



## A NEURAL NETWORKS BASED DIRECT ADAPTIVE CONTROLLER FOR MULTIVARIABLE SYSTEMS

**W.C. CHO**

*Department of Information & Communications  
Gyeongdo Provincial College  
Yecheon, Korea*

*e-mail: [wccho@gpc.ac.kr](mailto:wccho@gpc.ac.kr); [wccho@daum.net](mailto:wccho@daum.net)*

**I.S. LEE**

*Department of Electronics and Electrical Engineering  
Sangju National University  
Sangju, Korea*

*e-mail: [islee@samback.sangju.ac.kr](mailto:islee@samback.sangju.ac.kr)*

**K.Y. KIM**

*Department of Electronics Engineering  
Cheju National University  
Cheju, Korea*

*e-mail: [Kyungyk@cheju.cheju.ac.kr](mailto:Kyungyk@cheju.cheju.ac.kr)*

**P.G. LEE**

*Division of Electrical Engineering  
Uiduk University  
Kyeongju, Korea*

*e-mail: [pglee@uu.ac.kr](mailto:pglee@uu.ac.kr)*

**ABSTRACT**—This paper presents a direct multivariable adaptive controller using neural network which adapts to the changing parameters of the multivariable nonlinear system with nonminimum phase behavior, mutual interactions and time delays. It base on the theory which a nonlinear multivariable systems to be controlled is divided a linear part and a nonlinear part. The controller parameters of the linear part are obtained by the recursive least square algorithm at the parameter estimation stage, whereas the nonlinear part is achieved the through the Back-propagation neural network. This controller is performed on-line. In order to demonstrate the effectiveness of the proposed algorithm, the computer simulation results are presented to adapt a nonlinear multivariable system with nonminimum phase, noises and time delays and with changed system parameter after a constant time. The proposed method is effective compared with the conventional direct multivariable adaptive controller using neural network.

**Key Words:** Multivariable nonlinear system, Multivariable self-tuning controller, Neural network, Direct adaptive multivariable controller, Nonminimum phase system