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MULTI-OBJECTIVE PERFORMANCE DESIGN OF INJECTION MOLDING MACHINE VIA A NEW MULTI-OBJECTIVE OPTIMIZATION ALGORITHM

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Abstract. *To solve the multi-objective optimization problem of injection molding machine product's overall performance, firstly, the optimal design of injection molding machine is studied and the design problem is formulated as a constrained multi-objective problem involving continuous and discrete design variables. Furthermore, with the K means of joint support vector clustering method to reduce the number of external stocks, a new multi-objective optimization algorithm KSVC-SPEA is proposed. Then, taking the multi-objective optimization of the overall performance of the HT160X1N high-speed injection molding machine as an example, the traditional linear weighting methods, Strength Pareto Evolutionary Algorithm (SPEA) and the KSCV-SPEA are applied. Case studies show that the KSVC-SPEA is able to effectively achieve the multi-objective optimization design of the overall performance of injection molding machine with a high efficiency.*
Keywords: K means clustering, Support vector clustering, Multi-objectives optimization, Injection molding machine

1. **Introduction.** The injection molding machine is one of the most important industrial equipments. It is widely used in the manufacturing of complex-shaped and high value-added products. Usually, the injection parameters of injection pressure and injection power are in conflict. In addition, the design restrictions such as injection precision, injection speed and clamping force must be taken into consideration for the overall performance design of the injection molding machine. Therefore, the optimization design of the injection molding machine is a multi-objective optimization problem, which usually has non-singular optimal solution.

In such problems, there is a Pareto-optimal solution set, which is the set of solutions such that attempting to improve any one objective function would necessarily worsen another. A wide variety of multi-objective optimization techniques have been proposed and developed to search for the optimal solutions. Meta-heuristics methods [1,2] were applied to various types of industrial problems to search the best trade-offs between the objective functions in a reasonable time; however, in these methods each objectives is treated separately. In literatures [3-5], the multi-objective optimization problem is