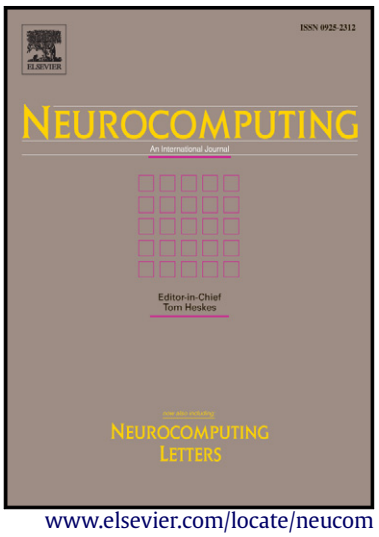

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H_∞ Control of T-S Fuzzy Fish Population Logistic Model with the Invasion of Alien Species

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Abstract: The problem of H_∞ control for a fish population logistic model with the invasion of alien species is studied via a T-S fuzzy control approach in this paper. Firstly, the harvested capability induced by economic factors and purification capability induced by invasion of alien species are analyzed. Secondly, the corresponding bio-economic model is established by taking the above two factors into account. Thirdly, the singularity-induced bifurcation (SIB) and impulsive behavior of the resultant bio-economic model are investigated. After that, a T-S fuzzy system is used to describe the nonlinear system for the bio-economic model with added input disturbance. A sufficient condition is proposed to satisfy the H_∞ norm of the system by using the Lyapunov theory and a linear matrix inequality approach. Finally, a modified differential transform method is exploited to present the invasion system to analyze the characters. The application of H_∞ controller according to actual events demonstrates the effectiveness of the method used in this paper.

Key words: T-S fuzzy system, H_∞ control, alien species, singularity-induced bifurcation, modified differential transform method

1 Introduction

During the past decades, the Takagi-Sugeno (T-S) fuzzy systems have attracted considerable attention, see, .e.g, [1-3]. For the applicability of the T-S fuzzy system theory, [4] surveys the vehicle suspension system problem based on an H_∞ control approach. The authors in [5] further studied the delay-dependent stability criteria and time-varying delay in the T-S fuzzy systems. [6] has addressed the filter design problem for fuzzy systems with D stability constraints. In this paper, we further study fuzzy systems with an H_∞ control approach, which better controls and regulates the densities of species for biological benefit. The problem of how to build an appropriate model, which can give a description reasonably well for the complex situations of interference and uncertainty, is a significant issue for practical control