應用遺傳算則於壓電致動平台之建模與定位控制

陳書胤、林志哲

E-mail: 9419857@mail.dyu.edu.tw

摘 要

本論文中的壓電致動平台使採用Bouc-Wen model 來建立系 統模型，而影響建模是否精準的系統外型參數以往都只是用試誤 法來調整，非常的不方便因此本論文採用基因遺傳演算法，利用 其尋優的特性來搜尋壓電平台的系統參數以達到高精密度定位控 制。由於壓電致動器本身存在著磁滯與蠕動現象，會使得定位精 度變差，因此本論文使用結合磁滯觀測器來設計反向前饋控制器 來補償磁滯與蠕動現象，此外再加上前饋與PI 回授控制器來提高 定位精度，在實驗方面使用雙軸壓電平台來做循圓定位控制，此 外還結合微步進平台做四軸粗微定位平台的定位控制。

關鍵詞 : 基因遺傳演算法，磁滯，觀測器，前饋控制

目錄

參考文獻

[1] J. H. Holland, “ Adaptation in natural and artificial systems ” , Ann Arbor, University of Michigan Press, 1975.

[2] J. H. Holland, “ Genetic Algorithms ” , Sci. Am., pp. 66-72, 1992.

[3] D. E. Golderg, “ Genetic Algorithms in Search, Optimization and Machine Learning ” , Addison-Wesley, 1989.

[4] D. Jong, “ Analysis of the behavior of a class of a genetic adaptive systens ” , Ph. D. Dissertation, The University of Michigan, Ann Arbor, 1975.
[5] Y. P. Kuo, and T. H. S. Li, “ GA-based fuzzy PI/PD controller for automotive active suspension system ” , IEEE Trans. Industrial Electronics, Vol. 46, No. 6, pp. 1051-1056, 1999.
[6] S. Park, and H. Lee-Kwang, “ Designing fuzzy logic controllers by genetic algorithms considering their characteristics ” , the 2000 Congress on Evolutionary Computation , Vol. 49, No. 1, pp. 124-133, 2001.
[7] N. H. Moin, A. S. Zinober, and P. J. Harly, “ Sliding mode control design using genetic algorithms ” , 1st International Conference on Genetic Algorithms in Engineering Systems, pp. 238-244, 1995.
[8] S. C. Lin, and Y. Y. Chen, “ A GA-based fuzzy controller with sliding mode ” , IEEE International Conference on Fuzzy System, pp. 1103-1110, 1995.
[9] Z. M. Al-Hamouz, and H. N. Al-Duwaish, “ A new Variable structure DC motor controller using genetic algorithms ” , Thirty-Third Annual Meeting on industry Applications,1998.
[10] H. N. Al-Duwaish, and Z. M. Al-Hamouz, “ A genetic approach to the selection of the variable structure controller feedback gains ” , IEEE Conference on Control Application, pp. 227-231, 1998.
[11] W. S. Oh, Y. T. Kim, C. S. Kim, T. S. Kwon, and H. J. Kim, “ Speed control of induction motor using genetic algorithm based fuzzy controller ” , IEEE 25th Annual Conference on Industrial Electronics Society, pp. 625-629, 1999.
[12] W. A. Farag, V. H. Quintana, and G. Lambert-Torres, “ A genetic-based neuro-fuzzy approach for modeling and control of dynamical systems, ” IEEE Trans. Neural Networks, Vol. 9, No. 5, pp. 756-767, 1998.
[13] P. Ge and M. Jouaneh, “ Tracking control of a piezoceramic actuator ” , IEEE Transactions on Control Systems Technology, Vol. 4, No. 1, pp. 209-216, 1996.
[14] Y. K. Wen, “ Methods of Random Vibration for Inelastic Structures ” , Journal of Applied Mechanics Review, Vol.42, No. 2, pp. 39-52, 1989.
[15] M. Goldfarb, and N. Celanovic, “ Modeling Piezoelectric Attack Actuators for Control of Micromanipulation ” , IEEE Control Systems Magazine, Vol.17, pp. 69-79, 1997.
[16] J.-H. Xu, “ Neural Network Control of a Piezo Tool Positioner ” , Canadian Conference on Electrical and Computer Engineering, Vol.1, pp. 333-336, 1993.
[17] D. Croft and S. Devasia, “ Hysteresis and Vibration Compensation for Piezoactuators ” , Journal of Guidance, Control, and Dynamics, Vol. 21, pp. 710-717, 1998.
[18] C. Newcomb, “ Improving The Linearity of Piezoelectric Ceramic Actuators ” , Electr. Letters, Vol. 10, pp. 442-444, 1982.
[19] S. S. Ku, U. Pinsopon, S. Cetinkunt and S. Nakajima, “ Design, Fabrication, and Real-time Neural Network Control of a Three-degrees-of-freedom Nanopositioner ” , IEEE/ASME Transactions on Mechatronics, Vol. 5, No. 3, pp. 273-280, 2000.
[20] 周鵬程, “ 遺傳演算法原理與應用活用Matlab ” , 全華科技圖書股份有限公司, 2001.
[21] 葉怡成, “ 類神經網路模式應用與實作 ” , 儒林圖書有限公司, 1993.
[22] 楊森任, “ 壓電致動平台之精密定位控制 ” ,碩士論文,大葉大學機械工程學系,2004.