Uncertain multi-objective optimization using a nonlinear interval number

programming method

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An uncertain multi-objective optimization method is developed based on nonlinear interval number programming (NINP) method. A general multi-objective optimization problem with uncertainty is considered in which the objective functions and constraints are both nonlinear and uncertain. The NINP method is employed to transform each uncertain objective function into a deterministic single-objective optimization problem and a modified possibility degree of interval number based on the probability method is suggested to deal with the uncertain constraints. Using the constraint penalty function method, a deterministic multi-objective and non-constraint optimization problem is formulated in terms of penalty functions. Then the micro multi-objective genetic algorithm (μ MOGA) and the intergeneration projection genetic algorithm (IP-GA) are adopted as outer layer and inner optimization operator to solve the nesting optimization problem, respectively. Finally, the present method is applied to four numerical examples, and the optimization results demonstrate its efficiency.

Keywords: Uncertainty, Multi-objective optimization, Nonlinear interval number programming