Lévy Distribution Meta-heuristic Fuzzy Based Optimization Algorithm for Optimal Framework Design of Type-2 Fuzzy Controller: Subject to perturbations

Dr. Himanshukumar R. Patel, himanshupatelp32@gmail.com

Abstract:
New metaheuristic algorithms have been created in recent times based on L$\grave{e}$vy Flight (LF), drawing inspiration from biological and natural events. Many researchers have adopted this nature-inspired approach to algorithm creation to solve optimization challenges. These algorithms have been tested against standard algorithms and have proven to be superior in a variety of complicated problems. One of the most powerful aspects of Cuckoo Search (CS) is the use of L$\grave{e}$vy steps to generate fresh possibilities. This approach modifies possible solutions by causing a large number of changes and a few major transition. As a consequence of this, CS will be capable to greatly improve its search skills while also increasing the connection between exploration and exploitation. This research work, the Interval Type-2 Fuzzy Logic Controller (IT2FLC) is introduced to the typical Cuckoo Search Optimization (CSO) algorithm to ascertain the optimal membership functions (MFs) parameters of Interval Type-2 Fuzzy Logic Systems (IT2FLSs).The investigation considers two types of MFs: triangle and trapezium. Whenever disturbance are used to execute to each one control issue, the CSO algorithm's performance and efficacy boost dramatically. Two standard control problems are used to evaluate the suggested method: one is tank level controller and the second one is inverted pendulum controller. The primary purpose is to demonstrate the effectiveness of the CSO algorithm in locating suitable fuzzy controllers for nonlinear plants. All control problem considers two forms of disturbances. The CSO algorithm produces good results in the field of Fuzzy Logic Controllers (FLCs), according to the findings.

Keywords:
Cuckoo Search Optimization Algorithm, interval type 2 fuzzy logic controller, perturbation, benchmark control problem.