

# Adaptive Two-Stage Fuzzy Temperature Control for an Electroheat System

王志湖, 林俊宏, 李柏坤, 劉建男, 蘇朝琴

Electrical Engineering

Engineering

bkleee@chu.edu.tw

## Abstract

In this paper, we construct a simple adaptive two-stage fuzzy temperature tracking controller for a commercial electroheat system. Being not well isolated from the environment, it is hard to build an analytical model for the system due to heat convection caused by a fan for heat mixing in the chamber, heat leakage to the environment, variation of the environment temperature, and uncertain nonlinear heating dynamics. Also, as a commercial product by using cheap heater coils and without equipping a cooling system, this system usually has a bad transient response such as a long rise time, a large over-shoot, and a long settling time. Moreover, temperature tracking at the steady-state phase is not easy to maintain due to heat interaction with the environment. Here, in the presence of the unknown system dynamics, we use a two-stage fuzzy controller to improve the transient response. Furthermore, a simple fine-tuning adaptive control scheme is proposed to overcome environmental influence and ensure tracking of the temperature setting. Simulation study and experimental results show good performance of the adaptive fuzzy

temperature control system.

Keyword : adaptive fuzzy control, temperature controller