



Contents lists available at ScienceDirect

Physica Medica

journal homepage: <http://www.physicamedica.com>

Review paper

## Computer aided diagnosis of Coronary Artery Disease, Myocardial Infarction and carotid atherosclerosis using ultrasound images: A review

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## ARTICLE INFO

## Article history:

Received 25 August 2016

Received in Revised form 21 November 2016

Accepted 4 December 2016

Available online xxx

## Keywords:

Computer aided diagnosis  
Coronary Artery Disease  
Myocardial Infarction  
Carotid atherosclerosis  
Thoracic Ultrasound  
Intravascular Ultrasound

## ABSTRACT

The diagnosis of Coronary Artery Disease (CAD), Myocardial Infarction (MI) and carotid atherosclerosis is of paramount importance, as these cardiovascular diseases may cause medical complications and large number of death. Ultrasound (US) is a widely used imaging modality, as it captures moving images and image features correlate well with results obtained from other imaging methods. Furthermore, US does not use ionizing radiation and it is economical when compared to other imaging modalities. However, reading US images takes time and the relationship between image and tissue composition is complex. Therefore, the diagnostic accuracy depends on both time taken to read the images and experience of the screening practitioner. Computer support tools can reduce the inter-operator variability with lower subject specific expertise, when appropriate processing methods are used. In the current review, we analysed automatic detection methods for the diagnosis of CAD, MI and carotid atherosclerosis based on thoracic and Intravascular Ultrasound (IVUS). We found that IVUS is more often used than thoracic US for CAD. But for MI and carotid atherosclerosis IVUS is still in the experimental stage. Furthermore, thoracic US is more often used than IVUS for computer aided diagnosis systems.

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<http://dx.doi.org/10.1016/j.ejmp.2016.12.005>

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**Acronyms**

3G	international mobile telecommunications-2000	EDR	ECG-derived respiration
4g	successor to 3G	ECHONET	echocardiographic healthcare online networking expertise in Tasmania
A	accuracy	EEG	electroencephalograph
A-V	atrio-ventricular	EM	electromagnetic
ADA	American diabetes association	EMG	electromyography
AES	advanced encryption standard	EOG	electrooculography
AF	atrial fibrillation	FAQ	frequently asked questions
AFL	atrial flutter	FB	fusion beat
ApEn	approximate entropy	FD	fractal dimension
ANS	autonomic nervous system	FDDI	fiber distributed data interface
ANN	artificial neural network	FES	functional electrical stimulation
ANSI	American national standards institute	FCM	fuzzy C-means
AHI	apnea/hypopnea index	FIR	finite impulse response
AI	apnea index	FN	false negative
AI	artificial intelligence	FNN	false nearest neighbor
ASM	active shape model	FP	false positive
ANOVA	analysis of variance	FSC	fuzzy sugeno classifier
API	application programming interface	GA	genetic algorithm
AR	autoregressive	GLCM	gray-level co-occurrence matrix
ARMA	autoregressive moving average	GMM	Gaussian mixture model
AT	atrial tachycardia	GPRS	general packet radio service
ATM	automated teller machine	GSM	global system for mobile communications
AUC	area under curve	GUI	graphical user interface
BA	Bayesian averaging	H	hurst exponent
BCI	brain computer interface	HDNT	hospital digital networking technologies
BMI	body mass index	HIHM	home integrated health monitor
BPA	back-propagation algorithm	HIPAA	health insurance portability and accountability act
BPSO	binary particle swarm optimization	HMA	haemorrhages and microaneurysms
BPM	beats per minute	HOS	higher order spectra
BSN	biomedical sensor network	HR	heart rate
CAD	computer-aided diagnosis	HRUS	High Resolution Ultrasound
CAD	Coronary Artery Disease	HRV	Heart Rate Variability
CaD	capacity dimension	HSDPA	High-Speed Downlink Packet Access
CAN	cardiovascular autonomic neuropathy	I	Internal
CART	classification and regression tree	ICA	independent component analysis
CD	correlation dimension	IEEE	institute of electrical and electronic engineers
CEUS	contrast enhanced ultrasound	IIR	infinite impulse response
CI	confidence interval	IR	infrared
CHF	congestive heart failure	IT	information technology
CHS	community health centers	IVUS	Intravascular Ultrasound
CLDA	clustering linear discriminant analysis algorithm	JMMB	journal of mechanics in medicine and biology
CM	clustered microcalcifications	KS	kolmogorov sinai
CSP	communicating sequential processes	K-NN	K-nearest neighbour
CS	compressed sampling	LBP	local binary pattern
CT	curvelet transform	LC	linear classifier
CPA	communicating process architectures	LCP	local configuration pattern
CPC	cardiopulmonary coupling	LDA	linear discriminant analysis
CSA	central sleep apnea	LLE	largest lyapunov exponet
CSME	clinically significant macular edema	LTE	long term evolution
CSR	cambridge silicon radio	LRNC	lipid-rich necrotic core
CVD	cardiovascular disease	LV	left ventricular
CWT	continuous wavelet transform	MA	moving average
D2H2	distributed diagnosis and home healthcare	MC	clustered microcalcifications
DAGSVM	directed acyclic graph support vector machine	NCSME	non-clinically significant macular edema
DCT	discrete cosine transform	NDDF	normal density discriminant function
DET	determinism	MI	Myocardial Infarction
DII	diabetic integrated index	ML	maximum likelihood
DM	diabetes mellitus	MLPNN	multilayer perceptron neural networks
DN	diabetic neuropathy	MOH	ministry of health
DR	diabetic retinopathy	MP	mobile phone
DT	decision tree	MR	magnetic resonance
DWT	discrete wavelet transform	MRI	magnetic resonance imaging
E	external	MSE	mean squared error
E-M	expectation-maximization	NASA	national aeronautics and space administration
ECC	electrocardiography		

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