Analysis and Synthesis of Multilayered Electromagnetic Antireflector Using Neural Network

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ABSTRACT

In this paper, the plane-wave incidence at a multilayered dielectric slab has been studied by using the artificial neural network, which determines the material properties, such as thickness and permeability, to minimize the reflection coefficients over a prescribed range of frequencies. The network adopts a multilayered perceptron structure, the learning algorithm is the backpropagation. Four learning methods of backpropagation algorithm can be used to analyze and synthesize. We can find the best one for the considered problem.

Keywords : artificial neural network、multilayered dielectric slab、backpropagation

Table of Contents

REFERENCES

[1] C. A. Balanis, Advanced Engineering Electromagnetics, New York: Wiley, 1989.

[2] J. J. Pesque, D. P. Bouche, and R. Mittra,“ Optimization of multilayer antireflection coatings using an optimal control method, ” IEEE Trans. on Microwave Theory and Techniques, vol. 40, no. 9, pp. 1789-1996, 1992.

[3] E. Michielssen, J.-M. Sajer, S. Ranjithan, and R. Mittra,“ Design of lightweight, broadband microwave absorbers using genetic algorithms, ” IEEE Trans. on Microwave Theory and Techniques, vol. 41, no. 6, pp. 1024-1031, 1993.

[4] W. S. McCulloch and W. Pitts,“ A logical calculus of the ideas immanent in nervous activity ”, Bulletin of Mathematical Biophysics, vol.5, pp.115-133, 1943.

[5] F. Rosenblatt,“ The perceptron : A probabilistic model for information storage and organization in the brain ”, Phychological Review, vol.65, pp.386-408, 1958.

[6] D. E. Rumelhart and J. L. McClelland,“ Parallel Distributed Processing ”, Cambridge, MA:MIT Press, vol.1, 1986.

[7] L. A. Zadeh, “ Fuzzy sets ”, Information and Control, vol. 8, pp.338-353, 1965.
[8] J.-S. Roger Jang, “ ANFIS : Adaptive-Network-Based Fuzzy Inference System, ” IEEE Trans. on System, Man, and Cybernetics, vol. 23, no. 3, pp. 665-685, 1993.
[9] D. K. Cheng, Field and Wave Electromagnetics, Mass.: Addison-Wesley, 1992.
[10] R. B. Schulz, V. C. Plantz, and D. R. Brush, “ Shielding theory and practice, ” IEEE Trans. on Electromagnetic Compatibility, vol. 30, no. 3, pp. 187-201, 1988.
[11] 羅華強，類神經網路-MATLAB的應用，清蔚科技，2001.
[12] 張斐章，張麗秋，黃浩倫，類神經網路理論與實務，東華書局，2003.
[13] F. Wang, V. Devabhaktuni, C. Xi and Q. J. Zhang, “ Neural network structures and training algorithms for RF and microwave applications, ” Int. J. RF and Microwave, vol. 9, no. 3, pp. 216-240, 1999.
[14] S. Sa iro lu, K. Guney, and M. Erler, “ Calculation of bandwidth for electrically thin and thick rectangular microstrip antennas with the use of multilayered perceptrons, ” Int. J. RF and Microwave, vol. 9, no. 3, pp. 277-286, 1999.
[15] J.-S. Roger Jang and C. T. Sun, “ Neuro-Fuzzy Modeling and Control, ” Proceedings of the IEEE, vol. 83, no. 3, pp. 378-406, 1995.
[16] 蘇春木，張孝德，機器學習:類神經網路、模糊系統以及基因演算法則，全華科技圖書股份有限公司，2004.