A robust structure identification method for evolving fuzzy system

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ABSTRACT

This paper proposes a robust structure identification method (RSIM) based on incremental partitioning learning. RSIM starts with an open region (initial domain) that covers all input samples. The initial region starts with one fuzzy rule without fuzzy terms and then evolves through incremental partitioning learning, which creates many subregions for system error minimization. The three major contributions of the proposed RSIM are as follows: It locates sufficient splitting points provided through a robust partitioning technique, determines the optimum trade-off between accuracy and complexity through a novel partition-selection technique, minimizes global error through global least square optimization. These contributions offer many remarkable advantages. First, RSIM provides a solution for the curse of dimensionality. Second, RSIM can also be applied to low-dimensional problems. Third, RSIM seeks to produce few rules with low number of conditions to improve system readability. Fourth, RSIM minimizes the number of fired rules. Therefore, RSIM can achieve low-level complexity systems. Three low-dimension and six high-dimension and real-life benchmarks are used to evaluate the performance of RSIM with state-of-the art methods. Although RSIM has high interpretability, the results prove that RSIM exhibits greater accuracy than other existing methods.