Design Fuzzy Type-1 and Interval Type-2 Fuzzy Based Harmonic Search Optimization Algorithm for Uncertain System: Fault Tolerant Control Utilization

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Abstract:
The purpose of this study is to enhance the efficacy of harmonic search (HS) algorithm with dynamically changing evolutionary optimization method parameters utilizing fuzzy type-1 (FT1) and interval type-2 fuzzy systems (IT2FS). We previously examined both types of fuzzy schemes in a number of bench-mark tasks and determined that combining fuzzy logic scheme with the harmonic search method gives prominent outcome. Many of the scientific research clearly show that proposed method outperforms other algorithms statistically. In this example, the harmony memory (HMR) variable is dynamical adjusted throughout the evolution procedure using FT1 and IT2FS. The primary contribution of this work is the ability to determine the two form of fuzzy inference scheme used in the harmonic search approach delivers superior consequence through experimentation in a benchmark control problem. This is because there has been no previous research that uses and compares type-1 and interval type-2 fuzzy systems. Additionally, 3 types of uncertainty are used to assess the performance of both fuzzy systems in the standard coupled-tank level control system, simulated the perturbation that may exist in reality and thus permit statistical verification if there are significant variances among FT1 and IT2FS. The statistical result ware produced and compared with other recent technique and found that the proposed fuzzy based technique gives superior performance under the perturbation.

Keywords:
Harmonic Search algorithm, Fuzzy controller, Type-2 fuzzy systems, Fuzzy sets