FUZZY SLIDING MODE CONTROLLER FOR A PH PROCESS IN STIRRED TANKS

LUIS E. ZÁRATE* AND PETERTON RESENDE**
*Applied Computational Intelligence Laboratory
Computer Science Department
Pontifical Catholic University of Minas Gerais
Belo Horizonte, Brazil
e-mail, zarate@pucminas.br

**Electronics Engineering Department
Federal University of Minas Gerais
Belo Horizonte, Brazil
e-mail, pr@cpdee.ufmg.br

ABSTRACT—The pH control is a difficult problem. This is due to the strong non-linearity and extreme sensitivity to disturbances in the neighborhood of the neutrality point. A Fuzzy Sliding Mode Controller (FSMC) which combines a Variable Structure Control with sliding modes (VSC) and the fuzzy logic theory to adjust the controller gains, for pH control (neutralization and regulation), is presented in this work. The FSMC was designed by considering the non-linearities and the uncertainties of the pH process. The controller uses the Smith predictor structure to deal with the effect of the time delay characteristic of this kind of process. It is shown how the FSMC can improve the response of the conventional VSC applied to pH process. It will be possible to observe that the required times to reach the steady-state is significantly improved. Simulation results for the pH process are presented with comparisons between the VSC and FSMC.