

UNA METODOLOGIA (3D) BASATA SU SVM PER LA RICERCA DI PATOLOGIE IN TESSUTI BIOLOGICI

L. Tonelli

Abstract

L'obiettivo del progetto e' quello di effettuare una standardizzazione nel formato eledia di un pacchetto software per applicazioni di imaging elettromagnetico basate su tecniche LBE. In particolare tale metodologia consente di individuare patologie in tessuti biologici fornendo opportune mappe di rischio.

References Bibliography: Support-Vector-Machines [1]-[7]; Inverse Scattering [8]-[26].

- [1] L. Lizzi, F. Viani, M. Benedetti, P. Rocca, and A. Massa, "The M-DSO-ESPRIT method for maximum likelihood DoA estimation," *Progress in Electromagnetic Research*, vol. 80, pp. 477-497, 2008.
- [2] M. Donelli, F. Viani, P. Rocca, and A. Massa, "An innovative multi-resolution approach for DoA estimation based on a support vector classification," *IEEE Trans. Antennas Propag.*, vol. 57, no. 8, pp. 2279-2292, Aug. 2009.
- [3] L. Lizzi, G. Oliveri, P. Rocca, and A. Massa, "Estimation of the direction-of-arrival of correlated signals by means of a SVM-based multi-resolution approach," *IEEE Antennas Propag. Society International Symposium (APSURSI)*, Toronto, ON, Canada, pp. 1-4, 11-17 Jul. 2010.
- [4] F. Viani, P. Rocca, M. Benedetti, G. Oliveri, and A. Massa, "Electromagnetic passive localization and tracking of moving targets in a WSN-structured environment," *Inverse Problems - Special Issue on "Electromagnetic Inverse Problems: Emerging Methods and Novel Applications"*, vol. 26, pp. 1-15, May 2010.
- [5] F. Viani, P. Rocca, G. Oliveri, D. Trincherio, and A. Massa, "Localization, tracking and imaging of targets in wireless sensor network: An invited review," *Radio Science*, vol. 46, 2011.
- [6] F. Viani, L. Lizzi, P. Rocca, M. Benedetti, M. Donelli, and A. Massa, "Object tracking through RSSI measurements in wireless sensor networks," *Electronics Letters*, vol. 44, no. 10, pp. 653-654, 2008.
- [7] F. Viani, P. Rocca, G. Oliveri, and A. Massa, "Electromagnetic tracking of transceiver-free targets in wireless networked environments," *6th European Conference on Antennas Propag. (EuCAP 2011)*, Rome, Italy, pp. 3808-3811, Apr. 11-15, 2011 (Invited paper).
- [8] S. C. Hagness, E. C. Fear, and A. Massa, "Guest Editorial: Special Cluster on Microwave Medical Imaging", *IEEE Antennas Wireless Propag. Lett.*, vol. 11, pp. 1592-1597, 2012.
- [9] G. Oliveri, Y. Zhong, X. Chen, and A. Massa, "Multi-resolution subspace-based optimization method for inverse scattering," *Journal of Optical Society of America A*, vol. 28, no. 10, pp. 2057-2069, Oct. 2011.

- [10] A. Randazzo, G. Oliveri, A. Massa, and M. Pastorino, "Electromagnetic inversion with the multiscaling inexact-Newton method - Experimental validation," *Microwave Opt. Technol. Lett.*, vol. 53, no. 12, pp. 2834-2838, Dec. 2011.
- [11] G. Oliveri, L. Lizzi, M. Pastorino, and A. Massa, "A nested multi-scaling inexact-Newton iterative approach for microwave imaging," *IEEE Trans. Antennas Propag.*, vol. 60, no. 2, pp. 971-983, Feb. 2012.
- [12] G. Oliveri, A. Randazzo, M. Pastorino, and A. Massa, "Electromagnetic imaging within the contrast-source formulation by means of the multiscaling inexact Newton method," *Journal of Optical Society of America A*, vol. 29, no. 6, pp. 945-958, 2012.
- [13] M. Benedetti, D. Lesselier, M. Lambert, and A. Massa, "Multiple shapes reconstruction by means of multi-region level sets," *IEEE Trans. Geosci. Remote Sensing*, vol. 48, no. 5, pp. 2330-2342, May 2010.
- [14] M. Benedetti, D. Lesselier, M. Lambert, and A. Massa, "A multi-resolution technique based on shape optimization for the reconstruction of homogeneous dielectric objects," *Inverse Problems*, vol. 25, no. 1, pp. 1-26, Jan. 2009.
- [15] M. Donelli, D. Franceschini, P. Rocca, and A. Massa, "Three-dimensional microwave imaging problems solved through an efficient multi-scaling particle swarm optimization," *IEEE Trans. Geosci. Remote Sensing*, vol. 47, no. 5, pp. 1467-1481, May 2009.
- [16] M. Benedetti, G. Franceschini, R. Azaro, and A. Massa, "A numerical assessment of the reconstruction effectiveness of the integrated GA-based multicrack strategy," *IEEE Antennas Wireless Propag. Lett.*, vol. 6, pp. 271-274, 2007.
- [17] P. Rocca, M. Carlin, G. Oliveri, and A. Massa, "Interval analysis as applied to inverse scattering," *IEEE International Symposium on Antennas Propag. (APS/URSI 2013)*, Chicago, Illinois, USA, Jul. 8-14, 2012.
- [18] L. Manica, P. Rocca, M. Salucci, M. Carlin, and A. Massa, "Scattering data inversion through interval analysis under Rytov approximation," *7th European Conference on Antennas Propag. (EuCAP 2013)*, Gothenburg, Sweden, Apr. 8-12, 2013.
- [19] P. Rocca, M. Carlin, and A. Massa, "Imaging weak scatterers by means of an innovative inverse scattering technique based on the interval analysis," *6th European Conference on Antennas Propag. (EuCAP 2012)*, Prague, Czech Republic, Mar. 26-30, 2012.
- [20] L. Poli, G. Oliveri, and A. Massa, "Imaging sparse metallic cylinders through a Local Shape Function Bayesian Compressive Sensing approach," *Journal of Optical Society of America A*, vol. 30, no. 6, pp. 1261-1272, 2013.
- [21] F. Viani, L. Poli, G. Oliveri, F. Robol, and A. Massa, "Sparse scatterers imaging through approximated multitask compressive sensing strategies," *Microwave Opt. Technol. Lett.*, vol. 55, no. 7, pp. 1553-1558, Jul. 2013.
- [22] L. Poli, G. Oliveri, P. Rocca, and A. Massa, "Bayesian compressive sensing approaches for the reconstruction of two-dimensional sparse scatterers under TE illumination," *IEEE Trans. Geosci. Remote Sensing*, vol. 51, no. 5, pp. 2920-2936, May. 2013.
- [23] L. Poli, G. Oliveri, and A. Massa, "Microwave imaging within the first-order Born approximation by means of the contrast-field Bayesian compressive sensing," *IEEE Trans. Antennas Propag.*, vol. 60, no. 6, pp. 2865-2879, Jun. 2012.
- [24] G. Oliveri, P. Rocca, and A. Massa, "A bayesian compressive sampling-based inversion for imaging sparse scatterers," *IEEE Trans. Geosci. Remote Sensing*, vol. 49, no. 10, pp. 3993-4006, Oct. 2011.
- [25] G. Oliveri, L. Poli, P. Rocca, and A. Massa, "Bayesian compressive optical imaging within the Rytov approximation," *Optics Letters*, vol. 37, no. 10, pp. 1760-1762, 2012.

- [26] L. Poli, G. Oliveri, F. Viani, and A. Massa, "MT-BCS-based microwave imaging approach through minimum-norm current expansion," *IEEE Trans. Antennas Propag.*, vol. 61, no. 9, pp. 4722-4732, Sept. 2013.

*This report is submitted in partial fulfillment of the degree of the course "IDBI".
Supervisors: Prof. A. Massa, Dr. M. Donelli.*