NEW MUTATION OPERATOR FOR MULTI-OBJECTIVE OPTIMIZATION WITH DIFFERENTIAL EVOLUTION

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ABSTRACT. Differential evolution is one of the widely used evolutionary algorithms in the field of single and multi-objective optimization. For a multi-objective case, differential evolution has been reported to be a powerful and simple mechanism to produce nondominated solutions. However, its efficiency may deteriorate because the trial vectors generated can cover only parts of the decision space. Typically, differential evolution operators developed for single objective optimization are used also for multi-objective optimization. In this paper, we question this practice and propose that operators designed for multiple objectives may be useful. For example, the operators used should be able to generate trial vectors capturing nonlinear dependencies in the decision variables in Pareto optimal solutions. To support the idea of a need of new operators we propose a new polynomial based mutation operator with curve tracking properties. This mutation operator has been created for nonlinear variable dependencies to enhance the exploitation capabilities of differential evolution based multi-objective algorithms. With some numerical experiments we demonstrate the usefulness of such a new operator.