

## FUZZY INFERENCE MODELING BASED ON FUZZY SINGLETON-TYPE REASONING

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**ABSTRACT.** *In this paper, the idea of the neuro-fuzzy learning algorithm has been extended, by which the tuning parameters in the fuzzy rules can be learned without changing the fuzzy rule table form used in usual fuzzy applications. A new neuro-fuzzy learning algorithm in the case of the fuzzy singleton-type reasoning method has been proposed. Due to the flexibility of the fuzzy singleton-type reasoning method, the extended method is more reasonable and suitable for constructing an optimum fuzzy system model than the conventional neuro-fuzzy learning algorithm. Moreover, the efficiency of the extended neuro-fuzzy learning algorithm compared to a genetic algorithm is demonstrated by identifying a nonlinear function.*

**Keywords:** Fuzzy singleton-type reasoning, Fuzzy rule table, Triangular-type membership function, Matching approach, Neuro-fuzzy learning algorithm

1. **Introduction.** In recent fuzzy theory applications, it is becoming more important to consider how to design a reasonable and suitable fuzzy system model for identifying the corresponding practical system [1-5,7,10,11,13-17,19-26]. Due to the above reasons, it is natural and necessary to consider how to generate or tune fuzzy rules by some learning techniques. By means of the back-propagation algorithm of neural networks [12], the so-called *neuro-fuzzy learning algorithms*, which are widely used in recent fuzzy applications for generating or tuning an optimal fuzzy system model, have been proposed by Horikawa et al. [2], Ichihashi [3,4], Lee et al. [5], Nomura et al. [10,11], Shi and Mizumoto [13,15,17], Wang and Mendel [20,21], independently. Any one of these algorithms can be used to