

Abstract

Alaa Eldin Ahmed Khalil

Loop Control and Tuning in Distributed Control System Using Fuzzy Controller

Abstract- In this paper, the designed schemes for two fuzzy controllers, employing the scaling factor tuning, are proposed. The first fuzzy logic controller is a normalized controller used to control the system. The tuning for the input and output-scaling factors of the first one is done through the second fuzzy controller (the supervisory controller). This combination is used to appropriately determine the control signal of the process. The supervisory fuzzy controller tunes the normalized fuzzy controller based on the model reference adaptive control technique. The great advantage of the proposed method is that, a supervisor as a fuzzy controller to tune the scaling factor of a normalized fuzzy controller can be used to supervise many control systems. The simplicity and modular structure of the controller makes it is more suitable to be applied to control most control loops in the distributed control systems (DCS). The normalized fuzzy controller and the supervisory fuzzy controller are organized with specific experience information about the controlled systems. The proposed fuzzy controllers are applied experimentally to control an experimental process, which simulate an LPG process. The proposed controller is applied to two different control loops, temperature and level, where the controller gains are Selected based on the process conditions and limitations. A comparison among scaling factor manual tuning, supervisor fuzzy and conventional adaptive fuzzy controller is done to verify the effectiveness of the proposed design. The results show that in the last case the system is forced to follow the desired response. Key Words: Normalized fuzzy controller, supervisor fuzzy controller, scaling factor tuning, and DCS systems.