

REFERÊNCIAS BIBLIOGRÁFICAS

- [1] D.E. Bray and D. McBride, *Nondestructive Testing Techniques*, John Wiley, 1992.
- [2] J. Blitz, *Electrical and Magnetic Methods of Nondestructive Testing*, Adam Hilger, 1991.
- [3] D.E. Bray and R.K. Stanley, *Nondestructive Evaluation: A Tool in Design, Manufacturing and Service*, McGraw-Hill, 1989.
- [4] H.H. Uhlig and R.W. Revie, *Corrosion and Corrosion Control - An Introduction to Corrosion Science and Engineering*, Wiley-Interscience, New York, 1985.
- [5] K.R. Trethewey and J. Chamberlain, *Corrosion for Science and Engineering*, Longman, Essex, 1995.
- [6] D. Broek, *The Civil Damage Tolerance Requirements in Theory and Practice*, Structural Integrity of Aging Airplanes, S.N. Atluri, S.G. Sampath, P. Tong (Eds.), Springer-Verlag Press, 1991.
- [7] A.P. Berens and P.W. Hovey, *The Analysis of NDE Reliability Data*, Metals Handbook: Nondestructive Evaluation and Quality Control, Vol. 17, 9th ed. 1989.
- [8] J.E. Zimmerman, *Josephson effect devices and low-frequency field sensing*, Cryogenics, vol. 12, pp. 19-31, Feb. 1972.
- [9] L. Udpa, S. Mandayam, S. Udpa, Y. Sun, and W. Lord, *Developments in Gas Pipeline Inspection Technology*, Materials Evaluation, Vol. 54, No. 4, pp. 467-472, April 1996.
- [10] D. Jiles, *Introduction to Magnetism and Magnetic Materials*, Chapman&Hall, 1990.
- [11] P. Tipler, *Física—Volume 3: Eletricidade e Magnetismo*, Livros Técnicos e Científicos, 1995.
- [12] P. Ripka, *Review of Fluxgate Sensors*, Sensors and Actuators A v. 33, pp. 129-141, 1992
- [13] D. Cohen, E.A. Edelsack and J.E. Zimmerman, *Magnetocardiograms taken inside a shielded room with a superconducting point contact magnetometer*, Appl. Phys. Lett., vol. 16, p. 278, 1970.
- [14] J.E. Zimmerman, J.A. Beall, M.W. Cromar and R.H. Ono, *Operation of Y-Ba-Cu-O rf SQUID at 81 K*, Appl. Phys. Lett., vol. 51, p. 617, 1987.
- [15] J. Clark and R.H. Koch, *The Impact of High-Temperature Superconductivity on SQUID Magnetometer*, Science 242, p. 217, 1988.
- [16] N.S. Alzayed, C. Fan, D.F. Lu, K.W. Wong, M. Chester, and D.E. Knapp, *Deep Nondestructive Testing using a Bulk High T_c rf-SQUID*, IEEE Transactions on Applied Superconductivity, Vol. 4, No. 2, June 1994.
- [17] A.C. Bruno, P. Costa Ribeiro, J.P. von der Weid and I.R. Eghrari, *Spatial Discrimination: An Alternative Approach*, Biomagnetism: Application & Theory H. Weinberg et al. (Eds.), Pergamon Press, p.60, 1985.

- [18] A.C. Bruno, P. Costa Ribeiro, J.P. von der Weid and O.G. Symko, *Discrete Spatial Filtering with SQUID Gradiometers in Biomagnetism*, J. Appl. Phys., vol. 59, p.2584, 1986.
- [19] A.C. Bruno and P. Costa Ribeiro, *Digital Filter Design Approach for SQUID Gradiometers*, J. Appl. Phys., vol. 63, p.2820, 1988.
- [20] H. Weinstock, *A review of SQUID magnetometry applied to nondestructive evaluation*, IEEE Trans. Mag., vol. 27(2), p.3231, 1991.
- [21] W.G. Jenks, S.S.H. Sadeghi, and J.P. Wikswo, Jr., *SQUIDS for Nondestructive Evaluation*, a ser publicado em J. Physics D, 1997.
- [22] R.J.P. Bain, G.B. Donaldson, S. Evanson, and G. Hayward, *SQUID gradiometric detection of defects in ferromagnetic structures*, SQUID '85, Proc. 3rd International Conference on Superconducting Quantum Devices, H.D. Hahlbohm and H. Lübbig, Eds., Berlin: deGruyter, pp. 841-846, 1985.
- [23] R.J.P. Bain, G.B. Donaldson, S. Evanson, and G. Hayward, *Design and operation of SQUID-based planar gradiometers for non-destructive testing of ferromagnetic plates*, IEEE Trans. Mag. v. 23(2), pp. 473-476, 1987.
- [24] S. Evanson, *The evaluation of a SQUID based noncontact magnetic NDE technique for application to the inspection of offshore steel structure*, Ph. D. Thesis, University of Strathclyde, Glasgow, Scotland, 1988.
- [25] S. Evanson, R.J.P. Bain, G.B. Donaldson, G. Stirling, and G. Hayward, *A comparison of the performance of planar and conventional second-order gradiometers coupled to a SQUID for the NDT of steel plates*, IEEE Trans. Mag. v. 25, pp. 1200-1203, 1989.
- [26] A. Cochran and G.B. Donaldson, *Improved techniques for structural NDT using SQUIDS*, Superconducting Devices and Their Applications, H. Koch and H. Lübbig, Eds., Berlin: Springer-Verlag, vol. 64, pp. 576-580, 1992.
- [27] A. Cochran, G.B. Donaldson, L.N.C. Morgan, R.M. Bowman, and K.J. Kirk, *SQUIDS for NDT: The technology and its capabilities*, British J. NDT v. 35, pp. 173-182, 1993.
- [28] S. Cochran, G.B. Donaldson, C. Carr, D. McA. McKirdy, M.E. Walker, U. Klein, A. McNab, and J. Kuznik, *Recent progress in SQUIDS as sensors for electromagnetic NDE*, Nondestructive Testing of Materials, R. Collins, W.D. Dover, J. R. Bowler, K. Miya, Eds., Amsterdam: IOS Press, pp. 53-64, 1995.
- [29] J. Kuznik, C. Carr, A. Cochran, L.N.C. Morgan, and G.B. Donaldson, *First order electronic gradiometry with simple HTS SQUIDS and optimised electronics*, Applied Superconductivity 1995, D. Dew-Hughes, Bristol: IoP Publishing, pp. 1499-1502, 1995.
- [30] A. Cochran, J. Kuznik, C. Carr, L.N.C. Morgan, and G.B. Donaldson, *Experimental results in non-destructive evaluation with HTS SQUIDS*, Applied Superconductivity 1995, D. Dew-Hughes, Bristol: IoP Publishing, pp. 1511-1514, 1995.
- [31] A. Cochran, G.B. Donaldson, C. Carr, D. McA. McKirdy, M.E. Walker, U. Klein, J. Kuznik, and A. McNab, *Advances in the theory and practice of SQUID NDE*, Review of Progress in QNDE, vol. 15, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, pp. 1151-1158, 1996.

- [32] G.B. Donaldson, S. Evanson, M. Otaka, T. Shimzu, and K. Takaku, *Use of SQUID magnetic sensor to detect aging effects in duplex stainless steel*, British J. NDT v.32, pp. 238-240, 1990.
- [33] G. Sawande, J. Straub, H.-J. Krause, H. Bousack, G. Neudert and R. Ehrlich, *Signal analysis methods for the remote magnetic examination of prestressed elements*, Proceedings of the International Symposium Non-Destructive Testing in Civil Engineering, Berlin, September 1995.
- [34] Y. Tavrín, H.-J. Krause, W. Wolf, V. Glyantsev, J. Schubert, W. Zander, and H. Bousack, *Eddy current technique with high temperature SQUID for nondestructive evaluation of nonmagnetic metallic structures*, Cryogenics v. 36, pp. 83-86, 1996.
- [35] Y. Tavrín, H.-J. Krause, W. Wolf, V. Glyantsev, J. Schubert, W. Zander, A. Haller, and H. Bousack, *Eddy current technique with HTS SQUID gradiometer for non-destructive evaluation of nonmagnetic metallic structures*, Applied Superconductivity 1995, D. Dew-Hughes, Bristol: IoP Publishing, pp. 1519-1520, 1995.
- [36] M. Grünekle, H.-J. Krause, R. Hohmann, M. Maus, D. Lomparski, M. Banzet, J. Schubert, W. Zander, W. Wolf, H. Bousack, A. I. Braginski, and M. I. Faley, *HTS SQUID system for eddy current testing of airplane wheels and rivets*, Review of Progress in QNDE, vol. 17, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, pp. 1075-1082, 1998.
- [37] J. Banchet, J. Jouglar, P.-L. Vuillermoz, P. Waltz, and H. Weinstock, *Evaluation of stress in steel via SQUID magnetometry*, Review of Progress in QNDE, vol. 14, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, pp. 1675-1682, 1995.
- [38] J. Banchet, J. Jouglar, P.-L. Vuillermoz, P. Waltz, and H. Weinstock, *Magnetomechanical behaviour of steel via SQUID magnetometry*, IEEE Trans. Appl. Supercond. v. 5, pp. 2486-2489, 1995.
- [39] H. Weinstock, N. Tralshawala, A. N. Iyer, J. R. Claycomb, and K. Salama, *Detection of fatigue in steel via magnetomechanical measurement*, a ser publicado em Review of Progress in QNDE, vol. 18, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, 1999.
- [40] H. Weinstock and M. Nisenoff, *Defect detection with a SQUID magnetometer*, Review of Progress in QNDE, vol. 5, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, pp. 669-704, 1986.
- [41] H. Weinstock and M. Nisenoff, *Nondestructive evaluation of metallic structures using a SQUID gradiometer*, in SQUID'85, Proceedings of the Third International Conference on Superconducting Quantum Devices, H.D. Hahlbohm and H. Lübbig (Eds.), deGruyter, Berlin, p.843, 1985.
- [42] H. Weinstock, N. Tralshawala, and J. R. Claycomb, *Defect detection in wire manufacturing*, a ser publicado em Review of Progress in QNDE, vol. 18, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, 1999.
- [43] P.V. Czipott and W.N. Podney, *Use of a superconductive gradiometer in an ultrasensitive electromagnetic metal detector*, IEEE Trans. Mag. v. 25, pp. 1204-1207, 1989.
- [44] P.V. Czipott and W.N. Podney, *Pulsed operation of a superconductive electromagnetic gradiometer*, IEEE Trans. Mag. v. 27, pp. 2971-2974, 1991.

- [45] W.N. Podney and P.V. Czipott, *An electromagnetic microscope for eddy current evaluation of conductive materials*, IEEE Trans. Mag. v. 27(2), pp. 3241-3244, 1991.
- [46] W.N. Podney, *A superconducting electromagnetic microscope for eddy current evaluation of materials*, Review of Progress in QNDE, v. 13, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, pp. 1947-1954, 1993.
- [47] W.N. Podney, *Performance measurements of a superconductive microprobe for eddy current evaluation of subsurface flaws*, IEEE Trans. Appl. Supercond. v. 3, pp. 1914-1917, 1993.
- [48] W. N. Podney, *Eddy current evaluation of airframes using refrigerated SQUIDS*, IEEE Trans. Appl. Supercond. v. 5, pp. 2490-2492, 1995.
- [49] W.N. Podney, *Electromagnetic microscope for low frequency, pulsed, eddy current evaluation of airframes*, Review of Progress in QNDE, v. 17, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, pp. 1017-1024, 1998.
- [50] W.N. Podney, *Electromagnetic microscope compared to a conventional eddy current probe*, a ser publicado em Review of Progress in QNDE, v. 18, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, 1999.
- [51] T.E. Capobianco, J.C. Moulder, and F.R. Fickett, *Flaw detection with a magnetic field gradiometer*, Proc. of the 15th Symposium on NDE, D.W. Moore and G.A. Matzkanin, Eds., NDE Testing Information Analysis Center, San Antonio, p. 15, 1986.
- [52] J.C. Moulder and T.E. Capobianco, *Detection and sizing of surface flaws with a SQUID-based eddy current probe*, Journal of Research of the National Bureau of Standards v. 92(1), pp. 27-33, 1987.
- [53] D.S. Buchanan, D.B. Crum, D. Cox, and J.P. Wikswo, Jr., *MicroSQUID: A close-spaced four channel magnetometer*, Advances in Biomagnetism, S.J. Williamson, M. Hoke, G. Stroink, and M. Kotani, Eds., New York: Plenum, pp. 677-679, 1989.
- [54] J.P. Wikswo, Jr., J.M. van Egeraat, Y.P. Ma, N.G. Sepulveda, D.J. Staton, S. Tan, and R.S. Wijesinghe, *Instrumentation and techniques for high magnetic imaging*, Digital Image Synthesis and Inverse Optics, A. F. Gmitro, P. S. Idell and I.J. La Haie, Eds., SPIE Proceedings, vol. 1351, pp. 438-471, 1990.
- [55] B.J. Roth, N.G. Sepulveda, and J.P. Wikswo, Jr., *Using a magnetometer to image a two-dimensional current distribution*, J. Appl. Phys. v. 65, pp. 361-372, 1989.
- [56] D. Li, Y.P. Ma, W.F. Flanagan, B.D. Lichter, and J.P. Wikswo, Jr., *The use of superconducting magnetometry to detect corrosion in aircraft alloys*, Proc. of the Tri-Service Conference on Corrosion, pp. 335-346, 1994.
- [57] D. Li, Y. P. Ma, W. F. Flanagan, B. D. Lichter, and J. P. Wikswo, Jr., *Detection of in-situ active corrosion by a SQUID magnetometer*, Journal of Minerals, Metals and Materials v. 47, pp. 36-39, 1995.
- [58] D. Li, Y.P. Ma, W.F. Flanagan, B.D. Lichter, and J.P. Wikswo, Jr., *Application of superconducting magnetometry in the study of aircraft aluminum alloy corrosion*, Corrosion, *in press*, 1992.
- [59] Y.P. Ma, D.J. Staton, N.G. Sepulveda, and J.P. Wikswo, Jr., *Imaging flaws with a SQUID magnetometer array*, Review of Progress in QNDE, v. 10, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, pp. 979-986, 1991.

- [60] J.P. Wikswo, Jr., N.G. Sepulveda, Y.P. Ma, W.P. Henry, D.J. Staton, and D.B. Crum, *An improved method for magnetic identification and localization of cracks in conductors*, J. Nondestr. Eval. v. 12, pp. 109-119, 1993.
- [61] D.C. Hurley, Y.P. Ma, S. Tan, and J.P. Wikswo, Jr., *Imaging of small defects in nonmagnetic tubing using a SQUID magnetometer*, Res. Nondestr. Eval. v. 5, pp. 1-29, 1993.
- [62] Y.P. Ma and J.P. Wikswo, Jr., *Imaging subsurface defects using a SQUID magnetometer*, Review of Progress in QNDE, v. 12, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, pp. 1137-1143, 1993.
- [63] J.P. Wikswo, Jr., Y.P. Ma, N.G. Sepulveda, D.J. Staton, S. Tan, and I.M. Thomas, *Superconducting magnetometry: A possible technique for aircraft NDE*, SPIE Proc. on Nondestructive Testing of Aging Aircraft, M.T. Valley, N.K. Grande, and A.S. Kobayashi, Eds., vol. 2001, pp. 164-190, 1993.
- [64] Y.P. Ma and J.P. Wikswo Jr., *SQUID eddy current techniques for detection of second layer flaws*, Review of Progress in QNDE, v. 13, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, pp. 303-309, 1994.
- [65] Y.P. Ma and J.P. Wikswo Jr., *SQUID magnetometers for depth-selective, oriented eddy current imaging*, Review of Progress in QNDE, v. 17, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, pp. 1067-1074, 1998.
- [66] J.P. Wikswo, Jr., Y.P. Ma, N.G. Sepulveda, S. Tan, I. Thomas, and A. Lauder, *Magnetic susceptibility imaging for nondestructive evaluation*, IEEE Trans. Appl. Supercond. v. 3, pp. 1995-2002, 1993.
- [67] Y.P. Ma, I.M. Thomas, A. Lauder, and J.P. Wikswo, Jr., *A high resolution imaging susceptometer*, IEEE Trans. Appl. Supercond. v. 3, pp. 1941-1944, 1993.
- [68] I.M. Thomas, Y.P. Ma, S. Tan, and J.P. Wikswo, Jr., *Spatial resolution and sensitivity of magnetic susceptibility imaging*, IEEE Trans. Appl. Supercond. v. 3, pp. 1937-1940, 1993.
- [69] N.G. Sepulveda, I.M. Thomas, and J.P. Wikswo, Jr., *Magnetic susceptibility tomography for three-dimensional imaging of diamagnetic and paramagnetic objects*, IEEE Trans. Mag. v. 30, pp. 5062-5069, 1994.
- [70] E. Parente Ribeiro, J.P. Wikswo, Jr., P. Costa Ribeiro and J. Szczupak, *Magnetic susceptibility tomography with nonuniform field*, Proc. of the 10th International Conference on Biomagnetism, Santa Fe, NM, 1996.
- [71] D.C. Hurley, Y.P. Ma, S. Tan, and J.P. Wikswo Jr., *Imaging of small defects in nonmagnetic tubing using a SQUID magnetometer*, Res. Nondestr. Eval. v. 5, pp. 1-29, 1993.
- [72] D.C. Hurley, Y.P. Ma, S. Tan, and J.P. Wikswo, Jr., *Imaging of small defects in nonmagnetic tubing using a SQUID magnetometer*, Res. Nondestr. Eval. v. 5, pp. 1-29, 1993.
- [73] I.M. Thomas, Y.P. Ma, and J.P. Wikswo, Jr., *SQUID NDE: Detection of surface flaws by magnetic decoration*, IEEE Trans. Appl. Supercond. v. 3, pp. 1949-1952, 1993.

- [74] A.C. Bruno, A.P. Ewing, and J.P. Wikswo, Jr., *Measurements of surface-breaking flaws in ferromagnetic plates by means of an imaging SQUID susceptometer*, IEEE Trans. Appl. Supercond. v. 5, pp. 2484-2485, 1995.
- [75] C. Hall Barbosa, A.C. Bruno, L.F. Scavarda, E. Andrade Lima, P. Costa Ribeiro, C. Kelber, *Image Processing Techniques for NDE SQUID systems*, IEEE Transactions on Applied Superconductivity v. 5, p. 2486, 1995.
- [76] A. C. Bruno, C. Hall Barbosa and L. F. Scavarda, *Electric Current Injection NDE Using a SQUID Magnetometer*, Research in Nondestructive Evaluation v. 8, p. 165, 1996.
- [77] A. C. Bruno, C. Hall Barbosa, J. E. Zimmerman, P. Costa Ribeiro, E. Andrade Lima, L. F. Scavarda, C. Kelber, J. Szczupak, and C. S. Camerini, *Imaging Flaws Under Insulation Using a SQUID Magnetometer*, Rev. Prog. Quantitative NDE, v. 15, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, p. 2219, 1996.
- [78] C. Hall Barbosa, *Ensaio Não-Destrutivo de Placas Condutoras Utilizando o Magnetômetro Supercondutor SQUID*, Dissertação de Mestrado em Processamento de Sinais, Departamento de Engenharia Elétrica, PUC-Rio, 1995.
- [79] C. Hall Barbosa, A. C. Bruno, G. S. Kühner, J. P. Wikswo, Jr., A. P. Ewing, Y. P. Ma and C. S. Camerini, *Measurements of Surface-Breaking Flaws in Steel Pipes Using a SQUID Susceptometer in an Unshielded Environment*, Rev. Prog. Quantitative NDE, v. 17, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, pp. 1091-1097, 1998.
- [80] C. Hall Barbosa, A. C. Bruno, G. S. Kühner, J. P. Wikswo, Jr., and C. S. Camerini, *Measurements of Corrosion Pits in Steel Plates Using a Low-Field SQUID Susceptometer*, aceito para publicação em Rev. Prog. Quantitative NDE v. 18, 1999.
- [81] C. Hall Barbosa, A. C. Bruno, M. Vellasco, J. P. Wikswo, Jr., A. P. Ewing, C. S. Camerini, M. A. Pacheco, *Automation of SQUID Nondestructive Evaluation of Steel Plates by Neural Networks*, aceito para publicação em IEEE Trans. Applied Superconductivity, 1999.
- [82] C. Hall Barbosa, A. P. Ewing, T. A. Cruse, A.C. Bruno, J. P. Wikswo, Jr., *Boundary Integral Equation Measurement Model for the Electric Current Injection Method of Nondestructive Evaluation*, Proc. XI Conf. Comp. of Electromagnetic Fields, pp. 89-90, 1997.
- [83] C. Hall Barbosa, A. P. Ewing, T.A. Cruse, A. C. Bruno, J. P. Wikswo, Jr., *Experimental Validation of the Boundary Integral Equation Modeling for Arbitrary Flaw Geometries in ECI NDE*, aceito para publicação em Rev. Prog. Quantitative NDE v. 18, 1999.
- [84] E. Andrade Lima, A. C. Bruno, J. Szczupak, C. Hall Barbosa, *Spatial Deconvolution Technique for Planar and Axial Gradiometers* (em preparação).
- [85] A.C. Bruno, *Minimum Norm Least-Squares Inverse for Magnetic Flux Leakage Image Reconstruction*, Review of Progress in QNDE, v. 15, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, p. 911, 1996.
- [86] A. C. Bruno, *Imaging of Flaws in Magnetically Permeable Structures Using the Generalized Inverse on Leakage Fields*, Journal of Applied Physics v. 82, p. 5899 (1997).

- [87] A. C. Bruno, C. Hall Barbosa, E. Andrade Lima, G. S. Kühner, *Image Reconstruction of Spherical Inclusions in Ferromagnetic Structures Using the Generalized Inverse*, IEEE Transactions on Magnetics, vol. 34, no. 5, pp. 2912-2915, 1998.
- [88] N.G. Sepulveda, D.J. Staton, J.P. Wiksw, Jr., *A Mathematical Analysis of the Magnetic Field Produced by Flaws in Two-Dimensional Current-Carrying Conductors*, Journal of Nondestructive Evaluation, Vol. 11, No. 2, 1992.
- [89] T. A. Cruse, *Mathematical Foundations of the Boundary Integral Equation Method in Solid Mechanics*, AFOSR-TR-77-1002, 1977.
- [90] A. P. Ewing, C. Hall Barbosa, T. A. Cruse, A. C. Bruno and J. P. Wiksw, Jr., *Boundary Integral Equations for Modeling Arbitrary Flaw Geometries in ECI NDE*, Rev. Prog. Quantitative NDE, v. 17A, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, pp. 1011-1015, 1998.
- [91] C. Hall Barbosa, E. Andrade Lima, A. C. Bruno, A. P. Ewing, and J. P. Wiksw, Jr., *Flux/Voltage Calibration of Axial SQUID Gradiometers Using an Optimization Procedure*, aceito para publicação em IEEE Trans. App. Superconductivity, 1999.
- [92] L. A. Zadeh, *Fuzzy Sets*, Information and Control 8, 338-353, 1965.
- [93] L. A. Zadeh, *Fuzzy Algorithms*, Information and Control 19, 94-102, 1969.
- [94] E. H. Mamdani, *Application of fuzzy logic to approximate reasoning*, IEEE Trans. Computing. 26, 1182-1191, 1977.
- [95] E. H. Mamdani, *Applications of fuzzy set theory to control systems*, in Gupta et al., 77-88, 1977.
- [96] H. J. Zimmermann, *Fuzzy Set Theory and its Applications*, 2nd Ed, Kluwer Academic Publishers, Boston, 1990.
- [97] Earl Cox, *The Fuzzy Systems Handbook: A Practitioner's Guide to Building, Using, and Maintaining Fuzzy Systems*, AP Professional, 1994.
- [98] Philip D. Wasserman, *Neural Computing - Theory and Practice*, Van Nostrand Reinhold, New York, 1989.
- [99] Simon Haykin, *Neural Networks - A Comprehensive Foundation*, Macmillan College Publishing Company - New York, 1994.
- [100] Jacek M. Zurada, *Introduction to Artificial Neural Networks*, West Publishing Company, 1992.
- [101] L. Davis, *Handbook of Genetic Algorithms*, VNR Comp. Library, 1990.
- [102] D. Goldberg, *Genetic Algorithms in Search, Optimization and Machine Learning*, Addison-Wesley, 1989.
- [103] F. Girosi, T. Poggio and B. Caprile, *Extensions of a theory of networks for approximations and learning: outliers and negative examples*, Advances in Neural Information Processing Systems 3, R. P. Lippmann, J. E. Moody, and D. S. Touretzky (eds.), pp. 750-756, Morgan Kaufmann, San Mateo, CA, 1991.
- [104] E. J. Hartman, J. D. Keeler, and J. M. Kowalski, *Layered neural networks with Gaussian hidden units as universal approximations*, Neural Computation 2(2), pp. 210-215, 1990.

- [105] K. J. Lang and G. E. Hilton, *The development of the time-delay neural network architecture for speech recognition*, Technical Report CMU-CS-88-152. Carnegie-Mellon University, Pittsburgh, PA, 1988.
- [106] A. Waibel, T. Hanazawa, G. Hinton, K. Shikano and K. J. Lang, *Phoneme recognition using time-delay neural networks*, IEEE Trans. Acoustics, Speech, and Signal Processing, ASSP-37, 328-339, 1989.
- [107] Pacote de desenvolvimento e aplicação de redes neurais *Stuttgart Neural Network Simulator* v4.1, University of Stuttgart.
- [108] C. Hall Barbosa, A. C. Bruno, M. Vellasco, M. Pacheco and C.S. Camerini, *Automation of Electric Current Injection NDE by Neural Networks*, Rev. Prog. Quantitative NDE, vol 16A, D.O. Thompson and D.E. Chimenti (Eds), Plenum, NY, 1997.
- [109] S. Nath, J.P. Fulton and B. Wincheski, *Magneto-Optic Image Classification Using Neural Networks*, Review of Progress in Quantitative NDE, vol 15A, D.O. Thompson and D.E. Chimenti (Eds), Plenum, NY, pp. 891-896, 1996.
- [110] L. Udpa, and S. Udpa, *Eddy Current Defect Characterization Using Neural Networks*, Materials Evaluation, Vol. 48, No. 3, pp. 342-347, March 1990.
- [111] L. Udpa, and S. Udpa, *Neural Networks for Classification of Nondestructive Evaluation Signals*, IEE Proceedings F Special Issue on Radar and Signal Processing, Vol. 138(1), pp. 41-45, February 1990.
- [112] M. Takadoya, J.D. Achenbach, Q.C. Guo, and M. Kitahara, *Crack Parameter Characterization by a Neural Network*, Review of Progress in Quantitative NDE, vol 15A, D.O. Thompson and D.E. Chimenti (Eds), Plenum, NY, pp. 797-804, 1996.
- [113] A. C. Pardoe, D.A. Hutchins, J.T. Mottran, and E.L. Hines, *High Resolution Image Reconstruction of Polymer Composite Materials Using Neural Networks*, Review of Progress in Quantitative NDE, vol 15A, D.O. Thompson and D.E. Chimenti (Eds), Plenum, NY, pp. 853-860, 1996.
- [114] B. Wang, J.P. Basart and J.C. Moulder, *Fast Eddy Current Forward Models Using Artificial Neural Networks*, Review of Progress in QNDE, vol 16, D.O. Thompson and D.E. Chimenti (Eds), Plenum, NY, pp. 217-224.
- [115] V. Kamat, C. Yeah, P. Ivanov, D. Kim, Y. Sun, S. Mandayam, L. Udpa, S. Udpa and W. Lord, *Characterization of Mechanical Damage in Gas Transmission Pipelines*, Review of Progress in Quantitative NDE, vol 17A, D.O. Thompson and D.E. Chimenti (Eds), Plenum, NY, pp. 339-346, 1998.
- [116] J. Yim, S. Udpa, L. Udpa, and M. Mina, *Fusion of Ultrasonic and Eddy Current Images Using Radial Basis Function*, Proceedings of the Third Annual Midwest Electrotechnology Conference, pp. 10-14, April 1994.
- [117] J. Yim, S. Udpa, L. Udpa, M. Mina, and W. Lord, *Neural Network Approaches to Data Fusion*, Review of Progress in Quantitative NDE, vol 14, D.O. Thompson and D.E. Chimenti (Eds), Plenum, NY, 1995.
- [118] G. X. Xie, M. Chao, C.H. Yeoh, S. Mandayam, S. Udpa, L. Udpa, and W. Lord, *Optimization of Neural Network Parameters for Defect Characterization*, Review of Progress in Quantitative NDE, vol 15B, D.O. Thompson and D.E. Chimenti (Eds), Plenum, NY, pp. 2189-2196, 1996.


- [119] I. El-Shafiey, L. Udpa, S. Udpa, *Application of Neural Networks to Inverse Problems in Electromagnetics*, IEEE Trans. on Magnetics, Vol. 30, No. 5, pp. 3624-3632, September 1994.
- [120] I. El-Shafiey, L. Udpa, S. Udpa, *Solution of Inverse Problems in Electromagnetics Using Hopfield Neural Networks*, IEEE Trans. on Magnetics, Vol. 31, No. 1, pp. 852-861, January 1995.

PUBLICAÇÕES

- [1] C. Hall Barbosa, A. C. Bruno, M. Vellasco, J. P. Wikswo, Jr., A. P. Ewing, C. S. Camerini, M. A. Pacheco, *Automation of SQUID Nondestructive Evaluation of Steel Plates by Neural Networks*, aceito para publicação em IEEE Trans. App. Superconductivity, 1999.
- [2] C. Hall Barbosa, E. Andrade Lima, A. C. Bruno, A. P. Ewing, and J. P. Wikswo, Jr., *Flux/Voltage Calibration of Axial SQUID Gradiometers Using an Optimization Procedure*, aceito para publicação em IEEE Trans. App. Superconductivity, 1999.
- [3] C. Hall Barbosa, A. C. Bruno, G. S. Kühner, J. P. Wikswo, Jr., and C. S. Camerini, *Measurements of Corrosion Pits in Steel Plates Using a Low-Field SQUID Susceptometer*, aceito para publicação em Rev. Prog. Quantitative NDE v. 18, 1999.
- [4] C. Hall Barbosa, A. P. Ewing, T.A. Cruse, A. C. Bruno, J. P. Wikswo, Jr., *Experimental Validation of the Boundary Integral Equation Modeling for Arbitrary Flaw Geometries in ECI NDE*, aceito para publicação em Rev. Prog. Quantitative NDE v. 18, 1999.
- [5] C. Hall Barbosa, A. C. Bruno, G. S. Kühner, J. P. Wikswo, Jr., A. P. Ewing, Y. P. Ma and C. S. Camerini, *Measurements of Surface-Breaking Flaws in Steel Pipes Using a SQUID Susceptometer in an Unshielded Environment*, Rev. Prog. Quantitative NDE, v. 17, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, pp. 1091-1097, 1998.
- [6] A. C. Bruno, C. Hall Barbosa, E. Andrade Lima, G. S. Kühner, *Image Reconstruction of Spherical Inclusions in Ferromagnetic Structures Using the Generalized Inverse*, IEEE Trans. Magnetics, vol. 34, no. 5, pp. 2912-2915, 1998.
- [7] A. P. Ewing, C. Hall Barbosa, T. A. Cruse, A. C. Bruno and J. P. Wikswo, Jr., *Boundary Integral Equations for Modeling Arbitrary Flaw Geometries in ECI NDE*, Rev. Prog. Quantitative NDE, v. 17A, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, pp. 1011-1015, 1998.
- [8] A. P. Ewing, C. Hall Barbosa, T. A. Cruse, A.C. Bruno, J. P. Wikswo, Jr., *Boundary Integral Equation Measurement Model for the Electric Current Injection Method of Nondestructive Evaluation*, Proc. XI Conf. Comp. of Electromagnetic Fields, pp. 89-90, 1997.
- [9] C. Hall Barbosa, A. C. Bruno, M. Vellasco, M. Pacheco and C.S. Camerini, *Automation of Electric Current Injection NDE by Neural Networks*, Rev. Prog. Quantitative NDE, vol 16A, D.O. Thompson and D.E. Chimenti (Eds), Plenum, NY, 1997.
- [10] A. C. Bruno, C. Hall Barbosa and L. F. Scavarda, *Electric Current Injection NDE Using a SQUID Magnetometer*, Research in Nondestructive Evaluation v. 8, p. 165, 1996.
- [11] A. C. Bruno, C. Hall Barbosa, J. E. Zimmerman, P. Costa Ribeiro, E. Andrade Lima, L. F. Scavarda, C. Kelber, J. Szczupak, and C. S. Camerini, *Imaging Flaws Under Insulation Using a SQUID Magnetometer*, Review of Progress in QNDE, v. 15, D.O. Thompson and D. Chimenti, Eds., New York: Plenum Press, p. 2219, 1996.
- [12] C. Hall Barbosa, A.C. Bruno, L.F. Scavarda, E. Andrade Lima, P. Costa Ribeiro, C. Kelber, *Image Processing Techniques for NDE SQUID systems*, IEEE Trans. App. Superconductivity v. 5, p. 2486, 1995.

**ENSAIOS NÃO DESTRUTIVOS EM ESTRUTURAS METÁLICAS
UTILIZANDO O MAGNETÔMETRO SUPERCONDUTOR SQUID
E TÉCNICAS DE INTELIGÊNCIA COMPUTACIONAL**

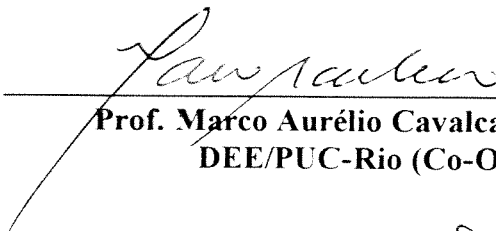
Tese de Doutorado apresentada por *Carlos Roberto Hall Barbosa* em 8 de julho de 1999
ao Departamento de Engenharia Elétrica da PUC-Rio e aprovada pela Comissão Julgadora,
formada pelos seguintes membros:



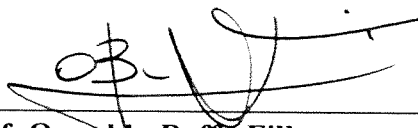
Prof. Antonio Carlos Oliveira Bruno
FIS/PUC-Rio (Orientador)



Profa. Marley Maria Bernardes Rebuszi Vellasco
DEE/PUC-Rio (Co-Orientadora)



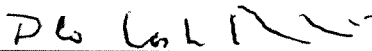
Prof. Marco Aurélio Cavalcanti Pacheco
DEE/PUC-Rio (Co-Orientador)



Prof. Oswaldo Baffa Filho
USP

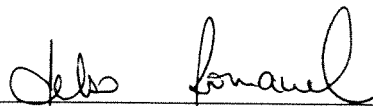


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Visto e permitida a impressão
Rio de Janeiro, 16 07/99



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Pesquisa do Centro Técnico Científico