A): Compton scattering
(B): Gaussian or Rayleigh
(C): Pair production
(D): Photoelectric

30: The _____ are used to define a shrinkage map which suppress those wavelet coefficients resulting from noise.
(A): probability density functions (PDFs)
(B): signal to noise ratio (SNR)
(C): modulated transfer functions (MTFs)
(D): none of the above

31: The gradient cannot always precisely separate the image and noise in ultrasound images, as variations due to speckle noise may be larger than those corresponding to underlying image.
(A): True (B): False

32: Which of the following clinical factor needs to be considered when choosing speckle reducing filter?
(A): Speckle Level
(B): Detail Clarity
(C): Overall Quality

(D): all of the above

33: Which of the following is **NOT** a speckle filter for Ultrasound images?
(A): Geometric Filter
(B): PMAD Filter
(C): Step-wedge filter
(D): DPAD filter

34: Which of the following filter produces extremely blurred ultrasound images?
(A): SRAD
(B): PMAD
(C): DPAD
(D): OSRAD

35: The _____ measures the preservation of structural information in the filtering process.
(A): Structural Similarity (SSIM)
(B): Contrast to Noise Ratio (CNR)
(C): H & D curve
(D): none of the above

36: The ____ quantifies the level of contrast between a region of interest and the background.
(A): Spacial resolution
(B): Flux gain
(C): Contrast to Noise Ratio (CNR)
(D): Shadow filtering

37: According to the study, if the main objective is to remove as much speckle as possible, the NMWD filter has the strongest speckle suppression capabilities.
(A): True
(B): False

38: An important aspect of evaluating the quality of speckle reduced echocardiography is that there are often differences between clinical and image processing perspectives.
(A): True (B): False

Chapter 4: Speckle Detection in Echocardiographic Images
39: Which of the following is a major type of ultrasound beam scattering?
(A): diffused
(B): coherent
(C): photoelectric
(D): both A and B

40: The ___ arises when the scatterers in the resolution cell are in phase and causes light or dark spots in the image.
(A): coherent scattering
(B): compton scattering
(C): quantum mottle noise
(D): none of the above

41: _____ is the **most** common statistical model for the envelope signal and assumes that a large number of scatterers per resolution cell exist.
(A): Pair production

(B): Rayleigh distribution
(C): Photo disintegration
(D): None of the above

42: In echocardiography, Rayleigh distribution fits to reflect properties of reflections from blood but fails with complex structures such as myocardial tissue.
(A): True (B): False

43: _____ is a random and deterministic pattern in the image formed by the use of the coherent radiation of a medium containing many scatterers.
(A): Wire mash
(B): Matrix arrangement
(C): Speckle
(D): None of the above

44: Each pixel in an ultrasound image is formed by the back scattered echoes from an approximately ellipsoid called the _____.
(A): TFT plate
(B): region of interest (ROI)
(C): resolution cell
(D): target tissue

45: Speckle has a positive impact on ultrasound imaging.
(A): True (B): False

46: The underlying parameter of the Rayleigh distribution associated with each pixel intensity of the RF image is related to the acoustic properties at the corresponding location called _____.
(A): echogenicity
(B): ionization
(C): magnification
(D): none of the above

47: The _____ in ultrasonic images relies on its ability to model both fully speckle (blood pool) and partially developed speckle (tissue area) situations.
(A): H distribution
(B): I distribution
(C): J distribution
(D): K distribution

48: The RF signal corresponds to the real part of the analytic signal.
(A): True (B): False

49: Speckle detection is a useful input for adaptive speckle suppression algorithms and for use in decorrelation algorithms to estimate the elevational distance between neighboring _____.
(A): Radiofrequency signals
(B): B-scans
(C): magnetic fields
(D): none of the above

50: Data clustering means partitioning data to fuzzy or crisp (hard) subsets.
(A): True (B): False