Self-regulating fuzzy control for forward DC-DC converters using an 8-bit microcontroller

許駿飛,鐘翊方,林志民,徐嘉佑
Electrical Engineering
Engineering
fei@chu.edu.tw

Abstract

This paper proposes a self-regulating fuzzy control (SRFC) design method; this control system uses a gradient rule modification method to regulate the fuzzy rules. Moreover, to reduce the number of fuzzy rules and to strengthen the robustness of SRFC, a self-regulating fuzzy sliding-mode control (SRFSMC) design method is also developed. Both the SRFC and SRFSMC systems contain two sets of fuzzy inference logic, one is the control regulator and the other is the rule modifier. The proposed SRFC and SRFSMC systems can automatically regulate the fuzzy rules to achieve satisfactory performance and the computation is easy; so that they are suitable for real-time control. Finally, the proposed SRFC and SRFSMC systems are applied to control a forward DC-DC converter to illustrate their effectiveness. A microcontroller-based experiment system is implemented. Experimental results show that the proposed SRFC and SRFSMC systems are robust with regard to different input voltages and load resistance variations for the forward DC-DC converter.

Keyword：converter, fuzzy control, microcontroller,