

A New BBO-Type-2 Fuzzy scheme for time series Modelling

Mohammed Assam OUALI, Mohamed LADJAL, Mohamed DJERIOUI

LASS, Laboratory of Analysis of Signals and Systems
Department of Electronics, Faculty of Technology
University of Mohamed Boudiaf of M'Sila
B.P. 166, Ichbilia, M'sila, 28000, Algeria

E-mails: mohammedassam.ouali @univ-msila.dz, mohamed.ladjal@univ-msila.dz,
mohamed.djerioui@ univ-msila.dz

Abstract: In this investigation a novel type-2 fuzzy model for Time series is presented. It is based on interval type-2 fuzzy systems. The proposed method deals with the curve fitting and computational time problems of type-2 fuzzy systems. This approach will significantly reduce the number of type-2 fuzzy rules and simultaneously preserves the fitting quality. The proposed model comprises a parallel interconnection of two type-2 sub-fuzzy models. The first one is the primary model, which represents an ordinary model with a low resolution for the time series under consideration. To overcome resolution quality problem and obtain a model with higher resolution, we introduce the second model called the error model. This model represents the error modelling between the primary model and the real time series model. The error model characterizes the uncertainty in the primary model which can be minimized by a simple subtraction of the error model output from the primary model output. The result is a parallel interconnection between the two sub models. Thus, a unique and entire final model possessing higher resolution is realized. The model's representation and identification are implemented by using type-2 fuzzy auto regressive moving average (T2FARMA) models. Identification is achieved by innovative metaheuristic optimization algorithm such as biogeography-based optimization (BBO). The effectiveness of the method is evaluated by testing the proposed model with the reference time series models. In addition, a detailed comparative study with several reference methods will be presented. The results of the experiments that have been conducted confirm that the proposed method can considerably improve convergence, resolution and computation time.

Keywords: Time Series Fitting; Type-2 Fuzzy Logic; Metaheuristics Algorithm, BBO.

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References