

# A PC-BASED SELF-ORGANIZING CONTROLLER USING FUZZY LOGIC

## ABSTRACT :

In recent years, much research has been concentrated on developing adaptive control methods capable of identifying the unknown parameters of a model of assumed structure. This estimated model then used to produce the required control algorithm. However, the performance of such system is still dependent upon design assumptions of system order, time delays, nonlinearities, ..etc. Many ill-defined systems are sometimes easily controlled using manual techniques. However, human memory is prone to forgetting and distorting stored information. Therefore, it is necessary to combine the vague symbolic processing capabilities of human with the speed, capacity and reliability of computers. To include the operator's control action in an automatic scheme, a method of describing his control strategy is required. This can be achieved using the theory of fuzzy sets.

Since the introduction of fuzzy control theory, it has been applied to a wide variety of industrial processes. However, such a control method has some problems obstructing its use in real-time applications. The main problems are the rule generation, tuning and time required to compute the control action.

The object of this research is to demonstrate how fuzzy logic and self-tuning techniques can be combined to implement a real-time self-organizing fuzzy controller. Simulated and experimental results indicate that the self-organizing fuzzy controller can learn the unknown information about a process and use it as an experience for future controls, so the performance of the system will be gradually improved.

**Keywords:** Fuzzy logic control, Self-organizing controller,  
adaptive control, Rule-based controller, Expert  
controller, Real-time computer control.