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An approach for minimizing the number of objective functions in the optimization of vehicle suspension systems

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Abstract: In recent studies, the suspension parameters of a vehicle model are estimated using multi-objective optimization procedures with genetic algorithms in order to overcome the well known conflict of ride comfort and road holding.
However, the researchers sometimes end up using more than one objective function representing the same requirement, growing the dimension of the optimization problem.
Thus, the optimization procedure becomes very quickly ineffective and the merits of the GAs are put aside because of the increased computational time of the simulations.
This work focuses on indicating that the inconsiderate selection of objective functions noticed in the literature, in order to obtain the optimum solution of a suspension design, doesn't lead to extra quality in the solution.
In this direction, six objective functions widely used in the literature depicting the ride comfort and the road holding, were selected.
In our experiments, various SOO approaches (Part A) and two MOO approaches (Part B and C) were selected, where Part B is proposing a novel way of handling the optimization objectives.
All the MOO approaches presented combine GAs for obtaining the Pareto set and a sorting algorithm for pointing out their optimum solution among the Pareto alternatives.
The optimum solutions of the two approaches are presented and compared in terms of convergence and computational time, concluding to the fact that the economy in the objective functions could provide not only a better solution but also could save significant computational time.