Dynamics of Continuous, Discrete and Impulsive Systems
Series **A:** *Mathematical Analysis* **11 (2004)** 787-796

THE FUZZY COGNITIVE MAPS BASED ON AFS FUZZY LOGIC

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Abstract. Fuzzy cognitive maps (FCM) are approaches to knowledge representation and inference that are essential to any intelligent dynamical system. However, the current techniques for constructing fuzzy cognitive maps are inadequate and infeasible in practice. In this paper, we propose the fuzzy cognitive maps based on AFS fuzzy logic, by which we can design and analyze the fuzzy cognitive maps for large-scale intelligent systems. It makes the systematic and theoretical approaches possible. The most important things are that the fuzzy cognitive maps based on AFS fuzzy logic can be transacted by computers easily.

Keywords. AFS algebra, AFS structure, AFS fuzzy logic, fuzzy cognitive map, molecular lattice

AMS (MOS) subject classification: 93A30.

1 Introduction

Fuzzy cognitive map (FCM) [12, 13] offers a far more flexible and powerful framework for representing human knowledge and for reasoning. In FCM's, it is able to represent all types of concepts and express the arcs (edges) connecting these concepts in terms of symbols or numeric values. Over the last ten years, fuzzy cognitive maps have been applied to represent knowledge and artificial inference, such as geographic information systems [18-20], fault detection [14, 15], policy analysis [17], etc. Although many developments have been achieved recently, progress in the detailed investigation of basic behavior of inference patterns and the analysis has been little. It is, therefore, in general, very difficult to develop large-scale intelligent systems based on fuzzy cognitive maps. In real-world applications, fuzzy cognitive maps are usually very large and complex, containing a large number of concepts and arcs and need a large number of high quality membership functions and the accurate logic operators "*and*", "*or*" and "$'$" between fuzzy sets which can not been obtained by the current fuzzy logic systems. The current techniques for constructing and analyzing fuzzy cognitive maps are inadequate and infeasible in practice. By AFS (Axiomatic Fuzzy Sets) fuzzy logic, we can