

Abstract

In this paper, artificial bee colony (ABC) optimization based methodology is proposed for automatically extracting Takagi–Sugeno (TS) fuzzy systems with enhanced performance from data. The design procedure aims to find the structures and the parameters of the TS fuzzy systems simultaneously without knowing the rule number as a priori. In the proposed method, a fuzzy system is encoded into a food source with appropriate string representation so that the TS model is entirely specified. The encoded premise and consequent parameters of the fuzzy model evolve together through artificial bee colony optimization strategy simulating the global foraging behavior of honey bee swarm so that good solutions can be achieved. Simulations on benchmark modeling and tracking control problems are performed and compared with other existing methods. The experimental results indicate that the proposed ABC optimization based fuzzy systems design algorithms can successfully find accurate fuzzy models with appropriate number of rules. Moreover, the proposed approach outperforms the compared methods and can provide considerable improvements in tackling complex modeling and tracking control problems.