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Multi-Objective Differential Evolution with a New Improved Mutation Strategy

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Abstract: Many real world problems are considered multi-objective problems because of their nature that two or more conflicting objectives need to be optimized at the same time. Such problems state a challenge for researchers to design efficient algorithms capable of helping decision makers to overcome the tradeoff between the different objectives. Therefore, it is a challenging task to design effective algorithms for multi-objective optimization. This paper presents a new algorithm, namely MOsDE-Im, based on a differential evolution algorithm and a new type of mutation scheme $\text{DE/current-to-robest}$. This mutation is a variation of original $\text{DE/current-to-best}$ that uses the best individual based on one objective value randomly chosen in each generation. This guided mutation helps to progress the search towards promising regions by switching between best objective-wise individuals and increasing the probability of producing potential superior solutions. A new method that combines crowding distance and a portion of best objective-wise solutions is used to obtain the desired number of well distributed non-dominated solutions in the objective space. The performance of the proposed algorithm is evaluated on a set of challenging benchmark problems. Results assert the fact that the proposed method effectively solves the multi-objective benchmark problems.