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Accession number:12620873
Title:Classification of terahertz-pulsed imaging data from excised breast tissue
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Source title:Journal of Biomedical Optics
Abbreviated source title:J. Biomed. Opt. (USA)
Volume:17
Issue:1
Publication date:Jan. 2012
Pages:016005 (11 pp.)
Language:English
ISSN:1083-3668
CODEN:JBOPFO
Document type:Journal article (JA)
Publisher:SPIE - The International Society for Optical Engineering
Country of publication:USA
Material Identity Number:BZ20-2012-003
Abstract:We investigate the efficacy of using data reduction techniques to aid classification of terahertz (THz) pulse data obtained from tumor and normal breast tissue. Fifty-one samples were studied from patients undergoing breast surgery at Addenbrooke's Hospital in Cambridge and Guy's Hospital in London. Three methods of data reduction were used: ten heuristic parameters, principal components of the pulses, and principal components of the ten parameter space. Classification was performed using the support vector machine approach with a radial basis function. The best classification accuracy, when using all ten components, came from using the principal components on the pulses and principal components on the parameter, with an accuracy of 92%. When less than ten components were used, the principal components on the parameter space outperformed the other methods. As a visual demonstration of the classification technique, we apply the data reduction/classification to several example images and demonstrate that, aside from some interpatient variability and edge effects, the algorithm gives good classification on terahertz data from breast tissue. The results indicate that under controlled conditions data reduction and SVM classification can be used with good accuracy to classify tumor and normal breast tissue.
Number of references:49
Inspec controlled terms:biological organs - biological tissues - biomedical optical imaging - cellular biophysics - gynaecology - image classification - medical image processing - parameter space methods - principal component analysis - support vector machines - surgery - terahertz wave imaging - tumours
Uncontrolled terms:excised breast tissue - terahertz-pulsed imaging data - data reduction techniques - terahertz pulse data classification - tumor breast tissue - normal breast tissue - breast surgery - data reduction - heuristic parameters - principal components - support vector machine

approach - radial basis function - data classification - SVM classification - parameter space
Inspec classification codes:A8760F Optical and laser radiation (medical uses) - A8770E Patient diagnostic methods and instrumentation - A0250 Probability theory, stochastic processes, and statistics - A8725 Cellular biophysics - A8770G Patient care and treatment - B7510J Optical and laser radiation (biomedical imaging/measurement) - B7520 Patient care and treatment - B0240Z Other topics in statistics - B6135 Optical, image and video signal processing - B7310N Microwave measurement techniques - C7330 Biology and medical computing - C5260B Computer vision and image processing techniques - C1140Z Other topics in statistics - C6170K Knowledge engineering techniques
Treatment:Practical (PRA); Theoretical or Mathematical (THR); Experimental (EXP)
Discipline:Physics (A); Electrical/Electronic engineering (B); Computers/Control engineering (C)
DOI:10.1117/1.JBO.17.1.016005
Database:Inspec