

## CHAOS SYNCHRONIZATION BASED ON FUZZY MODEL USING SLIDING MODE CONTROL

YOSHIMASA SHIMIZU, MICHIO MIYAZAKI

Department of Electrical, Electronic and information Engineering  
Kanto Gakuin University  
1-50-1 Mitsuura-Higashi, Kanazawa-ku, Yokohama, Kanagawa 236-8501, Japan  
{ d0042001, miyazaki }@kanto-gakuin.ac.jp

HEE-HYOL LEE AND KAGEO AKIZUKI

The Graduate School of Information, Production and Systems  
Waseda University  
2-7 Hibikino, Wakamatsu-ku, Kitakyushu, Fukuoka 808-0135, Japan  
{ lee, akizuki }@waseda.jp

Received November 2004; revised April 2005

**ABSTRACT.** *In this paper, the chaos synchronization system used for secrecy communication is considered. The compound system which consists of subsystems is chaos-synchronized. And, the state of synchronization section in each subsystem is constituted by fuzzy model. Subsystems with the same chaotic dynamics are asynchronous at first. Furthermore, the noise which exists between subsystems invades into the control input of the chaos synchronization additionally. In consideration of the noise, the sliding mode control is applied to the chaos synchronization control. Then, the control input for the chaos synchronization can be made small by use of the chaotic characteristic of the subsystems.*

**Keywords:** Chaos synchronization, Noise, Sliding mode control, Fuzzy model

**1. Introduction.** In recent years, networking of using computer is spread. And, the use of networks, such as the Internet, is progressing dramatically. Since the problem on security is actualizing, the secrecy communicating method is studied extensively. As one of them, there is chaos communication as secure communication, which uses the chaos signal for encryption of the information signal [1]. Further, the technique using the chaos synchronization is also proposed. Although the chaos synchronization is easy to constitute, it is excellent in secrecy quality [2, 3].

This research is related with chaos communication, and is targeting the chaos synchronization discrete time systems. Chaos synchronization is the phenomenon that the state of each subsystem becomes equal. Each subsystem is mutually combined and has the same chaotic dynamics. The state of each synchronization section of the transmission side and the reception side is synchronized only at the time of signal transmission. And, it is used as a code key [4, 5, 6]. Although the signal cannot be decoded if a mismatch arises, there are few methods which are able to take the noise between subsystems into consideration.